



Aviation

Flying in formation

How to combine hydrogen and carbon capture

READERS OF *The Economist* are a well-travelled lot. Many of them will be aware, perhaps slightly guiltily, that one of the biggest personal contributions to climate change is all that jet-setting. On average, each person on Earth going about their normal business produces the equivalent of five tonnes of CO₂ a year. But a single transatlantic round trip produces the equivalent of about one tonne per passenger even in economy class.

For some, the problem with global warming is the idea that they may have to change their behaviour to fight it, not just by recycling or eating more seasonal food but by, heaven forbid, forgoing that holiday in Gstaad or the Maldives. Eventually zero-carbon technology may be able to avert some of those difficult sacrifices, by combining green-hydrogen production with a way of sucking CO₂ out of the atmosphere to make synthetic fuels. This is currently very expensive, but it could help low-carbon aviation to take off.

On current trends, air-passenger numbers are expected to double within the next 20 years, mostly because of growth in Asia. That could push up today's emissions of 1bn tonnes of CO₂ a year to at least 1.7bn tonnes, mostly from long-haul flights. The International Air Transport Association, an industry group, has pledged to halve emissions by 2050. Airlines are developing more efficient aircraft to lower their emissions, some with more success than others (see chart). But it is not enough.

Batteries and hydrogen fuel cells are already finding their way into light aircraft for short trips, but they are too heavy or too bulky to propel a jetliner on a long flight. Instead, biofuels or synthetic fuels that combine clean

hydrogen and CO₂ could be used as “drop-in” fuels in existing engines.

In Finland a former oil refiner called Neste has made biofuels from the waste products of slaughtered cows and pigs. It has dropped small quantities of them into the fuel systems of Boeing Dreamliners. But the availability of all biofuels, even those from energy crops, is constrained by the shortage of land to produce raw materials sustainably. At Finland’s Lappeenranta University of Technology researchers are looking at synthetic fuels as an alternative. Christian Breyer says that if electrolysis were used in places with abundant renewable resources, such as the Atacama Desert in Chile, hydrogen could be produced cleanly at low cost.

To turn it into aviation fuel, he suggests siting the electrolyzers near plants extracting CO₂ from the air—a process known as Direct Air Capture (DAC). The gas would be converted into carbon monoxide and combined with hydrogen using the 100-year-old Fischer-Tropsch process that is used to make liquid fuels, all powered by renewable energy. The fuel could be refined into kerosene and other products, such as diesel for marine transportation and naphtha for use in the chemicals industry. When burned, there would be no net addition of carbon dioxide to the atmosphere. “It would work like nature,” says Dr Breyer.

Unfortunately DAC is the most nascent of nascent technologies. Yet it is attracting the attention of influential promoters such as Bill Gates, founder of Microsoft. Initially it was conceived as a way to reduce the amount of CO₂ in the atmosphere; if a captured CO₂ molecule can be burned again to keep people flying, at least it does not add to the overall stock.

The firm backed by Mr Gates is Carbon Engineering, based in Canada, that has run a DAC pilot project since 2015 that is capable of extracting one tonne of CO₂} per day, and has produced synthetic fuels since 2017. Another firm is Climeworks of Switzerland. Estimates have suggested the DAC technology

can cost up to \$600 per ton of CO₂ removed, but in a recent paper in *Joule*, an energy journal, Geoffrey Holmes of Carbon Engineering and others argue that costs can be below \$100 per ton if done at scale.

Mr Holmes says the company has borrowed and modified tested technologies to ensure that it is not reinventing the wheel. The pilot plant sucks in lots of air using a modified version of cooling-tower technology, and draws it through corrugated sheets of plastic sprayed with a hydroxide solution. The CO₂ absorbs into a liquid film to form a carbonate solution which goes through a pellet reactor, using chemistry common in water treatment, to form calcium carbonate pellets “like hailstones” that molecularly bind the CO₂ for further processing. These pellets are heated to 900°C in a high-temperature reactor to produce calcium oxide and CO₂. The heating process can be fired by natural gas and both the atmospheric CO₂ and that from combustion can be gathered and used.

The carbon thus captured does not have to be turned back into fuel; it could simply be buried. This is one of several ways of removing carbon dioxide out of the air for good. They include producing biomass such as forests, burning wood to generate electricity and capturing and sequestering the CO₂. A report by America’s National Academy of Sciences says that even the cheapest negative-emissions technologies such as biomass with CCS are still too limited in scale to make a big dent in atmospheric CO₂. A study by Britain’s Royal Society and Royal Academy of Engineering said a carbon price of \$100 a tonne may be needed to make most negative-emissions projects feasible. The danger is that policymakers will delay curbing emissions now in the hope of being able to remove large amounts of greenhouse gases from the air in the future. In fact, both are needed on a massive scale. ■



航空

编队飞行

如何将氢与碳捕获结合起来

《经济学人》的读者普遍旅行经验丰富。他们中的许多人都会意识到——或许是略带内疚地——对气候变化最大的个人贡献之一就是坐飞机出游。平均而言，地球上每个开展普通业务活动的人每年的产量相当于5吨二氧化碳。但是，即使是坐经济舱，只要跨大西洋往返一次，每位乘客也相当于产生了约1吨二氧化碳。

对于一些人来说，全球变暖的问题在于想到自己可能不得不改变行为习惯来对抗它——不仅仅要回收垃圾或吃更多的当季食物，而是还要放弃在瑞士格施塔德或马尔代夫的度假，这太要命了。最终，零碳技术或许能避免一些这么困难的牺牲。这种技术将绿色氢气生产与从大气中吸收二氧化碳以制造合成燃料的方法结合起来。这目前非常昂贵，但可帮助低碳航空启航。

根据目前的趋势，航空客运量预计会在未来20年增加一倍，主要来自亚洲的增长。这可能将目前每年10亿吨二氧化碳的排放量推高至至少17亿吨，大部分源自长途航班。行业组织国际航空运输协会承诺到2050年将排放量减半。航空公司正在开发更高效的飞机以降低排放，成效不一（见图表）。但这还不够。

电池和氢燃料电池已经进入轻型飞机来驱动短途飞行，但它们要么太重，要么太大，无法推进喷气客机做长途飞行。相反，生物燃料或结合清洁氢气和二氧化碳的合成燃料可用作现有发动机中的“直接替代”燃料。

在芬兰，一家名为Neste的前炼油厂从屠宰奶牛和猪的废弃物中生产生物燃料。它已将少量产品投入波音梦想飞机的燃油系统。但任何生物燃料的供应，哪怕是来自能源作物，都受到可持续生产原料的土地短缺的制约。

在芬兰的拉彭兰塔科技大学（Lappeenranta University of Technology），研究人员正在研究合成燃料作为替代品。克里斯蒂安·布雷耶（Christian Breyer）说，如果在拥有丰富可再生资源的地方——例如智利的阿塔卡马沙漠——使用电解法，就可以低成本而清洁地生产氢气。

为了将这些氢气变成航空燃料，他建议选择把电解槽放到从空气中提取二氧化碳（这一过程称为“直接空气捕获”[DAC]）的工厂附近。使用具有百年历史、用于制造液体燃料的费托合成工艺，可将二氧化碳气体转化为一氧化碳并与氢气结合，而这一切都由可再生能源提供动力。这种燃料可以精炼成煤油和其他产品，例如用于海运的柴油和用于化学工业的石脑油。燃烧时，大气中的二氧化碳将没有净增量。“这就像大自然一样。”布雷耶说。

不幸的是，DAC是一个新之又新的技术。不过，它吸引了微软创始人比尔·盖茨等有影响力推动者的注意。最初它被认为是减少大气中二氧化碳含量的一种方法。而如果被捕获的二氧化碳分子可以再次燃烧来让人们飞行，至少这不会增加二氧化碳整体存量。

盖茨支持的公司是总部位于加拿大的碳工程（Carbon Engineering），该公司自2015年起实施DAC试点项目，每天能提取1吨二氧化碳，并自2017年起生产合成燃料。另一家公司是瑞士的Climeworks。据估计，DAC技术每清除一吨二氧化碳的成本高达600美元。但最近在能源期刊《焦耳》（Joule）上刊登的一篇论文中，碳工程公司的杰弗里·霍尔姆斯（Geoffrey Holmes）等人认为，如果大规模开展，成本可低于每吨100美元。

霍尔姆斯表示，公司借用并调整了久经考验的技术，以确保自己不会做无谓的重复。试点工厂使用改进版冷却塔技术吸入大量空气，并让其通过喷涂了氢氧化物溶液的瓦楞纸板。二氧化碳被吸收到液膜中形成碳酸盐溶液，溶液再通过颗粒反应器，利用水处理中常见的化学反应在分子水平上结合二氧化碳，形成“冰雹般”的碳酸钙颗粒供进一步处理。这些颗粒在高温反应器中加热至900°C以生成氧化钙和二氧化碳。加热过程可以通过燃

烧天然气进行，来自大气和燃烧产生的二氧化碳都可以被收集和利用。

如此捕获的碳不一定要变回燃料，它也可以被简单地填埋。这是从空气中永久去除二氧化碳的几种方法之一。这些方法包括生产林木等生物质，燃烧木材用于发电，以及捕获和隔离二氧化碳。美国国家科学院的一份报告称，即使是最便宜的负排放技术，如带碳捕获和储存（CCS）的生物质，其规模仍然过于受限，无法显著减少大气中的二氧化碳。英国皇家学会和皇家工程院的一项研究表明，为了使大多数负排放项目可行，碳价可能需要达到每吨100美元。危险在于，政策制定者将会在目前推迟限制排放，期望未来能从空气中清除大量温室气体。事实上，两者都需要大规模进行。 ■



PayPal

Money in your purse

Under a “refounder” boss, one of the original dotcoms is thriving by defying conventional wisdom

In silicon valley people are besotted by the latest thing, which is why techies rarely give a thought to PayPal, a digital-payments firm that turns 20 this month. If its name comes up, it usually has to do with the “PayPal mafia”, a group of entrepreneurs, including Tesla’s Elon Musk and Peter Thiel, a venture capitalist, who made their first fortunes when eBay bought their firm for \$1.5bn in 2002. Ask tech employees about the Valley’s largest, high-flying firm and PayPal is unlikely to make their list.

What PayPal lacks in terms of its profile, it has made up for in performance. After languishing under eBay’s control, in 2015 it broke away and re-listed. Today PayPal has a market capitalisation of \$101bn and is one of Silicon Valley’s most valuable technology firms, larger than either Goldman Sachs or Morgan Stanley by value.

This year it is expected to facilitate digital payments worth around \$582bn, roughly four times more than in 2012. PayPal acts as a digital wallet and profits by charging merchants a fee when consumers use it for their online transactions. In 2018 the firm is expected to bring in \$3.4bn in operating income.

That offers a counterpoint to Silicon Valley’s conventional wisdom about how to build and run companies. One credo is that founders are the best bosses, which explains why they get so much leeway and are brought back to run companies (as Jack Dorsey was at Twitter).

For PayPal’s boss, Dan Schulman, who ran the telecoms firm Virgin Mobile

and worked at American Express before taking over in 2014, being an outsider appears to have helped. PayPal had previously embraced a strategy of clashing with rivals, including credit-card firms, as it gets higher fees if people link their bank accounts to PayPal instead of credit cards. According to Lisa Ellis of MoffettNathanson, a research firm, “Everyone hated them. They had a culture of disruption and fought with everyone.” Had Mr Schulman not changed tack, “PayPal could have been dead by now.”

Instead Mr Schulman brokered around 40 partnerships with would-be rivals, including Visa, MasterCard and Google Pay, to extend PayPal’s reach. For example, shoppers who use Google Pay to check out can link their PayPal accounts. For such openness the firm should partly thank Krav Maga, a form of martial arts developed by Israel’s army, of which Mr Schulman is a devotee—he sometimes shows up to the office with a black eye and cuts. “I’m a big believer because of martial arts that the best way to win a fight is to avoid a fight,” he says. This strategy has given investors confidence that credit-card firms and other tech firms would not try to stamp out PayPal, a concern that had hurt sentiment.

Mr Schulman is part of a cohort of little-known chief executives who did not found their firms but have lifted performance at stagnating companies. Dan Rosensweig, who is not a founder but is the longtime boss of the education-technology firm Chegg, calls this group “re-founders”. Satya Nadella of Microsoft is probably the best-known boss to fit the label; others include Shantanu Narayen of the software firm Adobe and Chuck Robbins of Cisco. As outsiders they have been able to embrace new strategies without being beholden to what founders had envisioned.

Another piece of accepted wisdom in Silicon Valley is that only one company in an area can win. “Network effects” which make a service more useful as more people join, helped Google conquer search and Facebook

reign over social networking. PayPal also has network effects—around 60% of Americans shopping online have used it in the past year, reckons Ms Ellis, and around 80% of the top 500 online retailers offer customers the option of paying with PayPal.

But the firm is proof that in certain online sectors, the pie is big enough to feed many. As e-commerce continues to grow, many firms that help with digital payments will thrive, including Square in America and Ant Financial in China. “The real war is the war on cash,” argues Mr Schulman. About 40% of transactions in America are paid for in cash so there is room to grow.

PayPal has grown through deals; in 2018 it has spent \$2.9bn. The largest transaction has been its purchase of iZettle for \$2.2bn in May. It offers software solutions to merchants and helps PayPal expand in Europe (although the deal is facing scrutiny from Britain’s competition authority and has not been approved). A smaller but still significant acquisition was Braintree, a firm that helps firms accept payment within their mobile apps, for \$800m in 2013. With it came Venmo, an app that lets mobile-phone users transfer money to each other. Venmo is popular with youngsters, which has helped extend PayPal’s appeal for a new generation. Venmo is not yet profitable, having been deliberately slow in starting to introduce fees and other moneymaking features. Venmo represents an opportunity, but there are others too. There are whispers that Facebook will integrate PayPal into WhatsApp, its messaging app.

There are still rivals to face down. The most unsettling is Amazon, which does not allow PayPal on its site and has a competing payments product, “Amazon Pay”. It is still significantly smaller than PayPal, handling around one-tenth of PayPal’s total payments, but is growing briskly. PayPal does have the advantage that retailers fear Amazon, so are unlikely to want to help it expand by making its payment service available on their websites. When Amazon bought the grocer Whole Foods in 2017, it “was the Pearl

Harbour of the retail industry. It woke everyone up that things are fundamentally changing," says Mr Schulman. The news probably helped PayPal win more partnerships with retailers. Should the e-commerce goliath invest more heavily in the area of payments, however, that could spell bad news for PayPal. Wars are long and gruelling affairs. ■



贝宝

钱包里的财源

在“再创始人”的治下，互联网最老牌企业之一打破常规，蓬勃发展

硅谷的人们沉迷于最新的事物，所以科技迷们很少会想起贝宝（PayPal）这家在上月满20岁的电子支付公司。如果它的名字出现了，那通常都与“贝宝帮”有关——包括特斯拉的伊隆·马斯克和风险资本家彼得·泰尔在内的一批企业家。2002年eBay以15亿美元收购了他们的公司，让他们收获了自己的第一桶金。要是问一问科技企业的员工硅谷最大、最成功的公司是哪家，贝宝不太可能出现在他们的名单中。

但贝宝靠业绩弥补了它在公众关注度方面的缺失。经历在eBay的控制下萎靡不振之后，它在2015年剥离出来并重新上市。如今贝宝的市值达1010亿美元，是硅谷市值最高的科技公司之一，甚至超过了高盛或摩根士丹利。

2018年它处理的数字支付价值预计将达5820亿美元左右，约为2012年时的四倍。贝宝是一个数字钱包，在消费者使用它完成在线交易时向商家收费获利。预计该公司2018年的营业收入将达34亿美元。

这与硅谷有关如何创建和经营公司的传统智慧非常不同。硅谷的一个信条是创始人是最好的老板。这就是为什么创始人获得了如此多的自主权，还常常被叫回去运营公司，比如杰克·多尔西（Jack Dorsey）在Twitter。

而对贝宝的老板丹·舒尔曼（Dan Schulman）来说，身为一名局外人似乎带来了好处。在2014年接管贝宝之前，他曾管理电信公司维珍移动（Virgin Mobile）并在美国运通任职。贝宝曾经采用的战略是与包括信用卡公司在内的竞争对手展开激烈竞争——因为如果人们是用他们的银行账号而不是信用卡与贝宝关联，贝宝能赚取更高的费用。调研公司MoffettNathanson的莉萨·埃利斯（Lisa Ellis）说，“所有人都讨厌他们。他们的文化是破坏性的，和谁都要斗。”如果不是舒尔曼改变策略，“贝宝可能已经死了。”

相反，舒尔曼与维萨卡、万事达卡和Google Pay等潜在竞争对手谈拢了约40项合作，以扩大贝宝的影响。例如，使用Google Pay结帐的购物者可以关联到贝宝帐户。这家公司会有这样的开放性，在某种程度上应该要感谢以色列近身格斗术（Krav Maga）。舒尔曼是这种由以色列军队开发的武术形式的忠实爱好者。他有时会带着乌青的眼圈和伤痕出现在办公室。“因为武术，我坚定地相信，赢得战斗的最好方法是避免战斗。”他说。这种策略让投资者相信，信用卡公司和其他科技公司不会试图铲除贝宝。过去，这方面的担忧损害了市场情绪。

舒尔曼属于这样一批首席执行官：鲜为人知、并非公司创立者，却让陷入停滞的公司提升了业绩。长期担任教育技术公司Chegg老板的丹·罗森维格（Dan Rosensweig）也不是这家公司的创始人，他给这个群体取名为“再创始人”。微软的萨提亚·纳德拉（Satya Nadella）可能是最符合这个名号的老板。此外还有软件公司Adobe的山塔努·纳拉延（Shantanu Narayen）和思科的查克·罗宾斯（Chuck Robbins）等。作为局外人，他们能积极拥抱新战略，而不会受制于创始人当初的设想。

硅谷另一个普遍认知是在一个领域里只能有一个赢家。“网络效应”（因为越来越多人加入而让一项服务变得更有用）帮助谷歌和Facebook分别称霸在线搜索和社交网络领域。埃利斯认为，贝宝也享有网络效应——网上购物的美国人中有约六成去年用过贝宝；在线零售商500强约八成都为客户提供了用贝宝付款的选项。

但这家公司证明，在某些在线行业，蛋糕之大足以喂饱许多人。随着电子商务持续发展，许多为数字支付提供便利的企业都将蓬勃发展，包括美国的Square和中国的蚂蚁金服。舒尔曼认为，“真正的战争是关乎现金的战争”。美国约有40%的交易仍以现金支付，因此数字支付业务还有增长的空间。

贝宝通过收购发展壮大。2018年它在收购上花费了29亿美元。最大的一笔交易发生在5月份，它以22亿美元收购了iZettle。iZettle为商家提供软件解

决方案，并帮助贝宝在欧洲扩张（不过该交易在英国仍面临竞争监管机构的审查而尚未获批）。一项较小但仍重要的收购是它在2013年以8亿美元收购Braintree，这家公司帮助企业在自己的移动应用中接受用户付款。那次收购一并带来了Venmo——一款让手机用户互相转账的应用。Venmo很受年轻人欢迎，这帮助贝宝扩大了对新一代用户的吸引力。Venmo尚未盈利，它有意放慢速度，推迟启动收费和其他营利功能。Venmo代表着一个机遇，不过机会还不止于此。有消息称，Facebook将把贝宝整合到旗下消息应用WhatsApp中。

仍有一些竞争对手需要对付。其中最令人不安的是亚马逊。亚马逊的网站不使用贝宝，而是用自己的支付产品Amazon Pay。这个竞争产品仍比贝宝小得多，处理的支付总额约为贝宝的十分之一，但增长迅猛。贝宝确实有一项优势：零售商对亚马逊的恐惧。零售商们不大会想在自己的网站上提供Amazon Pay的支付服务来助力亚马逊扩展。舒尔曼说，亚马逊在2017年收购杂货商全食超市“是零售业的珍珠港事变。它唤醒了所有人，让大家意识到事情正在发生根本性的变化”。这个事件可能帮助贝宝赢得了与更多零售商的合作。但是，如果亚马逊这个电商巨头在支付领域加大投入，对贝宝来说可能是个坏消息。战争终究是漫长又艰苦的。 ■



Decarbonising industry

Coke fiends

Steel and cement plants have long lifespans. Change needs to start now

ON THE SWEDISH shore of the Baltic Sea near the Arctic Circle, work has started on a SKr1.4bn (\$150m) pilot project aiming to help Sweden become the first country in the world to produce fossil-free steel. Martin Pei, the engineer behind the project, promises that by 2020, passengers flying to the nearby Luleå airport will be able to look down on a 50-metre-high test plant. “We need to hurry up, because ‘Winter is coming,’” quips the Chinese-born engineer. Or should that be global warming?

In fact, he says, it was not so much the threat of climate change that led Mr Pei to the idea of making Sweden a pioneer of “green steel”. It is the risk that SSAB, the steel company where he is head of technical development, could face public humiliation and a collapse in its business model if it were to stop Sweden from achieving its ambition to become carbon neutral by 2045. SSAB’s existing blast furnace and steel plant in Luleå emits 1.6 tonnes of CO₂ for every tonne of steel. Though low by global standards, the industry as a whole belches out one-tenth of Sweden’s total emissions.

HYBRIT Development, the zero-carbon-steel joint venture between SSAB, LKAB, a state iron-ore producer, and Vattenfall, a state-owned power company, aims to eliminate almost all of these emissions by curbing the use of coking coal. Instead, it will take advantage of Sweden’s abundant renewable energy to generate hydrogen via electrolysis, and use this to produce a product called “direct-reduced iron” (DRI). It hopes to complete the experimental phase by 2024, moving on to a full-scale trial in the decade up to 2035.

This is not the only example of fossil-fuel-dependent companies trying to reinvent themselves for a post-carbon future. According to McKinsey, almost half of the CO₂ emitted by the entire industrial sector comes from four industries; cement, steel, ammonia and ethylene. Unless consumption patterns change, all of them will have to cut emissions while meeting rising demand for cars, buildings, plastics and infrastructure. And because most of their products are commoditised, higher costs imposed by decarbonisation risk “carbon leakage”—the possibility that places with laxer climate policies will produce the commodities more cheaply.

In many countries the first priority for reducing industrial emissions will be to encourage recycling. But that will not be nearly enough, and the way the materials are made will also need to change. HYBRIT’s experience may provide a model. Its technological challenge starts with the fact that 75% of the world’s steel, including SSAB’s, is made using a blast furnace into which carbon, in the form of coke, is added to “reduce” the iron ore. In this “basic oxygen furnace” system, the iron oxide and the carbon react to form molten iron, carbon monoxide and CO₂ (see chart). In the alternative DRI process, natural gas instead of coke is used as the reductant, producing sponge iron that is then converted to steel via an electric arc furnace.

The reduction process generates as much as 90% of the CO₂ emissions in steelmaking, so HYBRIT wants to stop relying on blast furnaces, introduce DRI instead and use hydrogen rather than natural gas as the reducing agent. The hydrogen will react with iron oxides to form water rather than CO₂. The hydrogen will be produced using fossil-free electricity, which is abundant in Sweden. The arc furnace, into which scrap steel will be added, will also be powered by clean energy.

HYBRIT explored the alternative of using CCS to remove the carbon gases from the blast furnace, but found that it would fail to capture about half of the CO₂—not good enough for meeting Sweden’s zero-emissions goal.

It also rejected the idea, used by some Brazilian steel companies, of using charcoal instead of coke in the reduction process, because of the possible toll on Sweden's forestry. And it reckoned electricity prices in Sweden will be low enough to make it cheaper to use hydrogen from electrolysis rather than biogas in the DRI process.

That said, the process is likely to add 20-30% to the price of crude steel, assuming electricity prices remain at current levels. The amount of additional electricity needed will be staggering. Mikael Nordlander of Vattenfall says that at full production HYBRIT would use about 15 terawatt-hours of electricity a year, or 10% of the country's current power supply.

Production is not expected to reach commercial scale until at least 2035, which seems slow for such an important adjustment. Mr Pei explains that this is because scaling up takes time; all new technologies pass through a "valley of death" when progress appears to stall. Moreover SSAB's blast furnace in Luleå has recently been renovated. He says there would be a stranded-asset problem if the project moved ahead too quickly, because the blast furnace would be suddenly rendered obsolete.

If steel is a big test, cement is an even tougher challenge. Cement is the world's most widely used manufactured material, but cement works are typically small, scattered and undercapitalised, which makes them hard to press into service for the good of humanity. Demand for cement, which is mixed with water and aggregates to produce concrete, is set to soar in regions such as India and Africa. That means huge additional volumes of carbon dioxide will be generated. About 60% of the waste gas comes from producing clinker, one of the main ingredients of cement. This process, called calcination, involves heating ground limestone to more than 1,600°C in a kiln, which produces calcium oxide and CO₂.

The clinker is ground and blended with other materials to form what is

known as Portland cement; the power used for grinding also normally releases CO₂. Nearly all of the remaining emissions come from the fuels used to heat the kilns, often coal or coke. These can be replaced with alternatives, from biomass to waste materials such as tyres and municipal solid waste (but not electricity, which at present cannot generate the high temperatures needed to produce the clinker). Along with efficiency improvements, that would be the quickest way to lower cement's carbon footprint.

CCS is a possible low-carbon option for capturing the CO₂ from calcination and from the heat. McKinsey notes that the combined exhaust gases have low concentrations of CO₂, making them more expensive to capture. The consultancy points to an innovative EU-backed project in Belgium called LEILAC that aims to redesign kilns to make it easier to capture exhaust gases from calcination.

The bigger ambition is to develop clinker substitutes, which would do more to reduce emissions. A recent report by Johanna Lehne and Felix Preston of Chatham House, a think-tank, does not hold much hope for an early breakthrough on clinker. But having analysed 4,500 patents, it found that, surprisingly, "the cement sector is more technically innovative than its reputation suggests" (more than steel, for instance).

"Novel cements", or alternatives to Portland, are being developed by Solidia, an American startup now in partnership with LafargeHolcim, a big cement producer. Solidia claims that its low-clinker concrete slashes CO₂ emissions, partly by containing them within the material. But cement and concrete standards usually dictate the Portland clinker content, and builders, architects and customers are understandably wary of new technology, lest their buildings fall down.

Other ways of decarbonising industry may be less daunting. One of the

companies exploring potentially lucrative opportunities is Elysis, a joint venture between Alcoa and Rio Tinto which could revolutionise aluminium smelting for the first time since it was invented in 1886. At present, aluminium comes from the combination of three ingredients: aluminium oxide (alumina), electricity and carbon. Electricity is run between a negative cathode and a positive anode, both made of carbon. The anode reacts with the oxygen in the aluminium oxide, producing CO₂ and liquid aluminium, which is then cast. The quantities of CO₂ can be huge. Vincent Christ, the boss of Elysis, says that in China, which uses coal for the smelting process, 16 tonnes of CO₂ are produced for each tonne of aluminium. Elysis aims to eliminate emissions by using an undisclosed proprietary, non-carbon material for the anode, producing oxygen rather than CO₂.

The project is backed by Apple, maker of the iPhone, which says it wants to lower the carbon footprint of its products. By 2024, Elysis hopes to sell a technology kit that can be used around the world to retrofit existing smelters or build new ones. The aim is to make zero-carbon aluminium 15% more cheaply and 15% more productively than the existing technology, says Mr Christ, partly because the anode will last 30 times longer. If it works at commercial scale, that will hugely increase the technology's potential. "It's taken us ten years to crack the code," he notes. "If it were merely an environmental initiative, it wouldn't have as much interest in the market."

Yet in the end much will depend on China, which produces and uses most of the world's steel, cement, aluminium and other industrial materials. Mr Pei, who recently explained the HYBRIT concept in his country of birth, says China has given little thought to producing zero-carbon steel, because its focus is on curbing the use of coal in its power system. It also has relatively new steel plants which it will be unwilling to close.

Cement may be a different story. The Chatham House study says China has invested more than any other country in cement R&D. Elsewhere in Asia,

Japan's steel industry is pursuing both the hydrogen and CCS approaches to decarbonising industry.

But ultimately it will take pressure from governments to ensure that industry takes the tough, long-term decisions needed for the transformation. They can start by drawing up plans to ensure that enough renewable electricity and sufficient carbon-storage sites are available for a combination of greater electrification and CCS. Then they can offer incentives for hydrogen production and CCS, either by pricing emissions more strictly or providing regulatory and financial support. In time, they can encourage the use of green cement, steel and other zero-carbon materials in public infrastructure projects, creating new markets. That way, industry will be able to move away from old technologies sooner rather than later, without fear that its customers will move elsewhere. ■



工业脱碳

焦炭恶魔

钢厂和水泥厂的寿命很长。变革需要立即开始

在瑞典波罗的海沿岸靠近北极圈的地方，一个耗资14亿瑞典克朗（1.5亿美元）的试点项目已经启动，目的是帮助瑞典成为世界上第一个不用化石燃料炼钢的国家。该项目的总工程师裴文国承诺，到2020年，飞往附近吕勒奥机场的乘客将能从空中俯瞰一座50米高的测试工厂。“我们得赶紧了，因为‘寒冬将至’，”这位中国出生的工程师打趣道。或者应该说全球变暖？

事实上，他说，他之所以会想到让瑞典成为“绿色钢铁”先驱，并不那么关乎气候变化的威胁，而是因为他担任技术开发主管的瑞典钢铁集团（SSAB）所面临的风险：如果妨碍了瑞典实现2045年达到碳平衡的雄心壮志，这家公司可能会蒙羞并面临商业模式崩溃。SSAB现有的位于吕勒奥的高炉和钢铁厂每生产一吨钢就排放1.6吨二氧化碳。尽管按全球标准来看很低，但整个炼钢业的排放量占到了瑞典总排放量的十分之一。

由SSAB、瑞典国有铁矿石生产商LKAB、国有大瀑布电力公司（Vattenfall）建立的零碳钢合资企业HYBRIT Development旨在通过抑制焦炭的使用来消除该行业的几乎所有排放。它将利用瑞典丰富的可再生能源，通过电解产生氢气，用氢来生产一种名为“直接还原铁”（DRI）的产品。该公司希望到2024年完成实验阶段，并在截至2035年的十年里进入全面试产。

这并不是依赖化石燃料的企业尝试为重塑自我，迎接后碳未来的唯一例子。根据麦肯锡的数据，整个工业部门排放的二氧化碳有近一半来自四个行业：水泥、钢铁、氨和乙烯。除非人类的消费模式发生变化，否则这四个行业都必须在满足汽车、建筑、塑料和基础设施不断增长的需求的同时减少排放。而由于它们的大多数产品都已经成为一般商品，因脱碳造成成本增加会导致“碳泄漏”，即气候政策更宽松的地方可能会以更低的成本

生产这些商品。

在许多国家，减少工业排放的首要任务将是鼓励回收利用。但这还远远不够，制作材料的方式也需要改变。HYBRIT的经验可能会提供一个范本。其技术挑战始于这样一个事实：世界上75%的钢，包括SSAB的，都是在高炉中添加焦炭形式的碳以“还原”铁矿石来炼制的。在这种“碱性氧气转炉”系统中，氧化铁和碳反应生成熔铁、一氧化碳和二氧化碳（见图表）。在替代它的DRI工艺中，使用天然气代替焦炭作为还原剂，来生成海绵铁，然后通过电弧炉将其转化为钢。

还原过程产生了占整个炼钢过程高达90%的碳排放量，因此HYBRIT希望停止依赖高炉而改用DRI，并使用氢气而非天然气作为还原剂。氢气将与氧化铁反应生成水而不是二氧化碳。氢气将使用无化石燃料的电力生产，而这种电力在瑞典产量丰富。电弧炉（将向其中投入碎钢）也将由清洁能源提供动力。

HYBRIT曾尝试使用碳捕获和存储（CCS）来去除高炉中产生的碳排放，但发现它只能捕获约一半二氧化碳，不足以满足瑞典的零排放目标。它没有采用巴西一些钢铁企业采用的方法，即在还原过程中使用木炭而非焦炭，因为担心瑞典的林业可能因此受损。并且它认为瑞典的电价会变得足够低，在DRI过程中使用电解氢会比沼气更便宜。

尽管如此，假设电价保持在当前水平，这项工艺可能会让粗钢的价格上涨20%到30%。所需的额外电量将是惊人的。大瀑布公司的米卡埃尔·努德兰德（Mikael Nordlander）表示，如果全面投产，HYBRIT每年将消耗约150亿度电，占瑞典目前供电量的10%。

至少在2035年之前，生产预计不会达到商业规模。对于如此重要的调整来说，这样的速度似乎太慢。裴文国解释说，这是因为规模化需要时间，而所有新技术都会经历一个进展似乎停滞的“死亡谷”。此外，SSAB在吕勒奥的高炉最近做了翻新。他说，如果项目进展太快，将会出现资产搁浅的问题，因为这些高炉瞬间就作废了。

如果钢是一个重大考验，水泥就更是一个艰难的挑战了。水泥是世界上使用最广泛的制造材料，但水泥厂通常都规模小、分散且资金不足，要敦促它们为人类的福祉服务十分困难。在印度和非洲等地，水泥（与水和骨料混合以生产混凝土）的需求势必飙升。这意味着还将生成巨量二氧化碳。其中约60%来自生产熟料——水泥的主要成分之一。这个过程叫煅烧，要在窑炉中把石灰石粉加热到1600°C以上，生成氧化钙和二氧化碳。

将熟料研磨并与其他材料混合，就制成了人们所知的波特兰水泥。用于研磨的动力通常也会释放二氧化碳。剩余的排放几乎全部来自用于加热窑炉的燃料，通常是煤或焦炭。这里可以使用替代性燃料，从生物质，到轮胎等废料和城市固体废物等（但不能用电，目前电力还不能产生制造熟料所需的高温）。随着效率提高，这将是降低水泥碳足迹最快的方法。

CCS是一种可能的低碳选项，它将捕获煅烧和加热过程产生的二氧化碳。麦肯锡指出，混合废气中含有的二氧化碳浓度很低，这令捕获二氧化碳的成本上升。该咨询公司指出，比利时一个欧盟支持的创新项目LEILAC旨在重新设计窑炉，让捕获煅烧产生的废气变得更容易。

一个更大的野心是研发熟料的替代品，这将更大幅度地减排。智库英国皇家国际事务研究所（Chatham House）的约翰娜·莱纳（Johanna Lehne）和费利克斯·普雷斯顿（Felix Preston）最近发表的报告对熟料会较快取得突破并不抱太大希望。但在分析了4500项专利之后，他们吃惊地发现，“水泥行业在技术上的创新性超过它的名声给人的印象。”（比如超过钢铁行业。）

美国创业公司Solidia正在和大型水泥生产商拉法基豪瑞（LafargeHolcim）合作，研发一种替代波特兰水泥的“新型水泥”。Solidia声称其含熟料量低的混凝土可以大幅减少二氧化碳排放，部分原因是它将二氧化碳“扣留”在材料中。但水泥和混凝土标准通常都明确规定波特兰水泥的熟料含量，而建筑公司、建筑设计师和客户要避免建筑物坍塌，自然对新技术很警惕。

其他工业脱碳方式的挑战可能不那么令人生畏。美国铝业（Alcoa）和力拓的合资公司Elysis是积极探索丰厚盈利机会的公司之一。该公司可能会带来炼铝工艺自1886年发明以来的首次变革。目前，铝来自三种成分的组合：氧化铝（铝矾土）、电和碳。电在均由碳制成的负极和正极之间流动。正极与氧化铝中的氧反应，产生二氧化碳和铝液，然后再进行浇铸。二氧化碳的生成量可以非常大。Elysis的老板文森特·克里斯特（Vincent Christ）说，在使用煤炭炼铝的中国，每吨铝产生16吨二氧化碳。Elysis的目标是使用一种未公开的专有的非碳材料作正极，生成氧气而非二氧化碳，从而消除碳排放。

该项目由iPhone的制造商苹果公司资助，苹果表示希望降低其产品的碳足迹。到2024年，Elysis希望出售一种技术套件，可在世界各地使用，以改造现有的冶炼厂或建造新的冶炼厂。克里斯特表示，目标是使零碳铝的制造比现有技术便宜15%，生产效率提高15%，部分原因是正极的使用寿命将延长30倍。如果它在商业化的规模上也奏效，那将大大增加这项技术的潜力。“我们用了十年时间来攻克难点，”他指出，“如果它仅仅是一项环保措施，市场不会对它有那么大的兴趣。”

不过，最终结果在很大程度上将取决于中国。中国生产和使用世界上大部分的钢铁、水泥、铝和其他工业材料。裴文国最近在他的出生国介绍了HYBRIT的概念。他说，中国几乎不考虑生产零碳钢，因为它的重点是遏制煤炭在电力系统中的使用。中国的钢铁厂也相对较新，并不愿关闭。

水泥可能是另一回事。皇家国际事务研究所的研究表明，中国在水泥研发方面的投入超过了其他任何国家。而在亚洲其他地区，日本的钢铁工业正在尝试氢气和CCS两种方法来寻求实现工业脱碳。

但到头来，需要政府施压来确保工业部门做出转型所需的艰难的长期决策。政府可以从制定计划开始，确保有充足的可再生电力和碳储存设施来实现更大规模的电气化和CCS。然后它们可以通过更严格地定价碳排放，或提供监管和财务支持来为制氢和CCS提供激励。随着时间推移，它们可以鼓励在公共基建项目中使用绿色水泥、钢铁和其他零碳材料，从而创造

新的市场。这样，工业部门将能够尽早摆脱旧技术，而不必担心客户流失。 ■



Heating

Left out in the cold

In the rush to renewables, decarbonising heat has been overlooked

STARTING IN THE 1960S, a flat-capped army of gasfitters fanned out across Britain to convert a network that used so-called town gas, a mixture of hydrogen, carbon monoxide and other gases, to one based on natural gas, recently discovered under the North Sea. The operation was meticulously planned to avoid stranding customers without heat, and avoiding gas leaks and explosions. Natural gas is less toxic than town gas, which is derived from coal, so the potential benefits were huge, not least that the suicide rate fell as fewer people gassed themselves with their ovens.

If Leeds, Britain's third-largest city, has its way, parts of the country may soon put the process into reverse, going from natural gas back to hydrogen, though this time the pure stuff. Northern Gas Networks, a utility, has pioneered a project, called H21, that uses a blueprint based on Leeds to set out how Britain's gas networks can be used to bring low-carbon hydrogen instead of natural gas into homes and businesses. Once the city's old cast-iron pipes are fully replaced by polyethylene ones, the challenge will be to prove that hydrogen can be delivered safely at scale. If it can, Northern Gas hopes to provide hydrogen for heating and cooking across the north-east of England. It wants to make Leeds a powerhouse of a global hydrogen economy. To achieve that, it hopes to adapt the most common way of making hydrogen, by steam-methane reforming (SMR), capturing the CO₂ emitted in the process.

Apart from the need to improve insulation in houses, heating gets little attention in discussions about the climate, though it is a huge consumer of energy, especially in chilly climates. Britain uses more energy for heating

than for generating electricity or for running its transport system. Some 70% of this energy comes from burning natural gas, producing more than a quarter of the country's CO₂ emissions. According to the IEA, about three-quarters of the fossil fuels used in the world's buildings goes on heating.

One reason why heating rarely figures in climate discussions is that it is harder to decarbonise than electricity. This gives policymakers an incentive to ignore it. It is much easier to feed renewable energy into a single power grid than to convert millions of gas-fired boilers in people's homes and workplaces to electricity. Second, gas companies are smaller and draw less attention than electric utilities. "The gas industry is an invisible industry," says Northern Gas's Dan Sadler, the brain behind the Leeds project.

Electricity can heat homes but often that may not be the best option. In Britain, for instance, peak heating demand during periods of extreme cold runs to about 300 gigawatts, five times peak electricity demand. It would take a vast expansion of the power grid to satisfy that, especially until it becomes possible to store large amounts of electricity.

Moreover, in places where natural gas is the dominant heating fuel, abandoning gas networks could "strand" trillions of dollars-worth of assets. If hydrogen or other gases such as biomethane produced from organic matter can be produced cleanly and cheaply, they may be able to use many of the same pipelines and storage facilities as natural gas, with minor modifications. Once new burners are installed in stoves and boilers, consumers may barely notice.

Electricity will still have a big role to play, especially when combined with better insulation. Electric heat pumps, for example, work like a refrigerator or air-conditioning system in reverse, taking heat from the air or the ground to warm a building. They are expensive to buy but cheap to run, consuming less energy than they use to transfer the heat. The European Heat Pump

Association says the stock of pumps in Europe doubled between 2011 and 2017, to 10.6m.

But where natural gas is already the main heating fuel, hydrogen could act as replacement. In Leeds the plan is to create it by turning steam and methane into hydrogen and CO₂, capturing the CO₂ using carbon capture and storage (CCS). Eventually, when sufficient zero-carbon electricity is available, it may be possible to produce it sustainably via electrolysis of water. The biggest question now is whether CCS can be a viable technology.

On the other side of the North Sea, Equinor, an energy firm that is part of the Leeds project, is trying to help answer that question. On the bleak west coast of Norway, it is a partner with the Norwegian government, Shell and Total in the Technology Centre Mongstad (TCM), which cost a hefty NKR6bn (\$600m) to build. Started in 2012, it is now the world's largest test centre for carbon-capture technologies. From December, Fluor, an American engineering and construction company, will be the latest big firm to test a new CCS process at the site.

CCS is a technology that has repeatedly failed to live up to expectations. Fossil-fuel producers want to make it work because it could provide their products, such as natural gas, with a role in a post-carbon future. But the cost of capturing emissions and burying them—estimated at \$50-100 per tonne in the power sector—is high, especially as emitting CO₂ into the atmosphere carries few penalties. As the IEA notes, for every large-scale CCS operation started or operating since 2010, at least two have been cancelled.

Yet the technology may have a bright future, especially when applied to SMR, and in industries such as cement (see next article). This year the administration of President Donald Trump threw CCS an unexpected lifeline in the form of a revamped Section 45Q, a tax-credit scheme that sharply increased the amount of financial support per tonne of CO₂.

captured, and removed a cap on how much of it could be stored. It is likely to give CCS projects a boost, in the same way that investment tax credits have boosted solar and wind.

Environmentalists, many of whom distrust CCS, say the credit is most beneficial for firms wanting to use the subsidised CO₂ to inject into oil wells to bolster recovery. Tellingly, after the 45Q modification an American lobby group called the National Oil Enhanced Recovery Initiative changed its name to the Carbon Capture Coalition.

TCM in Norway is testing two ways of capturing CO₂. Ernst Petter Axelsen, its managing director, explains that the more widely used one involves injecting flue gases into a tall solvency chamber and adding droplets of a solvent called amine, a stripped-down form of ammonia that binds with the CO₂ in the flue gas to form a liquid. This is then boiled at 120°C, releasing the CO₂. The other technology, using chilled ammonia as a solvent, is less popular because it requires more manpower, engineers say.

Companies use the facility to test their amine chemistry, which they view as a “secret sauce”, to explore new processes such as lung-like membranes, and to work with absorbent materials instead of solvents. Mr Axelsen says interest in CCS has been rekindled by 45Q. And some of the world’s largest oil companies have set up a group called the Oil and Gas Climate Initiative, with a \$1bn fund devoted to supporting CCS projects.

As for storage, Norway is in the early stages of a big project to capture CO₂ from Norcem HeidelbergCement, in the south of the country, and a waste-to-energy Fortum Oslo Varme plant in Oslo. It will then use Equinor, Shell and Total to ship the CO₂ and inject it into a porous limestone formation 3km below the sea bed.

Equinor hopes this will be the start of an industry that develops into

transporting CO₂ by ship or pipeline from Teesside in Britain. Some of that CO₂ may come from the Leeds hydrogen project (Equinor is also working with Northern Gas on a supplementary proposal to turn the north of England's biggest cities from methane to hydrogen). The CO₂ could also be stored in former hydrocarbon deposits in Britain's North Sea waters.

But CCS projects eat up a lot of capital, which is hard to recuperate in the absence of a meaningful price on carbon. Globally, it also relies on huge amounts of storage sites. The best hope for boosting carbon capture is its role in industry. ■



供暖

冷遇

在向可再生能源的匆忙转变中，供暖环节的脱碳被忽视

从上世纪60年代开始，一大批戴着鸭舌帽的燃气管道工人奔赴英国各地，将一个使用所谓的城市燃气（氢气、一氧化碳和其他气体的混合物）的网络改造成使用不久前在北海发现的天然气。这项工程经过精心策划，以避免造成对客户供暖中断或气体泄漏和爆炸。天然气的毒性小于用煤生产的城市燃气，所以其潜在的好处是巨大的，尤其是自杀率下降了，因为开煤气寻死的人少了。

如果英国第三大城市利兹得愿所偿，那么该国的部分地区可能很快就会逆转这一过程，又从天然气转回氢气——不过这次是纯粹的氢气。公用事业公司北方天然气公司（Northern Gas Networks）开创了一个名为H21的项目，使用基于利兹的蓝图，计划如何利用英国的天然气网络，把低碳氢气代替天然气送入家庭和企业。一旦城市的旧铸铁管道完全被聚乙烯管替代，剩下的挑战就是证明氢可被安全地大规模输送。如果可以，北方天然气公司希望在整个英格兰东北部供应氢气用于供暖和烹饪。它想把利兹变成全球氢经济的发动机。为实现这一目标，它希望调整蒸汽-甲烷重整（SMR）这种最常见的制氢法——捕获过程中排放的二氧化碳。

除了需要改善房屋的保温隔热外，人们在讨论气候问题时很少会关注供暖，尽管它能耗巨大，特别是在气候寒冷的地方。英国供暖的能源消耗超过了发电或运输系统。其中约70%来自燃烧天然气，产生了该国二氧化碳排放量的四分之一以上。根据国际能源署（IEA）的数据，全球建筑物中使用的化石燃料中约有四分之三用于供暖。

在气候讨论中很少提及供暖的一个原因是它的脱碳比发电的脱碳更难。这让决策者更容易忽视它。将可再生能源接入单个电网要比将人们家中和工作场所的数百万个燃气锅炉转换成电炉容易得多。其次，天然气公司比电

力公司规模小，吸引的注意力也更少。“天然气行业是一个隐形的行业。”利兹氢项目的策划者、北方天然气公司的丹·萨德勒（Dan Sadler）说。

电可以为家庭供暖，但通常可能都不是最好的选择。例如，在英国，极端寒冷天气期间的高峰供暖需求达到约300吉瓦，是电力需求峰值的五倍。电网需要大规模扩建才能满足这一需求，尤其还要能够存储大量电力。

此外，在天然气作为主要供暖燃料的地方，放弃天然气网络可能会让数万亿美元的资产“搁浅”。如果可以清洁又廉价地生产氢气或其他气体（例如由有机物质生产的生物甲烷），它们或许就可以使用许多现有天然气管道和储存设施，只需稍作调整即可。一旦新的燃烧器在炉灶和锅炉中安装就绪，用户可能几乎注意不到任何变化。

电力仍将扮演重要角色，特别是与更好的隔热保温相结合后。例如，电热泵就好像是反向冰箱或空调，从空气或地面吸取热量来加热房屋。这种设备买起来贵，但用起来便宜，总能耗要少于它们传送的热量。欧洲热泵协会表示，2011年至2017年，欧洲的热泵保有量增加了一倍，达到1060万台。

但在那些天然气已成为主要供暖燃料的地方，氢可以作为替代品。在利兹，项目计划是将蒸汽和甲烷转化为氢气和二氧化碳，再利用碳捕获和储存（CCS）捕获二氧化碳。最终，当有足够的零碳电力时，或许可以通过电解水来可持续地生产氢。现在最大的问题是CCS能否成为一种可行的技术。

在北海的另一边，作为利兹项目参与者的挪威国家石油公司（Equinor）正试图帮助解答这个问题。在挪威荒芜的西海岸，它是挪威政府、壳牌和道达尔在蒙斯塔德技术中心（TCM）的合作伙伴。该中心的建设花费高达60亿挪威克朗（6亿美元）。它于2012年启动，目前是世界上最大的碳捕获技术测试中心。从12月开始，美国工程和建筑公司Fluor将成为在这里测试新CCS工艺的最新一家大企业。

CCS这项技术屡屡未能实现预期。化石燃料的生产商希望它能发挥作用，

因为这可以让它们的产品——比如天然气——在一个后碳的未来保有一席之地。但是，捕获碳排放并填埋它们的成本很高（在电力行业内的运行成本估计为每吨50至100美元），这在向大气中排放二氧化碳几乎没有处罚时尤其突出。正如IEA指出，自2010年起，每有一个大规模CCS项目启动，就有至少两个被取消。

然而，这项技术可能会有一个光明的未来，特别是应用于SMR以及水泥等行业时（参见下一篇文章）。今年，美国总统特朗普的政府修订了45Q条款，出人意料地向CCS投去了一条救生索。这项税收抵免计划大幅增加了对每吨碳捕获的财政支援，并取消了碳存储量的上限。它很可能会提振CCS项目，就像投资税收抵免推动了太阳能和风能那样。

许多不信任CCS的环保主义者表示，从该税收计划中得到最多好处的是那些想把补贴注入油井以推动石油业复苏的企业。颇能说明问题的是，在45Q条款修订后，一个名为“国家石油强化恢复计划”的美国游说团体改了名字，叫“碳捕获联盟”。

挪威的TCM中心正在测试两种捕获二氧化碳的方法。其主管厄恩斯特·培特·阿克塞尔森（Ernst Petter Axelsen）解释说，更广泛使用的方法是将烟气注入一个高高的溶剂室，往里添加几滴一种叫做胺的溶剂（从氨中分离而来），它会与烟气中的二氧化碳结合形成液体。然后将这种液体在120°C下煮沸，释放出二氧化碳。工程师说，另一种使用冷冻氨作为溶剂的方法需要更多人力，因而较不常用。

一些公司使用该设施测试他们的胺化学，他们视之为“秘方”，以探索新工艺，比如类似肺部结构的薄膜，并使用吸收材料而非溶剂。阿克塞尔森表示，对CCS的兴趣已经被45Q重新点燃。世界上一些最大的石油公司已经成立了一个名为“石油和天然气气候倡议”的组织，其中有一笔10亿美元的基金用于支持CCS项目。

至于碳存储方面，挪威正处于一个大型项目的早期阶段。该项目旨在从该国南部的海德堡水泥（HeidelbergCement）下属Norcem公司以及位于奥

斯陆把废弃物转化为能源的Fortum Oslo Varme垃圾焚烧厂捕获二氧化碳。然后它让挪威国家石油公司、壳牌和道达尔运输这些二氧化碳，并将它们注入海床下三公里处的多孔石灰岩地层。

挪威国家石油公司希望这将成为一个新行业的起点，逐渐发展成通过英国提赛德（Teesside）的船舶或管道运输二氧化碳。其中一些二氧化碳可能来自利兹氢项目（挪威国家石油公司还在与北方天然气公司合作一个补充提案，要将英格兰北部的几个最大城市从使用甲烷转为使用氢气）。这些二氧化碳也可以被存储在英国北海水域的原烃类矿床中。

但CCS项目耗费大量资金，如果没有合理的碳价，很难收回投资。在全球范围内，它还依赖大量的存储地点。推广碳捕获的最大希望在于它的工业应用。 ■



Heavy transport

The great freight race

Can lorries deliver the hydrogen economy?

“GET THE hell out of our way and stop funding the oil companies. That’s the thing that pisses me off,” thunders Trevor Milton, boss of Nikola, an American startup making hydrogen-powered lorries. His rage is directed at the government, and not for nothing does he sound like Elon Musk, the other clean-energy maverick with a company named after Nikola Tesla, developer of the alternating-current electric motor. He and Mr Musk are engaged in a race to decarbonise road transport.

Nikola, based in Arizona, has pre-orders for 8,000 hydrogen-fuelled trucks that will compete with Tesla’s battery-powered “Semis”, as well as other zero-carbon juggernauts made by Volvo, Hyundai, BYD and others. Many dismiss batteries and hydrogen in trucking because of the weight and volume needed to move heavy loads over long distances. Though both types of engine are more energy-efficient than internal-combustion engines (see chart), neither produces as much power per litre as conventional fuels, so they need far more storage space. Hydrogen has the additional disadvantage that it takes lots of electricity to make.

Yet finding ways to decarbonise freight is becoming increasingly important, because its share of CO₂ emissions is likely to rise as that of increasingly electrified light transport declines. Currently lorries produce about 2.5bn tonnes of CO₂ a year out of an estimated total for all transport of about 9.5bn tonnes (not to mention the air pollution they generate). But emission standards for trucks are rare, unlike those for cars, and it is a fragmented business with lots of owner-drivers who cannot easily be corralled into taking collective responsibility for tackling climate change.

Reducing road-freight emissions can take many forms. Sweden is trying out power lines along a short stretch of road for heavy vehicles to hook up to, as buses do in some cities. Policymakers are also encouraging companies to move more heavy goods by rail, which has lower carbon emissions and may also be electrified. Biofuels such as ethanol could be used more extensively to curb emissions from internal-combustion engines. But since 2008, when China introduced battery-powered rubbish trucks for the Beijing Olympics, the most popular approach has been to use batteries in short-haul transport, especially along predictable routes where recharging is easy. McKinsey, a consultancy, estimates that in Europe and America, light- and medium-duty electric lorries could become cost-competitive with diesel ones in the 2020s.

Journeys of more than 800km (500 miles) are more problematic because the weight of large battery packs reduces the amount of cargo that a lorry can carry, and long battery-charging times—perhaps 90 minutes a go—can penalise drivers who get paid by the mile. Enter the Tesla Semi, which Mr Musk promises will be on the road in America in 2019, with four battery packs to speed up charging. Some Tesla specialists estimate that their fuel system will weigh two tons more than that of a 40-ton diesel truck, meaning smaller cargoes. But that may not put off all users, especially since firms that use them can claim to be cutting emissions, making their products more environmentally friendly.

Enter, also, hydrogen fuel-cell vehicles, which have a driving range and refuelling time similar to those of conventional vehicles, and an exhaust that is just water vapour. Companies like Nikola could find themselves in the vanguard of the hydrogen economy before it extends to heating, shipping and heavy industry. But first they have to overcome three challenges that will affect the future of hydrogen as a whole: making it, using it and transporting it.

Start with hydrogen's main drawback: it has to be manufactured. On Earth it is rarely found in isolation, instead forming compounds like natural gas and water. About 95% of today's industrial hydrogen comes from fossil fuels. The most common method of making it is steam-methane reforming (SMR), which uses a catalyst to separate hydrogen from natural gas and steam. This method is used extensively in the chemicals industry but produces lots of carbon dioxide, which needs to be captured if hydrogen is to be produced with low emissions (see diagram).

The cleaner way is to use zero-carbon electricity to run electrolyzers that split water into hydrogen and oxygen. This is a power-hungry process. For every unit of energy used, only 0.8 units of hydrogen is produced. So the cost of electricity is crucial, accounting for perhaps three-quarters of the price of hydrogen. And the price of emitting CO₂ is negligible (at least until governments make it more realistic) giving SMR a big advantage. But the paltry share of hydrogen produced by electrolysis is expected to grow because the more renewables are installed, the more prices drop. The IEA says that recent renewables auctions in places like Chile and Morocco suggest power prices of about \$30 a megawatt-hour. At that price, hydrogen could be produced at \$2 per kilo, making it competitive with SMR, which costs \$1-3 per kilo.

Higher demand for electrolyzers will lower their price, too. Graham Cooley of ITM Power, a British company based in the city of Sheffield, says that the price of the electrolyzers his firm produces has halved to £800 (\$1,000) per kilowatt (kW) in three years. (Others claim lower prices.) He puts this down mainly to volume production. ITM Power is currently building what it says will be the world's largest Polymer Electrolyte Membrane (PEM) electrolyser, with a capacity of 10MW, for Shell in Germany. Mr Cooley expects the cost of electrolyzers to fall to about £400 a kilowatt by the mid-2020s.

The main technologies used for electrolysis are PEM and alkaline. Alkaline electrolysers are more established and cheaper, but bulkier. PEM is becoming cheaper and has faster response times, which works better with intermittent renewables, and can be used on a small scale, which is suitable for hydrogen refuelling stations.

Nikola has helped boost production of alkaline electrolysers. In June it awarded a contract to Nel—a Norwegian company that was once a part of Norsk Hydro, which built the first such electrolysers in 1927—to supply 448 of them, plus fuelling equipment for Nikola trucks. They will have a total capacity of 1,000MW, or 1.5 times all the electrolysers Norway has produced since 1927. The lorries will be leased by Anheuser-Busch, an American brewer, and others.

Dickon Pinner of McKinsey, a consultancy, reckons that, though at present levels electrolysers are still “out of the money”, their costs could fall a lot through industrialisation, as has happened with wind and solar, especially if China embraces the technology. A price on carbon would also make them more attractive.

Not only will hydrogen have to be produced more cleanly and cheaply, the cost of using it as a fuel must also come down. The instrument of choice is the fuel cell, which works like electrolysis in reverse, turning hydrogen back into electricity and water to power an electric motor. Fuel cells are not new; they provided power for the spacecraft that put the Apollo astronauts on the Moon. But until now they have been too pricey for widespread terrestrial use. They feed hydrogen to an anode and air to a cathode. Both are sandwiched around an electrolyte. Hydrogen electrons released at the anode travel through an external circuit to the cathode, making electricity.

America’s Department of Energy says the cost of fuel cells for use in small vehicles, currently \$53-60 per kW if produced at scale with the best available

technology, will need to fall to \$40 per kW to compete with internal-combustion engines. Fuel cells will also have to be more rugged and better able to operate in freezing weather, and more refuelling stations will be needed, along with better systems for getting the green hydrogen to them. Nikola's Mr Milton says its electrolyzers will be powered by solar power, wind farms and hydro, most of it coming from off-grid sources.

Making clean hydrogen at scale will also require supply chains. Setting up a new infrastructure for delivering it could be prohibitively costly, especially in developing countries. (Nel recently showed off its hydrogen filling stations, hand-assembled in Denmark and costing about €1m, or \$1.14m, apiece.) Many of the best sources of renewable energy that could be used to power electrolyzers are found in isolated places such as the Atacama Desert in Chile, Patagonia, Somalia, Tibet and Australia. Hydrogen is very hard to send through pipelines, and shipping it in liquid form requires very low temperatures and very high pressures.

With encouragement from Japan, which wants to be a leader in the hydrogen economy, Australia is working on a solution to this that could also benefit another freight sector: shipping. Michael Dolan of the Commonwealth Scientific and Industrial Research Organisation (CSIRO), an Australian body, notes that as yet there are no ships that can move hydrogen as a liquid (other than space ships, which burn liquid hydrogen).

To avoid the drawbacks of liquefying hydrogen it can be converted into ammonia via the simpler (though energy-intensive) Haber-Bosch process. Counterintuitively, there is a greater mass of hydrogen in a litre of liquid ammonia than in one of liquid hydrogen. The ammonia can then be shipped in liquid form—and some of it could be used in ships' engines if they are modified.

Hydrogen fuel-cell vehicles, alas, cannot burn ammonia, and so it would

have to be converted back into hydrogen after shipping (at additional cost). In August, CSIRO demonstrated, with some excitement, that a Toyota Mirai and a Hyundai Nexo could be fuelled with high-purity hydrogen extracted from ammonia using its membrane technology. The membrane allows the hydrogen through while blocking other gases.

All this may put the world's truckers closer to the post-carbon era. But to get the economies of scale to bring hydrogen costs well down, non-fossil energy needs other big drivers of demand. One, which may use carbon capture and storage, is heating. ■



重型运输

货运大赛

卡车能带来氢经济吗？

“别特么挡我们的道儿，别资助石油公司了。我真是受够这个了。”生产氢动力卡车的美国创业公司尼古拉（Nikola）的老板特雷弗·米尔顿（Trevor Milton）咆哮道。他的怒火指向政府，而且他听起来像伊隆·马斯克也不无原因。马斯克是清洁能源界另一位特立独行者，开了一家以交流电动机发明者尼古拉·特斯拉命名的公司。米尔顿和他正在进行一场让公路运输脱碳的竞赛。

总部位于亚利桑那州的尼古拉汽车拥有8000辆氢燃料卡车的预订单，这些卡车将与特斯拉用电池供电的“Semi”，以及沃尔沃、现代、比亚迪等公司生产的其他零碳重型卡车竞争。由于长距离移动重载荷所需的重量和体积，许多人对在卡车运输中使用电池和氢气嗤之以鼻。虽然两种类型的发动机都比内燃机更节能（见图表），但单位体积产生的功率都不如传统燃料，因此它们需要的存储空间要多得多。氢气的另一个缺点是生产需要消耗大量电力。

然而找到使货运脱碳的方法变得越来越重要，因为随着轻型运输的电气化减少了其碳排放量，货运排放量所占的份额很可能会增加。目前卡车每年产生约25亿吨二氧化碳，而所有运输的排放总量约为95亿吨（更不用说它们产生的空气污染了）。但和轿车不同，卡车的排放标准很少，而且这是一个非常碎片化的业务，有许多自驾车主，无法轻易集中起来以承担应对气候变化的集体责任。

减少公路货运排放可以采取多种形式。瑞典正试验沿着一小段道路铺设输电线，让重型车辆可以边跑边充电，就像一些城市的公共汽车那样。政策制定者还鼓励企业通过铁路运输更多重型货物，因为铁路碳排放量较低，也可能会电气化。乙醇等生物燃料可以更广泛地用于抑制内燃机的排放。

但自2008年中国为北京奥运会推出电池供电的垃圾车以来，最受欢迎的方法是在短程运输中使用电池，特别是对于可预测的路线来说充电很容易。咨询公司麦肯锡估计，在欧洲和美国，到2020年代轻型和中型电动卡车的成本也许能与柴油卡车竞争。

超过800公里的旅程更成问题，因为大型电池组的重量减少了卡车可以携带的货物量，并且漫长的电池充电时间——可能充一次要90分钟——不利于那些按里程数拿薪水的司机。配备四个电池组以加速充电的特斯拉Semi就为此而生，马斯克承诺它将于2019年在美国上路。一些特斯拉专家估计，他们的燃料系统将比40吨柴油卡车重两吨，这意味着载货更少。但这可能不会吓跑所有用户，特别是使用它们的公司可以宣称减少排放，使其产品更加环保。

同样加入竞争的还有氢燃料电池车，它的续航里程和加油时间都和传统车辆类似，而尾气仅仅是水蒸气。在氢能拓展到供暖、航运和重工业之前，尼古拉这样的公司可能会发现自己处于氢经济的前沿。但首先，他们必须克服三个将影响氢能整个未来前景的挑战：制造、使用和运输氢。

从氢的主要缺点开始：它必须被生产出来。它在地球上很少以单质存在，而是形成天然气和水等化合物。今天大约95%的工业氢来自于化石燃料。制造它的最常用方法是蒸汽—甲烷重整（SMR），即使用催化剂从天然气和蒸汽中分离出氢。这种方法广泛用于化学工业，但会产生大量二氧化碳。如果要以低排放生产氢气，则需要捕获二氧化碳（见图表）。

更清洁的方法是使用零碳电力来驱动电解槽，将水分解为氢气和氧气。这是一个非常耗电的工艺。每消耗一个单位的电力，仅能生产0.8单位的氢。因此电力成本至关重要，可能会占到氢价的四分之三。排放二氧化碳的价格可以忽略不计（至少在政府让碳排放成本变得更现实之前）给了SMR很大的优势。但电解氢那点可怜的份额预计会增加，因为安装的可再生能源越多，其价格下降的也会越多。国际能源署表示，最近智利和摩洛哥等地的可再生能源拍卖表明，电力价格约为每兆瓦时30美元。以这个价

格计算，氢可以每千克2美元的价格生产，能与每千克成本1至3美元的SMR竞争。

对电解槽的更大需求也将降低其价格。总部位于谢菲尔德市的英国公司ITM Power的格雷厄姆·库里（Graham Cooley）说，他的公司生产的电解槽的价格已在三年内降低一半，降到每千瓦800英镑（1000美元）。（其他人还号称能提供更低的价格。）他把主要原因归结为批量生产。ITM Power目前正在为壳牌德国公司建造它号称的世界上最大的聚合物电解质膜（PEM）电解槽，容量为10兆瓦。库里预计，到2020年代中期，电解槽的成本将降至每千瓦400英镑左右。

用于电解的主要技术是PEM和碱。碱性电解槽更成熟、更便宜，但体积更大。PEM变得越来越便宜，响应也更快，这更适合间断性的可再生能源。它也可以小规模应用，这比较适合加氢站。

尼古拉帮助提升了碱性电解槽的产量。今年6月，它与挪威公司Nel签订了一份合同，由Nel为其供应448台电解槽，并为尼古拉的卡车提供加氢设备。Nel曾经属于在1927年建造了第一台此类电解槽的挪威海德罗（Norsk Hydro）公司。这些设备的总容量将达到1000兆瓦，是挪威自1927年以来生产的所有电解槽的1.5倍。卡车将租给美国啤酒商安海斯-布希等。

咨询公司麦肯锡的迪肯·平纳（Dickon Pinner）认为，虽然在目前的水平上，电解槽仍处于“净亏钱”状态，但其成本可能会因工业化而大幅下降，就像风能和太阳能一样，特别是如果中国积极采用这种技术的话。碳价也会使它们更具吸引力。

氢气不仅必须能够更清洁、更便宜地生产，使用它作为燃料的成本也必须下降。优选的手段是燃料电池，其原理类似于反向电解，将氢气重新变成电和水来为电动机提供动力。燃料电池并不新鲜；他们为把阿波罗宇航员送上月球的宇宙飞船提供了动力。但到目前为止，对于广泛地面使用来说它太贵了。它们将氢气送到阳极，空气送到阴极。两者周围都夹着电解质。阳极释放的氢电子通过外部电路接到阴极，从而发电。

美国能源部表示，用于小型车辆的燃料电池的成本（如果使用现有最好的技术大规模生产，目前成本为每千瓦53至60美元）将需要降至每千瓦40美元才能与内燃机竞争。燃料电池也必须更加坚固，能够在寒冷的天气中更好地运作，并且需要更多的加氢站以及更好的系统来把绿色氢气输送到加氢站。尼古拉的米尔顿表示，其电解槽将由太阳能、风电场和水电站提供动力，其中大部分来自离网发电。

大规模生产清洁氢气也需要供应链支持。建设一套新的基础设施来输送它的成本可能会高到无法负担，特别是在发展中国家。（Nel最近展示了其在丹麦手工组装的加氢站，每台成本约为100万欧元或114万美元。）可用于为电解槽供电的最佳可再生能源很多是位于如智利的阿塔卡马沙漠、巴塔哥尼亚、索马里、西藏和澳大利亚等偏远地区。氢很难通过管道输送，而以液体形式运输氢需要极低的温度和极高的压力。

在希望成为氢经济领导者的日本的鼓励下，澳大利亚正在努力寻求解决方案，这也可能使另一个货运部门——航运——受益。澳大利亚联邦科学与工业研究组织（CSIRO）的迈克尔·多兰（Michael Dolan）指出，目前还没有能以液体形式运输氢的船只（燃烧液氢的太空船除外）。

为了避免液氢的缺点，可以通过更简单（尽管耗能更高的）的哈伯法将其转化为氨。不合直觉的一点是，一升液氨中氢的质量大于一升液氢中氢的质量。然后氨可用液体形式运输——部分液氨也可用于改装后的船舶发动机。

唉，可惜氢燃料电池车烧不了氨，因此在运输后必须将氨转化回氢气（需要额外费用）。2018年8月，CSIRO兴奋地展示了一台丰田Mirai和一台现代Nexo，可以使用其研发的膜技术从氨中提取高纯度氢气作为燃料。这种膜可以让氢透过而阻挡其他气体。

所有这些都可能使全世界的卡车司机更接近后碳时代。但要实现规模经济来把氢的成本大幅降低，非化石能源需要其他庞大的需求驱动因素。其中之一是供暖，它可能用到碳捕获和储存。■



Towards Zero carbon

The hydrogen bombshell

What would it take to decarbonise the global economy? Lots of clean electricity and a revolutionary shift towards the lightest gas, writes Henry Tricks

FROM BEHIND the wheel of a self-driving electric Tesla model S, gliding amid the forests and fjords of Norway, the future of the planet looks pretty good. It almost feels as if you are on the road, hands-free, to a post-fossil-fuel future. Virtually all of Norway's electricity is emissions-free. It comes from hydropower delivered by cascading waterfalls, dams and rivers that run so close to the roads that you can almost run your fingers through them. There are so many fast-charging stations that you are unlikely to get stranded. Teslas have become so run-of-the-mill in Oslo that it is not unusual to see them spattered with mud, their seats matted with dog hair.

When your destination is Rjukan, three hours west of Oslo, which in the early 20th century was one of the world's biggest power plants, alternatives to fossil fuels look even more achievable. This is where one of the best potential zero-carbon options, hydrogen, was produced by hydroelectricity as far back as 1928. Cars powered by hydrogen fuel cells have now started to appear on Norway's streets, even though there may be much better uses of the gas than powering vehicles over short distances. A Hyundai Nexo, owned by Nel, a Norwegian hydrogen company that traces its roots back to Rjukan, carries a message on its rear window: "Thanks for the ride, dinosaurs! We'll take it from here." That could be the motto for the age of decarbonisation. Or it could be extreme hyperbole.

Alongside China, Norway has helped supercharge demand for electric vehicles, but it could afford to finance the tax breaks and other incentives because of the immense wealth it derives from oil and gas. Hydrocarbons

produced by the state energy company, Equinor, generated 310m tonnes of greenhouse gases in 2017. That was almost as much as the total carbon dioxide (CO₂) belched out by Britain, a country with 12 times Norway's population.

Torn in much the same fashion between a desire to tackle global warming and a dependence on fossil fuels, the world is moving far too slowly to decarbonise its energy system. Acting on the promises made under the 2015 Paris agreement on climate change could see the world on a path to global warming of 3°C above pre-industrial levels by the end of this century, rather than the 1.5-2°C countries agreed to strive for. To stabilise global temperatures, humans must be putting no more CO₂ into the atmosphere than they are taking out by about mid-century.

Renewables are advancing, absorbing twice as much investment for power generation as coal, gas, oil and nuclear combined last year. Sales of electric vehicles (EVs) are also gaining momentum. According to Bloomberg New Energy Finance, a clean-energy consultancy, it took 17 months, from mid-2014 to 2016, for the global number of passenger EVs to rise from 1m to 2m. It took just six months this year for them to go from 3m to 4m.

Yet last year the global energy system still derived 85% of its oomph from fossil fuels, and the International Energy Agency (IEA), a forecaster, expects global CO₂ emissions to reach a new record this year. In order to mitigate the impact of global warming and reduce the air pollution that does serious harm to physical and mental health around the world, the immediate task is to encourage the spread of zero-carbon ("clean") electricity and battery storage. By some estimates, power supply needs to increase fourfold over the next 30 years. To produce this electricity will require a huge increase in renewables, as well as nuclear power (more likely in the developing than developed world), as well as the use of fossil fuels with carbon capture and storage (CCS). And that is just what specialists call the "easy" part.

Decarbonising parts of the economy where electricity and lithium-ion batteries cannot be easily used, such as heavy transport, heating and industry, will be much harder. In 2014 (the latest year for which figures are available) these “hard-to-abate” sectors produced about 15bn tonnes of CO₂, or 41% of the total, compared with 13.6bn tonnes for the entire power sector (see chart). The biggest industrial emitters are cement, steel and chemicals.

In order to limit global warming to less than 2°C, total emissions from global energy use across industry alone will have to be 50-80% lower by 2050 than they are now, and as much as 75-90% lower if the rise in temperatures is to be capped at 1.5°C, according to the Intergovernmental Panel on Climate Change (IPCC), a UN-backed body of experts. Even then, over the course of the century hundreds of billions of tonnes of CO₂ will need to be extracted from the atmosphere, in what are called “negative emissions”.

It is an historic undertaking. In the 200 years from the start of the coal age to 1970, the burning of fossil fuels, flaring and cement-making produced 420bn tonnes of greenhouse gases, mostly CO₂, or about 1,200 times the weight of every person on the planet today. Between 1970 and 2011, the amount tripled to 1.3trn tonnes.

CO₂ is invisible and odourless, so it is harder to visualise the effects of all of this than for more tangible scourges like sulphur and nitrogen oxides, which cause acid rain. Yet the quantities belched out are staggering. The steel and cement industries each produce more CO₂ than any country except China and the United States. For every tonne of cement produced, almost three-quarters of a tonne of CO₂ seeps into the atmosphere. Cars and trucks are an even bigger burden on the climate; and knowing how much you produce when you fly can ruin the joy of taking off in an aeroplane. This report focuses on energy-related emissions, not greenhouse gases emitted by agriculture, forestry and other land use. The latter account for about a

quarter of total emissions.

Steven Davis of the University of California, Irvine, has led a team of researchers in mapping out what a net-zero-emissions energy system would look like, using a set of already available technologies that he describes as “fairly simple and finite”. Besides electricity and batteries, they include hydrogen and ammonia, biofuels, synthetic fuels, CCS, and removal of carbon from the atmosphere. They can have many end uses. Hydrogen could have a role in light and heavy transport, heating, steelmaking and synthetic fuels for jet aircraft. CCS could be used in heating and cement-making.

Each of them has its pros and cons. There are obstacles to making, moving and using hydrogen on a large scale. Biofuels such as ethanol are already blended with hydrocarbons in fuels in places such as Brazil and America, but energy crops compete with the food industry for land, and their cultivation also produces greenhouse gases. Emission-free synthetic fuels rely on lots of hydrogen and carbon monoxide to produce surrogate hydrocarbons, so their development hinges on low-cost supplies of those two gases. CCS, as Mr Davis puts it, elicits a “collective groan” from environmentalists, who see it as life support for the fossil-fuel industry. But it is hard to imagine decarbonisation of industries like cement without capturing the CO₂ emitted in flue gases.

Some are much closer to commercialisation than others. Those working on decarbonising the energy system have an approximate time frame for their endeavours. They say 2025-35 could see the emergence of battery and hydrogen-powered long-distance lorries, and hydrogen-fuelled residential heating. In the 2030s, synthetic hydrocarbons may be developed for ships and planes. In the 2040s, CCS and hydrogen could be applied at vast scale in industry. By the 2050s there would be full-scale carbon removal, either by massive reforestation or direct capture from the air.

All this may seem pie in the sky if you live in Africa, or another impoverished region, where the main priority is to satisfy existing energy demand. It will hinge crucially on what government mandates and tax incentives are in place to encourage the shift.

Still, this report will argue that the obstacles to decarbonisation of the energy sector are not insurmountable. What is more, they could bring economic benefits. The IPCC estimates that, between 2016 and 2035, the annual cost of keeping the rise in temperature to 1.5°C would be about \$2.4trn, or roughly 2.5% of world GDP. Last year total energy investment was \$1.6trn, mostly in coal, oil and gas. Adair Turner, chairman of the Energy Transitions Commission (ETC), a global body, says the additional cost per year of running the hard-to-abate industries with net-zero emissions would be \$1.2trn in 2050. “You can be absolutely terrified [by the amount]. But if you could go back to building railways in 1850, I’m willing to bet you would also terrify yourself.”

Moreover, none of the technologies involved is new; and, unlike fossil fuels, the more they are used, the more their costs fall, providing an incentive to use them across as many industries as possible. Hydrogen could be the most promising, because it is the best complement to mass electrification and could also be used in heavy transport, heating and industry.

In a report, the ETC says that to achieve net-zero CO₂ emissions, global hydrogen production needs to rise from about 60m tonnes a year today to 500m-700m tonnes by mid-century, even without assuming there will be many hydrogen fuel-cell cars. That sounds ambitious but the interest in hydrogen is growing fast. Membership of the Hydrogen Council, a forum made up of global chemical, car and oil companies started in 2017, has quadrupled in 18 months. Francis O’Sullivan, head of research at the MIT Energy Initiative, says: “Battery storage may feel like a headline act in the transition. But ultimately it will play second fiddle to hydrogen.”

To make the hydrogen cleanly, most of it will have to come from electrolysis of water, which today accounts for only 5% of hydrogen production (the rest comes from “steam reforming” of fossil fuels). That will require vast quantities of low-cost, zero-carbon electricity. Making that available, along with batteries to electrify cars, is one of the most pressing priorities in the coming decade. ■



走向零碳

重磅氢弹

如何使全球经济脱碳？亨利·特里克斯的答案是大量的清洁电力和向最轻气体的革命性转变

坐在无人驾驶的电动特斯拉S型车的驾驶座上，掠过挪威的森林和峡湾，这个星球的未来看起来相当不错。感觉几乎就是你无需动手，就在一路通往一个“后化石燃料”的未来。挪威几乎所有发电都是零排放的。电来自奔流的瀑布、水坝和河流产生的水力，它们如此靠近道路，几乎触手可及。快速充电站随处可见，你不太可能被困在路上。特斯拉在奥斯陆已经如此普遍，以至于车身溅满泥、座位上落满狗毛的也不少见。

如果你去往奥斯陆西侧三个小时车程的尤坎，化石燃料的替代品看起来就更容易实现了。这里在20世纪初是世界上最大的发电厂之一：早在1928年，尤坎就已经在用水力发电生产迄今最好的潜在零碳选择之一——氢气。由氢燃料电池驱动的汽车现在开始出现在挪威的街道上，尽管比起为短途车辆供能，氢气可能还有更好得多的用处。挪威氢能公司Nel的历史可以追溯到尤坎，它拥有的一辆现代Nexo的后窗上贴着一句话：“感谢恐龙们送了一程！我们就从这接手了。”这可能成为脱碳时代的座右铭，也可能沦为极端的夸张。

挪威和中国一样，大大增加了对电动汽车的需求，但由于石油和天然气带来的巨大财富，挪威可以负担减税和其他激励措施所需的资金。挪威国家能源公司Equinor生产的烃类在2017年产生了3.1亿吨温室气体。这几乎与英国产生的二氧化碳总量一样多，而英国是挪威人口的12倍。

这种同时存在解决全球变暖的愿望和对化石燃料的依赖的矛盾同样撕裂着整个世界，让能源系统脱碳变得太过缓慢。如果根据2015年巴黎气候变化协议所作出的承诺行动的话，到本世纪末，全球变暖将超过工业化前水平3°C，而不是各国同意努力争取的1.5°C至2°C。为了稳定全球气温，到大约本世纪中叶，人类必须停止向大气中净排放二氧化碳。

可再生能源正在发展，它在去年吸收了两倍于煤炭、天然气、石油和核能总和的发电投资。电动汽车的销售也在加速增长。据清洁能源咨询公司彭博新能源金融称，从2014年中到2016年的17个月里，全球乘用电动车数量从100万增加到200万辆，而今年仅用了6个月就从300万增加到了400万辆。

然而，去年全球能源系统仍然有85%的能源从化石燃料中获得。预测机构国际能源署（IEA）预计今年全球二氧化碳排放量将创下新纪录。为了减轻全球变暖的影响并减少严重危害全世界身心健康的空气污染，当务之急是鼓励推广零碳（“清洁”）电力和蓄电池。据估计，在未来30年内，电力供应需要增加四倍。要生产这么多电，可再生能源、核电（更有可能在发展中国家而非发达国家推广）以及带碳捕获和储存（CCS）的化石燃料使用都需要大幅增加。而这只是专家所说的“简单”的部分。

要让不易使用电力和锂离子电池的经济部门脱碳会更难，例如重型运输、供暖和工业。2014年（可获得数据的最近一年），这些“难以减碳”的行业产生了约150亿吨二氧化碳，占总量的41%，而整个电力行业的排放量为136亿吨（见图表）。最大的工业排放源是水泥、钢铁和化工。

据联合国支持的专家组织政府间气候变化专门委员会（IPCC）称，为了将全球变暖限制在2°C以下，到2050年，全球各行各业能源使用的总排放量必须比现在低50%至80%，如果温升上限定为1.5°C，则需要降低75%至90%。即便如此，在整个21世纪还需要从大气中提取数千亿吨的二氧化碳，即所谓的“负排放”工程。

这是一项历史性的事业。从煤炭时代开始到1970年的200年间，化石燃料燃烧、废气燃烧和水泥制造产生了4200亿吨温室气体，主要是二氧化碳，相当于当今地球上所有人体重总和的1200倍。从1970年到2011年，这一排放量增加了两倍，达到1.3万亿吨。

二氧化碳看不见摸不着，又没有气味，所以相对于会导致酸雨的硫和氮氧化物等更明显的祸害，它的影响更难想象。然而，其排放量是惊人的。钢

铁和水泥行业产生的二氧化碳均超过了除中国和美国外的任何国家排放总和。每生产一吨水泥，会有近0.75吨二氧化碳渗入大气。汽车和卡车对气候的影响更大。而如果你知道自己搭飞机出行时会产生多少二氧化碳，会破坏你飞行的乐趣。本报告重点关注与使用能源相关的排放，而不是农业、林业等土地使用产生的温室气体排放。后者约占总排放量的四分之一。

加州大学欧文分校的史蒂芬·戴维斯（Steven Davis）领导了一个研究小组，利用他称之为“相当简单和有限”的一系列现有技术，描绘了对一个零净排放能源系统的构想。除电力和电池外，它还包括氢和氨、生物燃料、合成燃料、CCS，以及从大气中去除碳。这可以有许多最终用途。氢可用于轻型和重型运输、供暖、炼钢，以及喷气式飞机用的合成燃料。CCS可用于供暖和水泥制造。

每种方法都有其优缺点。大规模制造、运输和使用氢气存在困难。在巴西和美国等地，乙醇等生物燃料已混入了烃类燃料，但能源作物与食品工业争夺土地，而其种植也会产生温室气体。无排放合成燃料依赖大量氢气和一氧化碳来生产烃类替代品，因此其发展取决于这两种气体的低成本供应。用戴维斯的话来说，CCS引发了环保主义者的“集体叹息”，他们视之为化石燃料行业的维生器。但很难想象，如果不靠捕获烟气中排放的二氧化碳，水泥等行业要怎么脱碳。

有些方案比另一些距离实现商业化要近得多。致力于使能源系统脱碳的人有一个大致的时间框架。他们说到2025至2035年就会出现使用电池和氢动力的长途货车，以及靠氢燃料供暖的住宅。到2030年代就可能出现为船舶和飞机开发的合成烃类。到2040年代，CCS和氢气可大规模用于工业。到2050年代将会通过大规模再造林或直接从空气中捕获碳排放来实现全面的碳去除。

如果你居住在非洲或其他贫困地区，那里的当务之急还是满足现有的能源需求，那么所有这些看起来都像是空中楼阁。关键要看政府的指令，以及有何种税收激励措施来引导这种转变。

不过，本报告仍然认为，能源部门脱碳的障碍并非不可克服。更重要的是，它们可以带来经济效益。据IPCC估计，在2016年至2035年之间，将温升控制在1.5°C内的年度成本约为2.4万亿美元，约占世界GDP的2.5%。去年，能源方面的总投资为1.6万亿美元，主要投向煤炭、石油和天然气。全球机构能源转型委员会（ETC）主席阿达尔·特纳（Adair Turner）表示，到2050年，每年以零净排放运营那些“难以减碳”的行业将另外需要1.2万亿美元的成本。“[这个数字]绝对会吓到你。但如果你回到1850年去造铁路，我敢说你也会吓一跳。”

此外，这种转变所涉及的技术没有一件是新的。而且，与化石燃料不同，它们被用得越多，成本就越低，这就会鼓励尽可能多的行业去使用它们。氢可能是最有希望的解决方案，因为它是大规模电气化的最佳补充，也可用于重型运输、供暖和工业。

ETC在一份报告中表示，哪怕不做未来会有很多氢燃料电池汽车的假定，要实现零净排放，全球氢气产量也需要从今天的每年约6000万吨增加到本世纪中叶的5亿至7亿吨。这听起来十分艰巨，但对氢能的兴趣正在快速增长。2017年启动的氢能委员会（Hydrogen Council）是一个由全球化学、汽车和石油公司组成的论坛，其成员数量在18个月内翻了两番。麻省理工学院能源计划（MIT Energy Initiative）的研究负责人弗朗西斯·奥沙利文（Francis O'Sullivan）表示：“我们也许会觉得蓄电池是转型中的头条。但最终它会成为氢能的副手。”

为使氢能洁净，其中大部分必须来自于电解水，而它目前仅占氢产量的5%（其余来自化石燃料的“蒸汽重整”）。这将需要大量低成本的零碳电力。如何提供这样的电力，加上让汽车电气化的电池，将是在未来十年中最紧要的大事之一。 ■



From hot air to action

Decarbonised capitalism

Hope for mankind is not yet lost

IMAGINE, SAYS Adair Turner, chairman of the Energy Transitions Commission, that a beneficent god had sent envoys in the night to steal two-thirds of the world's store of fossil fuels, so that mankind knew it would run out of them within 40 years. "I'm certain that by 2060 we'd have built a zero-carbon economy and the cost of doing so would be trivial," he says.

The alternative to heavenly intervention may be equally fanciful: that governments will curb the world's addiction to fossil fuels by agreeing on the global application of the ultimate sin tax—a price on carbon-dioxide emissions that will rise from, say, \$50 a tonne in 2025 to \$200 a tonne in 2050.

Miracles do happen, but it is unwise to rely on them. In the meantime, the challenges of building a global energy system that requires a fourfold increase in electrification, a hydrogen economy built almost from scratch, and the removal of hundreds of billions of tonnes of greenhouse gases from the atmosphere, should not be underestimated. It is feasible; the technologies are available and could become a lot cheaper if they were adopted widely. Mandates to curb carbon emissions in the future are spurring companies to innovate to survive. But to have a meaningful global impact, the effort requires a level of political ambition that does not yet exist.

To encourage such ambition, it helps to bear three mantras in mind. The first comes from a ten-year-old gem of a book called "Sustainable Energy—Without the Hot Air", by the late British scientist David MacKay. It

is “think big”. As he puts it (with his italics): “Don’t be distracted by the myth that ‘every little helps.’ *If everyone does a little, we’ll achieve only a little.* We must do a lot. What’s required are *big* changes in demand and in supply.”

Second, think inside the box, not just outside it. The more that zero-carbon technologies can make use of existing systems built for the fossil age, the less risk there will be of trillions of dollars-worth of stranded assets, or of consumers having to change their habits much. Examples include synthetic fuels in existing jet engines, hydrogen in natural-gas pipelines, or zero-carbon aluminium smelters. Steve Oldham, boss of Carbon Engineering, a Canadian startup that sucks CO₂ out of the atmosphere, puts it this way: “To make an impact, non-disruptive disruptive technologies are required.”

Certainly none of the zero-carbon technologies is developing quickly enough, but they have been under development for decades, at least in the laboratory. The hard part is scaling them up. And the more potential uses a technology such as hydrogen has, ranging from heating to making steel to powering ships with clean ammonia, the more compelling it is as a business venture.

Third, embrace collaboration as well as competition. Just as Carbon Engineering has borrowed ideas from other industries to make direct air capture more efficient, so steelmakers, iron-ore producers, utilities, cement companies and oil multinationals should be exchanging ideas on how best to turn natural gas into hydrogen or capture and store CO₂. Competition is still vital. Potential rewards beckon for those who can license the first zero-carbon-steel or aluminium technologies, if the carbon price is high enough. But tackling climate change is a shared mission to overcome a massive market failure: the negligible cost of potentially catastrophic emissions. This is not about “winner takes all”, more about “we all lose unless we work together”.

In the long run, decarbonisation could be a way of reinvigorating capitalism. Carbon-intensive energy, together with capital, ingenuity and cheap labour, has been a driving force of economic growth since the Industrial Revolution. It has changed everything, from agriculture, industry, transport and warfare to global geopolitics. Billions of people still crave the development fossil fuels bring. Yet they have also delivered huge rewards to despotic, rentier regimes, encouraged cartels and over-centralised economies, and never borne the cost of their environmental impact.

Mass electrification, from zero-carbon sources, could stimulate new industries and further decentralise the global economy. It could absorb some of the surplus savings that exist in parts of the rich world, provide plentiful demand for jobs to meet the engineering challenges and ease energy poverty in poor countries. It might sound far-fetched in an era of trade wars and isolationism to think that anything can be done for the common good. But using human ingenuity to build a post-carbon future could be a big economic, as well as environmental, opportunity. Sadly, mankind is still not doing nearly enough to rise to the challenge. ■



从空话到行动

脱碳资本主义

人类希望尚存

能源转型委员会（Energy Transitions Commission）的主席阿代尔·特纳（Adair Turner）说，想象一下，一个仁慈的上帝在夜间派出使节，偷走了世界上三分之二的化石燃料库存，这样人类就知道40年内它们就要用光了。“我敢肯定，到2060年，我们已经建立了零碳经济，而这样做的成本将是微不足道的。”他说。

不靠上天干预的话，另一种方案可能同样是幻想：各国政府会就在全球范围实施“终极罪恶税”达成协议，以遏制全球对化石燃料的沉迷。比如，二氧化碳排放的价格将从2025年的每吨50美元上涨到2050年的每吨200美元。

奇迹确有发生，但要指望这个就不明智了。与此同时，要建立这样一个全球能源系统，面临的挑战也不容小觑：电气化须增加四倍、几乎从零开始建设氢能经济，还要从大气中清除数千亿吨温室气体。它是可行的：相关技术已经存在，而如果广泛应用，成本还会大幅下降。未来遏制碳排放的强制要求正在刺激企业努力创新以存活下来。但要想产生有意义的全球影响，这项工作需要一定程度的政治野心，而这一点目前仍然缺失。

要鼓励这样的野心，记住三句真言会有帮助。第一句是“志向远大”。它来自已故英国科学家戴维·麦凯（David MacKay）于十年前发表的一本好书《永续能源——拒绝空话》《Sustainable Energy—Without the Hot Air》。正如他所说（并用斜体字强调）：“不要受‘积少成多’这种说法误导。如果每个人都做了一点，我们只会做成一点点。我们必须做很多。需要实现供求的巨大变化。”

其次，不但要突破常规，还要在常规中突破。零碳技术越能利用为化石燃料时代建造的既有系统，数万亿美元资产被搁浅或消费者需要大力改变行

为习惯的风险就越低。这包括在现有喷气发动机中使用合成燃料、把氢气送入天然气管道，或建设零碳炼铝厂。加拿大创业公司碳工程（Carbon Engineering）的老板史蒂夫·奥尔德姆（Steve Oldham）是这样说的：“要产生影响，需要不颠覆的颠覆性技术。”

当然，目前没有一种零碳技术发展得足够快，但它们已经开发了几十年，至少在实验室里是这样。难点在于扩大规模。而氢气等技术的潜在用途越多——从供暖到炼钢，再到用清洁的氨为船舶供电——它作为一个商业项目就越有说服力。

第三，开展竞争的同时须积极合作。就像碳工程公司借用了其他行业的想法来提高直接空气捕获（DAC）的效率那样，钢铁企业、铁矿石生产商、公用事业公司、水泥公司和石油跨国公司应当积极交流探讨如何最好地将天然气转化为氢气，或捕获和储存二氧化碳。竞争仍至关重要。如果碳价足够高，能把自己研发的突破性零碳炼钢铝技术授权他人使用的企业就能获得巨大回报。但是，应对气候变化需要共同克服一种巨大的市场失灵：潜在灾难性排放的成本被忽略不计。这里并不关乎“赢家通吃”，而是“除非齐心协力，否则人人皆输”。

从长远来看，脱碳可能是重振资本主义的一种方式。自工业革命以来，碳密集型能源——加上资本、独创性和廉价劳动力——一直是经济增长的推动力。它改变了一切，从农业，工业、运输、战争，到全球地缘政治。数十亿人仍然渴望靠化石燃料带来发展。然而，它也为专制、食利的政权带来了巨额回报，鼓励了卡特尔和过度集中的经济体，却从未承担所造成的环境影响的成本。

源自零碳能源的大规模电气化可以刺激新兴产业并进一步分散全球经济。它可以吸收部分富裕国家存在的一些剩余储蓄，并为满足工程挑战提供充足的就业需求，还能减轻贫困国家的能源匮乏问题。在贸易战和孤立主义的时代，认为人类可以基于共同利益去做什么事听起来可能不切实际。但是，运用人类的聪明才智建立一个后碳的未来可能是一个巨大的经济和环境机遇。可悲的是，人类作为仍远不足以应对挑战。■



Mass electrification

The (relatively) easy part

But the challenges of renewable energy are still daunting

HENRIK POULSEN, boss of Ørsted, a big Danish wind developer formerly known as Dong Energy, has a dream that may scare sailors and seabirds, but warms the hearts of renewable-energy advocates. He reckons there is scope to install 600,000 megawatts (MW) of offshore wind capacity in relatively shallow waters off Europe's Atlantic, Baltic and North Sea coasts, which could supply 80% of Europe's electricity. "You could turn the northern seas into one large power factory over the next 10-15 years," he says.

As yet, only 16,000MW of offshore wind has been installed in Europe, and already people are talking about space constraints, as with onshore wind and solar farms. Partly in response, Norway's Equinor, an energy company, is using its deepwater-oil technology to build floating wind turbines tethered to the ocean floor, which could be installed far from land in the North Sea, off the west coast of America and in East Asia. So far it has built one 30MW project off the coast of Scotland, and is considering another to power North Sea oilfields. But Mr Poulsen says the cost of floating turbines, up to four times that of fixed ones, may be prohibitive.

The price of offshore wind generated by his turbines, he says, fell by 60% in 2013-17 as they doubled in size to 8-9MW apiece without needing large increases in their foundations, cabling and installation time. By the mid-2020s he expects each of them to have a capacity of 15MW, but such growth is still not fast enough to meet Europe's climate goals. The same is true elsewhere.

Almost all agree that a lot more electricity, all of it carbon-free, will be

the backbone of efforts to decarbonise the energy system. The Energy Transitions Commission (ETC) says that electricity's share of final global energy demand, currently about 20%, could rise to 60% by mid-late century, with bioenergy and hydrogen providing most of the rest. That entails demand for electricity quadrupling to about 100,000 terawatt-hours over the same period to power vehicles, heating and other users of energy. A quarter of that would be just to make hydrogen.

Figures from BP, an oil company, show that last year less than 35% of the world's electricity was generated from non-carbon sources, including nuclear and hydro, and only 8.4% from non-hydro renewables. The ETC estimates that in order to produce all electricity by renewables in 2050, the annual deployment rate of solar and wind power would have to rise tenfold. Yet it is not necessary that all electricity should come from a mixture of renewables and batteries, even if it were possible. Some argue persuasively that it is cheaper to include non-renewable sources in the power mix to stabilise the system. Nestor Sepulveda at MIT and others argue in a recent paper that it is far more cost-effective to mix intermittent renewables with "firm" (ie, not intermittent) low-carbon resources such as nuclear, natural gas with carbon capture, and bioenergy. Without these, costs rise rapidly as the electricity system gets closer to full decarbonisation, even with storage and the ability to flex demand to cope with surpluses and shortages of power.

Savings in the total use of electricity could be made by using it more efficiently, lowering the amount of energy needed to produce each unit of GDP. Energy intensity declined at an average rate of 2% a year in 2010-16, which helped reduce greenhouse-gas emissions, though they have since risen again. Tightening new constructions standards, retrofitting existing buildings and managing consumption better would all help. At the same time electricity consumption in the developing world still lags far behind, averaging around a third of that in rich countries. Moreover, as energy

efficiency increases, consumers may simply use more of it.

There is an outside chance that a “breakthrough” technology will emerge to replace fossil fuels with a steady source of electricity. Ernest Moniz, who was America’s energy secretary in the Obama administration, says he has never seen so much interest in new nuclear fission technologies. Some continue to hold out hope for nuclear fusion. But as the price of renewables falls, hydrogen is looking more attractive as a way to store electricity over longer periods and distances than batteries. It could have even more uses with further development of carbon capture and storage. ■



大规模电气化

(相对)容易的部分

但可再生能源的挑战仍然令人生畏

丹麦大型风能开发商沃旭能源（Ørsted，早先叫丹能集团[Dong Energy]）的老板亨利克·普尔森（Henrik Poulsen）有一个梦想。它可能会吓到水手和海鸟，却会温暖可再生能源倡导者的心。据他估计，在欧洲的大西洋、波罗的海和北海沿岸相对较浅的海域可以安装600,000兆瓦（MW）的海上风电容量，可以提供欧洲电力的80%。“你可以在未来10到15年内将北海变成一个大型发电厂。”他说。

到目前为止，欧洲仅安装了16,000兆瓦的海上风电，而人们已经开始谈论空间限制，就像陆上风电和太阳能发电场一样。挪威的能源公司Equinor正在利用其深水石油技术建造拴在海底的浮动风力涡轮发电机，可安装在远离北海陆地的地方，以及美国西海岸和东亚，算是部分回应了这个问题。迄今它已在苏格兰沿海建造了一个30兆瓦的项目，并正在考虑另一个项目来为北海油田提供动力。但普尔森表示，浮动涡轮机的成本高达固定涡轮机的四倍，可能令人望而却步。

他说，他的涡轮机发出的海上风电价格在2013到2017年间下降了60%，因为它们的产能翻了一番，达到单台8至9兆瓦，却不需要大幅扩展底座及增加布线和安装时间。他预计到本世纪20年代中期，单台产能将达到15兆瓦，但这种增长仍然太慢，不足以满足欧洲的气候目标。在其他地方也是如此。

几乎所有人都同意，大幅增加全部无碳的电力将成为使能源体系脱碳的关键。能源转型委员会（ETC）表示，电力在终端能源需求中的份额目前约为20%，到本世纪中叶可能会上升到60%，由生物质能和氢能提供其余的大部分能源。这就需要在这一时期内让电力需求翻两番，达到大约100,000太瓦时，以满足车辆、供暖和其他能源用户的需求。而其中有四

分之一将用于制氢。

英国石油公司（BP）的数据显示，去年全球不到35%的电力来自非碳源，包括核电和水电，而非水电的可再生能源只占8.4%。ETC估计，为了在2050年通过可再生能源生产所有电力，太阳能和风能的年度部署速度必须提高十倍。然而，哪怕有可能做到这一点，电力也不必定要全部来自可再生能源和电池的搭配。一些人的观点很有说服力，认为在动力组合中加入不可再生能源来稳定系统会更便宜。麻省理工学院的内斯特·塞普尔韦达（Nestor Sepulveda）等人在最近的一篇论文中指出，将间歇性可再生能源与“稳定的”（即非间歇性）低碳资源（如核能、带碳捕获的天然气，以及生物能源）混合在一起会经济得多。如果没有这些，随着电力系统接近完全脱碳，即便拥有蓄电能力和调节需求以应对电力盈余和短缺的能力，成本也会迅速上升。

要节约总耗电量，还可通过更高效地利用电力，降低生产每单位GDP所消耗的能源。2010至2016年，能耗强度以每年平均2%的速度下降，这有助于减少温室气体排放，尽管此后它们又再度上升。收紧新建筑标准，改造现有建筑物以及更好地管理能耗也会有所帮助。与此同时，发展中国家的电力消耗仍远远落后，平均约为富裕国家的三分之一。此外，随着能源利用效率的提高，可能消费者就是会用得更多。

还有极小的可能会出现一种“突破性”技术，用一种稳定的电力来源替代化石燃料。曾任美国奥巴马政府能源部长的欧内斯特·莫尼兹（Ernest Moniz）表示，他从未见过人们对新核裂变技术有这么大的兴趣。一些人继续抱着核聚变的希望。但随着可再生能源的价格下跌，氢气作为一种比电池更长久、更长距离的蓄电方式，看起来更具吸引力。随着碳捕获和储存的进一步发展，它可能会有更多用途。 ■



Brain scan

John Goodenough

The man who helped invent the lithium-ion battery is still trying to reinvent it

"I WANT TO solve the car problem. I'd like to get all the gas [petrol] emissions off the highways of the world. I'm hoping to see it before I die. I'm 96 years old. There's still time." Delivered with an infectious chuckle, these words sum up what makes John Goodenough of the University of Texas a living legend in the world of batteries.

Almost 40 years after his pioneering electrochemistry helped usher in the era of the rechargeable lithium-ion battery, he is still trying to tame his troublesome brainchild. Today's mobile phones and electric vehicles contain the same core battery components as when Sony first introduced them in 1991: a liquid electrolyte, a lithium-cobalt-oxide cathode (the positive side of the battery), developed by Dr Goodenough, and a carbon anode (the negative side of the battery), pioneered by Akira Yoshino in Japan.

But as Dr Goodenough has been pointing out for years, serious drawbacks persist. The electrolyte is flammable. If the battery is charged too fast, the anode grows dendrites ("metal whiskers") that can pass through the liquid electrolyte, either shortening the life of the battery or short-circuiting it and causing it to catch fire. Dealing with these shortcomings and making stacks of battery cells light, powerful and affordable enough to propel a car is his life's mission.

In the past few years he and his colleagues have claimed a breakthrough. They have developed a solid-state battery using a lithium-glass electrolyte with a conductivity similar to a liquid electrolyte, and a lithium or sodium

metal anode that does not produce dendrites, making it safer and easier to charge quickly. It does not use cobalt, which is increasingly hard to obtain, it can be charged and discharged up to 23,000 times, rather than just a few thousand cycles.

Dr Goodenough is particularly keen on a sodium anode because, as he puts it, it is available to anyone with access to an ocean, whereas lithium may one day, like oil, require what he calls “gunboat diplomacy” to secure supplies. The cathode remains a work in progress. Some scientists are sceptical of the team’s claim that the more often their new battery was cycled, the more its capacity to store electricity increased. But Dr Goodenough dismisses such criticism as competitive rivalry. He is not alone in expecting solid-state batteries to become commercially successful within the next 5-10 years. Japanese carmakers and Panasonic (which also produces lithium-ion cells for Tesla) have formed a partnership to develop them.

Dr Goodenough’s technology has not yet been licensed by a battery manufacturer, and he is the first to concede that battery breakthroughs have been exaggerated in the past. “When everybody’s blowing trumpets, be careful,” he says. ■



人物

约翰·古迪纳夫

帮助发明了锂电池的人仍在努力重塑它

“我想解决汽车的问题。我想让汽车尾气从全世界的高速公路上消失。我希望我死之前能看到这一天。我今年96岁，还有时间。”约翰·古迪纳夫（John Goodenough）笑着说道，很有感染力。这些话恰好总结了这位德克萨斯大学的学者何以成为了电池世界里的传奇。

在他开创性的电化学研究成果帮助世界迎来可充电锂离子电池时代近40年后，古迪纳夫博士仍在努力驯服他自己那麻烦多多的创意结晶。今天的手机和电动汽车包含的电池核心组件与1991年索尼首次使用它们时一模一样：液体电解质、由古迪纳夫研发的锂钴氧化物阴极（电池的正极），以及由日本的吉野彰创制的碳阳极（电池的负极）。

但正如古迪纳夫多年来一直指出的那样，严重的缺陷仍然存在。这种电解质易燃。如果电池充电太快，阳极会长出能穿过液体电解质的树枝状晶体（“金属晶须”），要么缩短电池的寿命，要么使电池短路并着火。古迪纳夫一生的使命就是要处理这些缺点，并使电池组变得足够轻巧、强大又平价，以驱动一辆汽车。

过去几年里，他和他的同事们声称取得了突破。他们开发出了一种固态电池，使用的锂-玻璃电解质的导电性与液体电解质相似，锂或钠金属阳极不会产生枝晶，使其更安全，也更容易快速充电。它不使用越来越难以获得的钴。它可以充电和放电达23,000次，而不是仅仅几千次循环。

古迪纳夫特别热衷于研究钠阳极，因为正如他所说，任何能够接触到海洋的人都可以获得钠，而有一天锂却可能像石油那样，需要“炮舰外交”来确保供应。阴极仍在不断地改善中。对于该团队声称的其新电池循环充放电次数越多，蓄电能力就越高的成果，一些科学家表示质疑。但古迪纳夫认为这类批评不过是竞争者的攻击而已。他并不是唯一一个预期固态电池在

未来五到十年取得商业成功的人。日本的汽车制造商和松下（也为特斯拉生产锂电池）已经建立合作关系来研发它们。

吉迪纳夫的技术尚未获得电池制造商的许可，而他是第一个承认电池突破在过去被夸大了的人。“每个人都在吹号角时，就要小心了。”他说。 ■



Buttonwood

Sooner or later?

The perils of trying to time the market

Jesse Livermore earned his reputation as a talented speculator by pocketing a tidy sum during the Panic of 1907. Mindful that a scarcity of credit and a giddy stockmarket were a dangerous mix, he began to sell stocks short that autumn. When share prices crashed on October 24th, Livermore was up by \$1m (\$27m in today's money). He then changed course. He started to buy stocks, which were now a lot cheaper. The market rallied. By the end of the year Livermore had made \$3m.

Anyone who has ever invested in stocks has at one time fancied that they can time the market as exquisitely as Livermore did. Very often, they hope that a benchmark of fair value, such as the cyclically-adjusted price-earnings ratio, or CAPE, will be their guide. History shows that when stock prices rise a lot faster than profits—as they did in the 1920s, 1960s and 1990s—they tend subsequently to fall back (see chart). So the market-timer will sell when the CAPE is high and buy them back when it is low.

It seems simple. In practice, it is surprisingly hard to use valuation gauges to time the market. Investors who try often sell far too early. As a consequence, they miss out on some of the richest returns. Selling stocks when everyone is still buying may actually be the easy bit. It is harder to find the nerve to buy stocks when others are selling them in a panic.

The purist view is that market timing is a mug's game. It says stocks are a random walk: their past indicates nothing about their future path. In the 1980s academics questioned this creed. Since stock prices tend to revert to a mean value, they must be somewhat predictable. They deviate from

this fair value only because investors over-react to news. When profits are strong and stocks are rising, there will be keen buyers almost regardless of value. The reverse is true in recessions. This herding—or, if you prefer, this rational pricing of risk—creates the opportunity for market timing.

There is a drawback. What is “cheap” or “dear” is defined by reference to the full history of prices. But an investor active in any period could not have known this in advance. Nor is it obvious at the time whether the CAPE is close to a peak or trough. Without the benefit of hindsight, timing produces disappointing results.

A study in 2017 by Cliff Asness, Antti Ilmanen and Thomas Maloney of AQR Capital Management tested a timing strategy. Their gauge was a rolling 60-year average of the CAPE. When the CAPE was below its historical median—that is, below fair value—the strategy would borrow to buy stocks. When it was above fair value, it would lighten up on stocks in favour of cash. Over the whole period (1900-2015), returns to the market-timing strategy were scarcely better than to a buy-and-hold portfolio with a constant 100% stockholding. And over the latter half (1958-2015), returns were no better at all.

A big failing was that the strategy was under-invested in stocks for too much of the time. The average CAPE has trended upwards since the 1950s. Too often stocks were deemed dear based on historical valuations. Timing works no better in countries other than America. A study in 2013 by three academics, Elroy Dimson, Paul Marsh and Mike Staunton, found no consistent link between valuation and subsequent returns in 23 stockmarkets.

Value is too weak a signal to be much use. But it can be improved upon. The AQR researchers found that combining the value benchmark with a “momentum” signal of the underlying trend in stock prices yields better

results. This is intuitive. The problem with value benchmarks is that prices drift away from them for long periods. But a blend of value and momentum represents “value with a catalyst”, as the authors put it.

This strategy is too complex for ordinary investors to profit reliably from it. But there is a simpler form of market timing, which has some empirical support: rebalancing. It requires investors to decide first how they want to divide their investments. It could be, say, an equal split between American and non-American stocks. The precise weights matter less than that they are stuck to. That requires regular rebalancing to restore the original weights. It means shedding assets that have risen a lot in favour of those that have gone up by less.

The virtue of rebalancing is that it is simple. You are less likely to make a costly mistake than if you follow a more complex strategy. The drawback is that you must give up the delusion that you can time it like Livermore. To do what he did takes nerve and a rare feel for markets. You may think you have such talents. You almost certainly don't. ■



梧桐

不是太早，就是太迟？

尝试把握市场时机有其风险

杰西·利弗莫尔（Jesse Livermore）在1907年大恐慌期间大赚一笔，由此赢得了投机天才的名声。当时利弗莫尔注意到，信贷短缺加之股市狂热正在酝酿危险，于是开始在那年秋天做空股票。10月24日股价暴跌，利弗莫尔赚了100万美元（相当于今天的2700万美元）。之后他改变策略，转而买进当时价格已大幅下跌的股票。股市回升。到年底，他赚到了300万美元。

每个投资过股票的人都幻想过自己也能像利弗莫尔那样精准把握市场时机。很多时候，他们希望像周期调整市盈率（CAPE）这样的公允价值基准可以作为自己的行动指南。历史表明，当股价涨幅远大于利润增幅时（如上世纪20年代、60年代和90年代），随后往往回落后（见图表）。因此，择机入市者会在CAPE值处于高位时卖出，低位时买入。

这看似简单。但在实际操作中，利用估值指标来选择市场时机出人意料地难。尝试这种方法的投资者往往过早卖出，结果错失一些最丰厚的回报。事实上，在所有人仍在买入的时候卖出股票可能还算是容易的。在别人都恐慌地抛售股票时壮起胆子买入更难。

正统观点认为，傻瓜才会去选择市场时机：股票走势是随机的，过去的走势完全不能代表未来的走势。上世纪80年代，学者们对这一信条提出了质疑。股价总是趋于回归到平均值，所以它们在某种程度上一定是可预测的。股票偏离公允价值只是因为投资者对新消息反应过度。当利润增长强劲、股价上涨时，总会有买家趋之若鹜，几乎不管股票价值如何。而经济衰退时情况则正好相反。这种羊群行为，或者说得好听点也可称之为理性的风险定价，为选择市场时机创造了机会。

但缺点也摆在那里。股价是“低”是“高”参照的是整个历史价格。但是任何时期活跃的投资者都不可能事先知道股价算高还是算低，也不清楚当时CAPE是接近峰值还是谷值。事后之明无济于事，时机选择的结果令人失望。

AQR资本管理公司的克利夫·阿斯尼斯（Cliff Asness）、安蒂·伊尔马宁（Antti Ilmanen）和托马斯·马洛尼（Thomas Maloney）2017年的研究测试了一种时机选择策略。他们使用的指标是60年的CAPE滚动平均值。当CAPE低于其历史中位值（即低于公允价值）时，该策略就会借钱买入股票；而当CAPE高于公允价值时，则会减仓股票，持有现金。在从1900年到2015年的整个时期，市场时机选择策略的回报率几乎不比始终100%持仓的“买入并持有”组合的策略好多少。而在后半期（1958至2015年），回报率完全没有后者好。

时机选择策略的一大缺陷在于太多时候都对股票投资不足。自上世纪50年代以来，CAPE均值一直呈上升趋势。从历史估值来看，股价常常被认为是在高位。除了美国，时机选择策略在其他国家并没有起到更大作用。2013年，埃尔罗伊·戴姆森（Elroy Dimson）、保罗·马什（Paul Marsh）和迈克·斯汤顿（Mike Staunton）这三位学者进行的一项研究发现，23个股票市场的股票估值与随后的回报之间没有一致的关联。

价值的指示作用太弱，用处不大。但可以改进。AQR的研究人员发现，将价值基准和股价潜在趋势的“动量”信号相结合，效果会更好。这点比较直观。价值基准的问题在于价格长期偏离于它们。但是正如以上三位作者所言，价值策略和动量策略结合在一起就相当于“加了催化剂的价值策略”。

这种策略过于复杂，普通投资者无法依靠它稳定地获益。但还有一种更简单、也取得了一些实证支持的市场时机选择方法，那就是投资组合再平衡。该方法要求投资者首先决定如何分配自己的投资。比如，可能是平分投资美国股票和非美国股票。比精确的分配比例更重要的是保持比例。这需要定期再平衡以恢复原始权重，也就是放弃那些已经大幅升值的资产，转而投资升值较少的资产。

再平衡的好处在于它简单易行。比起其他更加复杂的策略，采用再平衡更能避免犯下损失惨重的错误。不过缺点就是必须放弃自己也可以像利弗莫尔那样把握时机的妄想。要做到他那样，需要勇气和罕有的对股市的超强敏感。你可能自以为有他那样的天赋。但我可以告诉你，你几乎肯定没有。 ■



Chaguan

What's love got to do with it?

Coldly calculated interests, not affection, are binding China and Russia closer

THE HIGH SPEED train from Changchun to Vladivostok would be a fine symbol of Sino-Russian friendship, if someone would finish it. The line's Chinese leg is a modern marvel: a silk-smooth ride through a blur of birch trees and red-roofed farms. Then the line ends at buffers in Hunchun, a border city near Russia.

At first Hunchun's residents are wary of discussing why their home town—a drab but friendly city of fewer than 230,000 people—is the terminus of a high-speed rail line from Changchun, the nearest provincial capital. The line, which cost 42bn yuan (\$6bn), opened in 2015. Public records show that the surrounding province, Jilin, invited Russia to help lay the track as far as Vladivostok, the Russian Far East's largest port. Russian selfishness scotched that plan, Hunchun's residents mutter. "Russia said, 'If you want it, you can build it,'" alleges a Chinese business owner. It will take 20 years for high-speed trains to cross that border, he sniffs.

Hunchun is a good place to hear how ordinary Chinese and Russians talk about each other, even in a city where they meet every day. Russian signs hang in shops and hotels. City clinics profit from Siberian medical tourists (Russian teeth are "not so good", says a dentist, delicately). Local seafood-importers turned to Russian suppliers after UN nuclear sanctions limited Chinese access to North Korean crabs. But suspicions lurk. Lang Yulin, a seafood dealer, blames Russian bureaucracy for the five days it takes goods to reach Hunchun from Vladivostok, 300km away by road. Worse, Russian partners will never work late or at weekends "no matter the financial hit", he grumbles.

There is a patriotic edge to Hunchun's main tourist site, an hour's drive away at Fangchuan. It marks a three-way border with North Korea and Russia created in 1860 when tsarist forces took advantage of imperial China's weakness and swiped a swathe of coastal land, leaving Jilin province landlocked and the sea a tantalising 15km away. That would never happen now, ventures a tourist from Sichuan province: "China is a strong country."

Economic ties between the two neighbours have long been disappointing. Despite growing exports of Russian natural gas, timber and other commodities to China, trade lags behind targets set by national leaders, says Xing Guangcheng of the Chinese Academy of Social Sciences, a government research institute.

Mutual coolness explains some of this slow growth. Mr Xing has devoted his working life to studying Russia. Still, when asked to explain trade volumes, he unhesitatingly contrasts the work ethic in China, a crowded, hyper-competitive country lacking in natural resources, with the languid pace of life in Russia, a country blessed with land and mineral riches to spare. He describes scenes of bafflement when Chinese farmers rent land in the Russian Far East, rising before dawn and working until after dark. When they pause for swift lunches in the fields, Mr Xing says, Russians circle them and stare, asking, "Why do you work so hard?" For their part, Siberian farmers think Chinese farmers use too many chemicals.

One barrier to co-operation used to involve fears about Chinese migrants overrunning the Far East, where just 6m Russians live. In the 1990s nationalist politicians lobbied against visa-free entry for Chinese citizens, thundering about Chinese men taking Russian wives. Fears were eased by a Russian government study, some four years ago, that found 600,000 Chinese living in Russia, mostly in the European west, rather than the millions commonly supposed. Still, the public is easily inflamed. Recently, Russian newspapers have fulminated against Chinese firms logging

Siberian forests.

Russian elites long viewed China with racially tinged scorn, says Alexander Gabuev of the Carnegie Moscow Centre, a think-tank. He recalls a Russian official, just before the financial crisis in 2009, scoffing at China's supposed modernity, calling it a Potemkin village whose big GDP reflected "millions of poor people who will work for a bowl of rice".

Such rudeness leads Westerners to doubt whether the two countries can grow very close. "I see little in the long term that aligns Russia and China," America's defence secretary, James Mattis, said in September. Wiser Chinese and Russian heads argue that ties are stronger because they are based on coldly calculated interests. In Soviet times, China signed deals as a junior partner, says Mr Xing. Today logic dictates whether Sino-Russian projects happen because relations are more normal, he suggests: build a fast train to sparsely peopled Siberia and who would take it?

Hunchun may be a fine place to see how underwhelming Sino-Russian friendship can be at ground level. But with the right catalysts, state-to-state relations deepen fast. That has been especially evident since 2014, when Russia's annexation of Crimea provoked Western sanctions that left the Kremlin turning to China in search of capital, technology and markets, says Mr Gabuev. In September 3,200 Chinese troops trained alongside 300,000 Russians in eastern Siberia: a remarkable show of trust between countries that fought a border war in 1969. Russian arms sales to China had slowed in 2005 after spy scandals, including China's theft of designs for a Russian fighter jet. They are booming now. A rising China will soon not need imported weapons, so Russian arms-makers are rushing to cash in. China does not want a military alliance—it views Russia as alarmingly hot-headed. But the pair work at the UN to promote a worldview that puts sovereignty and iron-fisted order ahead of universal rights. China copied Russia's law curbing foreign non-governmental organisations. Russian spooks are

fascinated by Chinese surveillance technology.

Chinese and Russians still view each other with striking cynicism: just ask residents of Hunchun about trains to nowhere. But a shared cynicism about the world unites their governments—and survives the complicating factor of an amoral American president. For some neighbours, friendship is not the point. ■



茶馆

与爱何干？

拉近中俄两国的不是彼此间的情谊，而是冷酷的利益算计

如果真有谁把长春到符拉迪沃斯托克（Vladivostok）的高铁修成，那么在这两地间飞驰的列车倒是能很好地象征中俄友谊。这条线路的中国段堪称现代奇迹：列车平稳地疾驰着，窗外的白桦树和农场里的红顶房子模模糊糊地一闪而过。随后便到达终点站——毗邻俄罗斯的边境城市珲春的自然保护区缓冲区。

珲春是一个平淡但友好的小城，人口不到23万。它怎么会成为以长春（离这里最近的省会城市）为起点的高铁线路的终点站呢？一开始，珲春居民谈论起这个问题时言语谨慎。这条线路造价420亿元，于2015年开通。公共档案显示，珲春所在的吉林省曾邀请俄罗斯帮助将铁路铺设到其远东地区最大的口岸符拉迪沃斯托克。珲春当地人咕哝说，俄罗斯自私自利，否决了这个计划。“俄罗斯说了，‘你要修就自己修去。’”一名中国的企业老板声称。高铁得花20年才能穿过边境线去，他鄙夷地说。

要听听中俄两国的普通人怎样评价对方，来珲春就对了，即使在这个城市里他们天天都会碰头。商店和酒店都挂着俄语标识。城里的诊所靠那些从西伯利亚来这里求医的游客赚钱（俄罗斯人的牙“不是太好”，一名牙医言辞谨慎地说。）联合国对朝鲜涉核武的制裁限制了中国进口朝鲜螃蟹，珲春的水产进口商遂转向俄罗斯的供应商。但人们也暗暗质疑。水产经销商梁玉林（Liang Yulin，音译）表示，货物从符拉迪沃斯托克运到珲春，300公里的公路要走五天，问题全出在俄罗斯的官僚作风上。更糟糕的是，俄罗斯合作方不管是工作日还是周末都决不肯加班，“不管有多大的金钱损失。”他抱怨道。

距离珲春一小时车程的防川是当地的主要旅游景点，那里笼罩着一种爱国主义氛围。1860年形成的边界线让防川成了中朝俄三国的交界处。就在那

一年，沙俄趁清廷虚弱，窃取了一长片滨海土地，致使吉林望区区15公里之外的出海口而不得。如今再也不会发生这样的事了，一名四川游客小心地说道，“中国强大了。”

长期以来，这两个邻国间的经济往来令人失望。尽管俄罗斯向中国出口的天然气、木材和其他大宗商品越来越多，但政府研究机构中国社科院的刑广程表示，两国间的贸易仍未达到两国领导人设下的目标。

双边贸易增长缓慢，部分原因是两国居民对彼此态度淡漠。刑广程致力于俄罗斯研究，但在被问及贸易数字平平无奇背后的原因时，还是不假思索地拿中国人吃苦耐劳的精神和俄罗斯人懒散的生活节奏作对比。中国人口众多，竞争激烈，自然资源匮乏，而俄罗斯土地辽阔，矿产资源自用外尚有富余。他讲述道，到俄罗斯远东地区租地耕种的中国农民起早贪黑地干活，让当地人困惑不已。到了中午，他们停下手中的活，快速地扒两口饭，当地人就会过来围观并发问：“你们干嘛这么拼啊？”而西伯利亚的农民则认为中国农民使用太多化学品了。

之前阻碍两方合作的一个因素是俄方担心仅有600万俄罗斯人居住的远东地区会涌入太多中国移民。上世纪90年代，民族主义政客强烈谴责娶了俄罗斯妻子的中国男人，游说政府取消对中国居民的免签政策。俄罗斯政府大约四年前开展的一项研究缓解了这样的担忧。该研究发现，在俄中国人有60万，并不是通常以为的几百万，而且他们主要生活在俄罗斯的欧洲部分。尽管如此，民众还是很容易被煽动。之前就有俄罗斯报纸愤怒地声讨中国企业砍伐西伯利亚森林的行为。

俄罗斯的精英分子素来都对中国怀有带种族主义色彩的鄙夷态度，智库卡内基莫斯科中心（Carnegie Moscow Centre）的陈寒士（Alexander Gabuev）说。他回忆，2009年金融危机发生前不久，一位俄罗斯官员对中国所谓的现代化嗤之以鼻，斥之为弄虚作假的面子工程，认为中国庞大的GDP反映出“成百上千万的穷人愿为一碗饭出卖劳动力”。

这种毫不客气的言论让西方人怀疑两国是否能变得很亲密。“长远来看，

我看不到什么让中俄走到一起的因素。”美国国防部长詹姆斯·马蒂斯（James Mattis）9月这样说道。一些中国人和俄国人看得更明白，他们认为，两国变得更紧密是因为它们的关系是根植于冷酷的利益算计。刑广程说，在苏联时代，中国是作为实力较弱的一方与苏联签订协议。到了今天，中俄是否要合作开展项目得看是否合理，因为两国关系变得更正常了。他指出：“修一条高铁通到没什么人的西伯利亚，你指望谁去坐啊？”

在珲春，你也许可以清楚地感受到中俄友谊在民间层面是有多冷淡。但有了合适的催化剂，国与国之间的关系会快速加深。陈寒士说，这在2014年之后体现得尤为明显：这一年俄罗斯吞并了克里米亚，西方国家对其实施制裁，促使俄政府转而向中国寻求资本、技术和市场。9月，3200名中国士兵与30万俄罗斯士兵在东西伯利亚举行演习，对于曾在1969年爆发边界冲突的两国来说，这突显了彼此间的信任。2005年，间谍丑闻接连爆出，其中包括一桩中国对一款俄罗斯战斗机设计的窃取。自那之后俄对华军售放缓，不过现在又兴旺起来了。日渐崛起的中国很快就不需要进口武器，因此俄罗斯武器制造商纷纷抓紧时间捞一笔。中国并不想结成军事联盟——在它看来，俄罗斯冲动鲁莽，令人不安。但是，它们在联合国携手推行一种将主权和铁腕秩序置于普世权利之上的世界观。中国效仿俄罗斯，立法控制外国非政府组织。俄罗斯密探则对中国的监控技术大有兴趣。

两国人民彼此仍怀有强烈的不信任：问问珲春居民对于一条不知道修不修得成的高铁有何看法就知道了。但对世界共同的不信任让两国政府团结在了一起，并且越过一个麻烦因素的影响——一个没有道德观念的美国总统。对有些相邻的国家来说，友谊不友谊的并不是关键。■



Identity

Les stats, c'est moi

A new way to think about data is needed

“Data”, runs a common refrain, “is the new oil.” Like the sticky black stuff that comes out of the ground, all those 1s and 0s are of little use until they are processed into something more valuable. That something is you.

Seven of the world’s ten most valuable companies by market capitalisation are technology firms. Excluding Apple, which makes money by selling pricey gadgets, and Microsoft, which charges businesses for its software and services, all are built on a foundation of tying data to human beings. Google and Facebook want to find out as much as it is possible to know about their users’ interests, activities, friends and family. Amazon has a detailed history of consumer behaviour. Tencent and Alibaba are the digital wallets for hundreds of millions of Chinese; both know enough about consumers to provide widely used credit scores.

Where tech companies have blazed a trail, others have followed. Consumer brands in every industry collect data on their customers to improve design and advertise products and services. Governments have looked at these firms and instituted their own systems to gather information on their citizens. Narendra Modi, India’s prime minister, cites Facebook as an inspiration. That is apparent in the ever-expanding reach of Aadhaar, an ID system for India’s 1.3bn residents that is required for nearly every government service imaginable.

That data are valuable is increasingly well-understood by individuals, too, not least because personal information is so often hacked, leaked or stolen. India’s database has been shown to be vulnerable to scammers and state

abuse. Facebook has spent most of 2018 dealing with the reputational damage of multiple breaches, most notably via Cambridge Analytica, a consulting firm. The list of other companies that have suffered some sort of data breach in 2018 alone reads like a roll call of household names: Google, Marriott, Delta, British Airways, Cathay Pacific, Best Buy, Sears, Saks 5th Avenue, even Panera Bread. Such events have caused a tectonic shift in the public understanding of data collection. People have started to take notice of all the data they are giving away.

Yet few have changed their online behaviour, boycotted snooping tech firms or exercised what few digital rights they possess. Partly this is because managing your own data is time-consuming and complex, even for those who understand how to do it. But it is also because of a misunderstanding of what is at stake. “Data” is an abstract concept, technical and intangible. Far more solid is the idea of identity (see Essay). It is only when “data” is understood to mean “people” that individuals will demand accountability from those who seek to know them.

Such accountability stretches far beyond an obligation to secure someone’s credit-card details. In the information age, data are used to decide what sort of access people have to services. Uber ratings determine who gets a taxi; Airbnb reviews decide what sort of property you can stay in; dating-app algorithms choose your potential life partners. Firms use location data and payment history to sell you products. Your online searches may establish the price you pay for things. Those with a good Zhima credit score, administered by an Alibaba subsidiary, enjoy discounts and waived deposits. Those without receive few offers.

When they are used by states, such techniques pose a still greater threat. Algorithms that are able to recognise patterns in data can pinpoint dissidents or even those with unconventional opinions. In 2012 Facebook experimented with using data to manipulate emotions. In 2016 Russia used

data to influence the American presidential election. The question is not whether someone is doing something wrong. It is whether others can do wrong to them.

The fossils of past actions fuel future economic and social outcomes. Privacy rules, data-protection regulation and new laws surrounding the use of algorithms are crucial in protecting the rights of individuals. But the first step towards ensuring the fairness of the new information age is to understand that it is not data that are valuable. It is you. ■



身份

吾即数据

对数据的新思考势在必行

一个常听到的说法是，“数据是新时代的石油。”与那些来自地下的黑色粘稠物质一样，所有这些1和0在被加工成某种更有价值的东西之前无甚用处。而那个有价值的东西便是你。

全球市值最高的十家公司中有七家是科技公司。苹果靠销售昂贵的小设备赚钱，微软就软件和服务向企业收费，其余五家的立身之本都是将数据和人关联在一起。谷歌和Facebook希望尽可能多地掌握用户的兴趣、活动、朋友和家人方面的数据。亚马逊对用户过往的消费行为一清二楚。腾讯和阿里巴巴充当了数亿中国人的数字钱包，两者都足够了解用户，并据此提供被广泛使用的信用评分系统。

科技公司开疆拓土，其他各方也紧随其后。各行各业的消费品牌都在收集客户数据，用以改进设计、宣传产品及服务。政府仔细观察了这些企业的变化后，也建立起自己的系统来收集公民信息。印度总理莫迪称自己是受Facebook的启发。印度居民身份系统Aadhaar的覆盖范围不断扩大就是明证。13亿印度人若要使用你能想到的任何政府服务，几乎都要依靠这个系统。

个人也越来越清楚数据的价值，尤其是因为个人信息如此频繁地遭到黑客攻击、被泄露或窃取。事实证明印度的数据库容易受到骗子的攻击和政府的滥用。2018年，Facebook大部分时间都在应付多起泄密带来的声誉损失，最出名的一起就是咨询公司剑桥分析事件。仅在2018年就有以下这些家喻户晓的公司发生了一定程度的数据泄露：谷歌、万豪、达美航空、英国航空、国泰航空、百思买、西尔斯、萨克斯第五大道，甚至还有美国最大的面包连锁店Panera Bread。这些事件已经颠覆了公众之前对数据收集的理解。人们开始注意到自己正在拱手送出的所有数据。

然而却很少有人改变自己的网上行为、抵制窥探个人隐私的科技公司，或行使自己微乎其微的数字权利。这在一定程度上是因为自我管理数据既耗时又复杂，即使对内行人也不例外。但同时也是因为人们对其中的利害存在误解。“数据”是个既专业又无形的抽象概念。而身份的概念则要实实在在得多。只有当“数据”被理解为代表着“人”时，个人才会要求那些企图掌握他们信息的公司承担责任。

这种责任远远不止保证个人信用卡信息安全那么简单。在信息时代，数据被用来决定人们可以获得什么层级的服务。优步的评分决定谁能打到出租车；爱彼迎的评论决定了你可以租到什么样的房屋；婚介app的算法为你选择潜在的生活伴侣。公司利用位置数据和支付记录向你销售产品。你的在线搜索记录可能会决定你购买商品的价格。那些芝麻信用分（由阿里巴巴的子公司管理）较高的人可以享受折扣和押金减免，反之则鲜有享受优惠。

如果这些技术为国家所用，构成的威胁则更大。能够识别数据模式的算法可以准确挑出异见人士，甚至是持非传统观点的人。2012年，Facebook开展了利用数据操纵情绪的试验。2016年，俄罗斯利用数据来影响美国总统大选。因此，问题并不是有没有人在做坏事，而是会不会让这些人有机可乘。

历史行为就像化石燃料，为未来的经济和社会结果添柴加火。隐私规则、数据保护法规以及有关算法使用的新法律在保护个人权利方面至关重要。但要确保新信息时代的公平，首先要明白，有价值的不是数据，而是你自己。 ■



Industrial policy

Big mistake

Mega-mergers would mean less competition when what Europe needs is more

No company founded in Europe in the past four decades has gone on to be worth over \$100bn today. Entrepreneurs in America have managed the feat a dozen times, including the founders of Amazon, Cisco and Home Depot. China will soon have more such corporate leviathans than the European Union does. Angela Merkel of Germany and Emmanuel Macron of France are among those who think they have found a solution to this relative impotence: let European companies merge their way into the top leagues.

Only the most hidebound politicians still yearn for the state-owned “national champions” of yore. But an increasing number see a need for “European champions” able to compete globally. Mrs Merkel has called for EU competition guidelines to be “modernised” so that European titans can emerge. Mr Macron says he wants the issue to feature prominently in the upcoming European election campaign. From eyeglasses to steelmaking, from stockmarkets to railways, proposed cross-border mergers are being backed by politicians as the only way to take on Chinese and American rivals (see Europe section). That should set alarm bells ringing, for two reasons.

The first is that Europe already has a competition problem. A forthcoming study by Chiara Criscuolo and colleagues at the OECD, a club of mainly rich countries, shows that the average market share of the top four firms in Europe in each industry has risen by three percentage points since 2000. The free cashflow of non-financial firms as a share of GDP is well above its 20-year average. When concentration is rising and profits are high and persistent, the answer is not to make big firms even bigger.

Industrialists argue that added size will make them more efficient, and so likelier to thrive globally. Sometimes sheer size pays off: Airbus, an aerospace giant, is a cross-border success story. But big deals often throttle competition. Take the mammoth proposed merger between the operations of Germany's Siemens and France's Alstom that make rolling stock and train-track signals. In some rail markets the combined firm would be three times bigger than its largest rival. Margrethe Vestager, the EU's independent-minded competition commissioner, seems sceptical that a Siemens-Alstom tie-up will be good for consumers. She is right to be wary.

The second reason to worry is political. As Mrs Merkel and Mr Macron become keener on the logic of big mergers, pro-competitive voices in Europe risk being drowned out. Britain, historically a stalwart defender of free markets, is consumed by the Brexit mess. The European Commission has a strong record of standing up to governments on issues such as state aid, but Ms Vestager's term ends next year. Suspicion of Chinese investment, though often warranted, can be exploited to hinder any foreign company taking over an EU firm.

If competition-sapping mergers are not the way to create world-beating companies, what is? Above all, European firms struggle compared with their American and Chinese rivals because the continent's markets are so fragmented. Making it so that an Irish firm can serve a Portuguese client as easily as a Texan one can serve a New Yorker would be good for businesses of all sizes. The EU's "single market" is designed for goods. It works less well for services—which make up over 70% of the European economy. Talk of greater integration of capital markets and digital services urgently needs to be turned into action. More funding for basic research is also needed to help foster innovation.

European bosses complain that China and America tilt the playing field in favour of their own companies, whether through "America first" trade

policies or Chinese soft loans. That is no reason to follow suit. Mercantilism benefits favoured companies but not economies and consumers. The answer to other countries giving their citizens and taxpayers a raw deal is not to emulate them. It is to foster competition. ■



产业政策

大错特错

大型并购可能会削弱竞争，而欧洲需要加强竞争

过去40年间在欧洲创立的公司没有一家如今市值超过1000亿美元。在美国，有十多家企业做到了这一点，包括亚马逊、思科和家得宝（Home Depot）。中国很快也将比欧盟拥有更多这样的企业巨头。包括德国总理默克尔和法国总统马克龙在内的一些人自认为找到了补救这一相对弱势的方法：让欧洲企业通过合并走向顶尖行列。

只有最顽固的政客仍渴望拥有昔日的国有“全国领军企业”。越来越多人认为需要打造有能力参与全球竞争的“欧洲领军企业”。默克尔呼吁把欧盟的竞争指导方针“现代化”，以便让欧洲的大型企业崛起。马克龙表示，他希望在即将到来的欧洲议会选举活动中突出强调此问题。从眼镜到炼钢，从股票市场到铁路，多个行业的跨境并购方案得到了政客的支持，被认为是对抗中美竞争对手的唯一途径。然而对此应该敲响警钟，理由有两点。

首先是欧洲市场本身就已经存在竞争方面的问题。经合组织（OECD，成员主要为富裕国家）的齐亚拉·克里斯库奥洛（Chiara Criscuolo）及其同事即将发表的一项研究表明，自2000年以来，欧洲各个行业的前四强企业的平均市场份额上升了三个百分点。非金融公司的自由现金流占GDP的比重远高于20年平均水平。当集中度上升且利润持续高企，对策不该是让大公司进一步坐大。

实业家们辩称，合并令规模扩大，将带来更高的效率，因而更有可能实现全球拓展。有时单凭规模就能带回报：航空航天巨头空客就是一个跨境合作的成功案例。但是大型合并往往会导致竞争。以德国西门子的轨道交通业务与法国阿尔斯通（铁路机车及轨道信号设备制造商）之间的庞大合并提案为例。在一些铁路市场上，二者合并后的公司将比其最大竞争对手规模大三倍。中立派欧盟竞争事务专员玛格瑞特·维斯塔格（Margrethe

Vestager) 似乎对这项合并是否有利于消费者持怀疑态度。她有理由保持警惕。

第二个疑虑在政治方面。默克尔和马克龙愈发坚信大型合并是可行之道，这可能致使提倡促进竞争的声音在欧洲被淹没。英国历来是自由市场的坚定捍卫者，但目前深陷脱欧进程的泥沼。欧盟委员会在国家援助等问题上向来敢于质疑各国政府，但维斯塔格的任期将于明年结束。中国对欧投资受到怀疑，虽说往往也不是事出无因，但这份质疑可能被利用来阻碍一切外国公司收购欧盟企业。

如果扼杀竞争的合并不是打造世界一流公司的正道，那什么才是？首先，与中美竞争对手相比，欧洲公司表现不佳是因为欧洲大陆的市场非常分散。创造条件让一家爱尔兰公司能便捷地为葡萄牙客户服务，就像美国德州的公司能轻松地服务纽约的客户那样，那么这对各种规模的公司都有好处。欧盟的“单一市场”是为货物贸易设计的，对服务业帮助没那么大，而服务业占到欧洲经济的70%以上。资本市场和数字服务更大程度的整合亟需从纸上谈兵化为实际行动。此外还需要向基础研究投入更多资金以促进创新。

欧洲的企业老板抱怨说，无论是通过“美国优先”的贸易政策还是中国的软贷款，中美都在操纵竞争环境以偏袒本国企业。但这不是欧洲效仿它们的理由。重商主义令受偏爱的企业受惠，但无益于经济体和消费者。在其他国家不公平对待本国国民和纳税人时，对策不是以其人之道还治其人之身，而是促进竞争。 ■



Charting the news

What the world reads now

The news events that most engrossed audiences in 2018

It is called the “beautiful game” for a reason. The 2018 men’s football World Cup, hosted by Russia in June and July, kept the world riveted. According to Chartbeat, a company that tracks readership of online news articles, it was among the events that drew the most attention in 2018. Chartbeat’s data cover some 5,000 publishers, half of which are in English-speaking countries, and about a quarter in Europe. The firm has provided audience figures for some 3m articles, spanning 33 topics.

What other news events engrossed the world in 2018? The royal wedding between Meghan Markle and Prince Harry drew the most eyes on a single day, with 1.1m hours spent reading articles as they tied the knot. Another heart-warming story, the rescue of young footballers from a cave in Thailand, got 3.4m hours of attention in total.

More often, however, big news was bad news. Sudden tragedies like the murder of Jamal Khashoggi, the mass shooting at a high school in Parkland, Florida, and the collapse of a bridge in Genoa in August received 12m hours between them. Longer-lasting woes in poor countries failed to drum up comparable interest: Yemen’s civil war got just 3.5m hours for the entire year.

Business stories get less attention on the whole. But revelations that Facebook, the world’s most popular social network, had allowed nefarious use of its data drew 3m hours of readership. Big personalities help to draw eyeballs: Elon Musk, the mercurial founder of Tesla and SpaceX, got 7m hours of attention in a year in which he was sued for securities fraud.

As in 2017, no one attracts eyeballs like President Donald Trump. His summit with North Korea's Kim Jong Un in June got 1.5m hours of readership. He would probably have preferred less attention to stories about Russian meddling during the 2016 presidential election, which have amassed 12m hours in 2018. Readers were particularly interested in his party's performance in the mid-term elections, which attracted 26m hours.

Mr Trump isn't the only world leader who fascinates readers. Brazil's election of Jair Bolsonaro, a populist in Mr Trump's mould, has collected 9.7m hours. And although Russia's president, Vladimir Putin, drew the most interest during the World Cup, his comfortable re-election and his navy's seizure of Ukrainian ships also kept audiences glued to their screens. ■



新闻热度图示

全球目光聚焦何处？

2018年最受全球瞩目的新闻事件

足球被称作“美丽的运动”是有道理的。2018年6月到7月，俄罗斯主办的男足世界杯吸引了全世界的目光。追踪网络资讯类文章阅读量的公司Chartbeat表示，世界杯是2018年最受关注的事件之一。Chartbeat的数据涵盖约5000个发布者，其中一半来自英语国家，约四分之一来自欧洲。该公司提供了大约300万篇文章的阅读数字，涉及33个主题。

此外还有哪些新闻事件在2018年受到了全世界的密切关注？单日内吸引最多眼球的是梅根·马克尔（Meghan Markle）和哈里王子的皇室婚礼。二人喜结连理之日，全球网友共花了110万个小时阅读相关文章。另一个温暖人心的事件——泰国少年足球队洞穴救援——总共获得了340万个小时的关注。

然而，重大消息常常都是坏消息。贾迈勒·卡舒吉（Jamal Khashoggi）遇害、佛罗里达州帕克兰市（Parkland）一所高中的大规模枪击事件，以及8月的热那亚高架桥垮塌这类突发悲剧共获得1200万个小时的关注。贫穷国家久久无法摆脱的困境则未激起类似程度的兴趣：也门内战全年只获得350万个小时的关注。

商业报道总体而言受到的关注要少些。但全世界最受欢迎的社交网络Facebook纵容恶意使用其数据的行为被爆出后，相关文章得到了300万个小时的阅读量。大人物有助于“吸睛”：特斯拉和SpaceX的创始人、性情多变的伊隆·马斯克在2018年得到了700万小时的关注，他在这一年因涉嫌证券欺诈被起诉。

和2017年一样，论博眼球，谁也比不过美国总统特朗普。他与朝鲜领导人金正恩在6月的首脑会晤得到150万个小时的阅读量。他可能倒是希望俄罗斯干扰2016年大选的报道别那么受人关注。这类报道在2018年共累积了

1200万个小时的阅读量。读者对特朗普所在政党在中期选举中的表现尤为感兴趣，这类报道吸引了2600个小时的关注。

特朗普并不是唯一深深吸引读者关注的国家领导人。民粹政治人物、“巴西特朗普”雅伊尔·博尔索纳罗（Jair Bolsonaro）的当选获得了970万个小时的关注。俄罗斯总统普京虽说在世界杯期间的动作最令网友感兴趣，不过他的轻松连任和俄海军扣押乌克兰船舰的事件同样吸引读者紧盯屏幕。





Family offices

Super-help for the super-rich

Billionaires' in-house investment teams are joining the ranks of the world's financial titans

Hussein Sayed, a local anchor with CNBC, a TV network, beams from the stage as he welcomes participants to a conference on family offices (FOs) in Dubai. Among those present are billionaires and their offspring, advisers and money managers, and a smattering of investment-minded blue-bloods, including Prince Michael of Yugoslavia. "We think there may be over \$2trn represented in this room," announces Mr Sayed, "though of course there's no way of knowing."

Now an essential part of every self-respecting billionaire's stable, FOs are booming. Their roles include managing families' wealth, administering their assets and often other services, from the mundane (paying bills) to the knotty (succession-planning). The biggest have become deal powerhouses, capable of competing with global banks and private-equity firms on big transactions. But they are also, by definition, private—and therefore little understood. "We're the most important part of the investment landscape most people have never heard of," says one executive.

The FO has its roots in the organisations that oversaw the fortunes of America's 19th-century robber barons, such as J.P. Morgan and John D. Rockefeller. Several hundred have been in operation for at least three generations. Some now serve extended families with hundreds of members—over 600 in the case of France's Mulliez clan, owners of the Auchan hypermarket chain. Most, however, are recent creations. Of the 311 family offices that took part in the survey for the latest annual Global Family Office Report by UBS and Campden Wealth, published in September, more

than two-thirds were established after 2000 (see chart 1) and over half are serving the first generation of wealth.

This spurt reflects an acceleration in the number of billionaires worldwide (see chart 2) and the wealth they control, now estimated at close to \$9trn. No one knows how much of that sits in FOs, but a reasonable guess is \$3trn-4trn. Several factors explain the growth. One is an increase in “liquidity events”: founders or their heirs cashing out of operating businesses, for instance through initial public offerings, and generating pools of cash that need managing. Another is fashion: newly minted billionaires, from Asia in particular, feel increasingly that they are not full members of the club without one. A third factor, says Philip Marcovici, a wealth-management consultant, is disillusionment with third-party money managers, fuelled by scandals over opaque and abusive fees, and banks pushing their own expensive products, or those of partners, in return for kickbacks. “The feeling is that if you want the job done well, you have to take it in-house.”

The definition of an FO is slippery. Some investment firms with loose or no family connections claim the tag for reasons of cachet. Some big, more thrusting FOs reject it as sleepy-sounding, preferring “private investment firm”, “capital partnership” or the like. And no two dynasties’ priorities are the same, hence the old saw: “When you’ve seen one family office, you’ve seen one.” Most, though, fit into one of two categories. The purest form is the “single-family office” (SFO), often sprouting from a family-owned business and continuing to serve one family. It will, on average, have a dozen employees. Running costs are such that this only makes sense for families with at least \$100m-150m. Rebecca Gooch, Campden’s head of research, estimates there are about 5,300 SFOs, of which three-quarters are in North America or Europe.

“Multi-family offices” (MFOs), by contrast, serve more than one master. Most manage the affairs of a handful of families. The largest serve hundreds. Pooling costs makes them viable for clans with as little as \$25m. Some MFOs began as SFOs, branching out later in the search for growth. Others were established as multi-client businesses by third-party money managers. Mergers have created hybrids. London-based Stonehage Fleming was formed in 2014 when the office of Britain’s Fleming family (relatives of Ian Fleming, the creator of James Bond) merged with a fiduciary firm serving South African families that had fled the apartheid regime. It has some 250 families on its books.

Some MFOs act as a family’s sole FO, others as adjuncts. Sandaire, another London-based MFO, whose origins lie in the sale of Provincial, a British insurer, manages money for the former owners, the Scotts, and 31 other families. Some of these have their own FOs for some tasks while using Sandaire for others where it has expertise, such as asset allocation for stocks and bonds, says Alex Scott, the founder (and a great-grandson of Sir James Scott, who set up Provincial).

This diversity means that FOs vary in size. The average one oversees \$500m-1bn. The biggest, mostly SFOs, administer far more. George Soros’s manages \$25bn. Other giants include Pritzker Group, run by scions of the family behind the Hyatt hotel chain, and JAB, owned by Germany’s Reimann family, whose holdings include Keurig Dr Pepper and other food and drink brands—though both prefer to see themselves as diversified investment firms and eschew the FO tag. The very biggest have hundreds of employees and engage in a dizzying array of activities besides managing money (or selecting outside managers to do so). This can include tax and legal services, compliance, cyber-security and monitoring invoices (yacht firms are notorious for overcharging if they think bills will not face close scrutiny).

Some also offer more personal “concierge” services, such as arranging travel

(down to ensuring limos are stocked with the right drinks), help with sensitive family issues, such as navigating marriage (pre-nups) or divorce, or preparing the next generation to take over. Some also help with the family's philanthropy, though most billionaires have separate charitable foundations to co-ordinate their giving.

At the top end of the industry, the aim is to offer the families whatever they need, whenever they need it, says Giuseppe Ciucci, Stonehage Fleming's boss. The role of the FO has evolved into being a trusted adviser on anything from an investment conundrum to a child going off the rails. Peter York, a British cultural critic, has described FOs as "super-help...for the super-rich".

These financial butlers are not stuck in the past, however. For some FOs, preserving wealth matters more than growing it. When David Tice, an American investor, told the conference in Dubai "you guys are already wealthy and you only need to get wealthy once", there was much nodding of heads. But many are comfortable at the cutting edge of finance. The FOs of the Pritzkers and Bill Gates, for instance, have reportedly been keen buyers of the riskiest "equity" tranches of collateralised loan obligations (a form of securitised debt).

FOs are also embracing sectors as diverse as cannabis, e-sports and crypto-investing. Of the workshops in Dubai, the biggest draw was one on blockchain startups and smart contracts. Some are unafraid to swim against the tide. The office run by the event's organiser, Anthony Ritossa, whose family money comes from Istrian olive groves, is said to have done well on contrarian bets related to subprime mortgages and European sovereign debt. Flexibility over controversial investments is possible because in many cases FOs answer neither to external investors nor regulators. In America, for instance, those managing money only for families or associates are exempt from disclosure and other rules governing investment advisers.

Open-minded investors with large sums of money have helped to shake up the world of corporate buy-outs, as FOs develop a taste for swooping on large stakes or entire companies. Private equity's share of FOs' portfolios has risen steadily. It now accounts for over a fifth of the average one—second only to equities (see chart 3). The \$100bn of deals done in 2016 was four times the amount invested in 2011, according to PitchBook, a research firm. Earlier this year Bloomberg called this burst of buying the “rich-ification of private equity”. Another recent report by Campden concluded that FOs' allocations to private equity—including both direct investments and those through funds—could rise by three-quarters between 2017 and 2019.

From a target's perspective, FOs offer several advantages over banks and private-equity firms, including longer-term capital and generally a less pushy attitude. FOs typically want in for at least ten years whereas private-equity funds look to divest after five to seven. When the founder's son sold Ring Container Technologies, a maker of plastic containers, he picked Michael Dell's FO, MSD Partners, over private-equity and industry suitors, on the grounds that it would stay longer and care more about preserving the firm's culture.

Such is the power of family wealth on Wall Street that some mergers-and-acquisitions rainmakers are building businesses around it. Byron Trott, a former Goldman Sachs partner, is one such facilitator, bringing FOs juicy deals, advising on investments and co-investing through his own vehicle, BDT Capital Partners. He worked on JAB's \$19bn purchase of Dr Pepper Snapple and is said to be close to the Pritzkers and the Waltons, the family behind Walmart. He is reportedly raising a new fund of up to \$9bn to channel family wealth.

A long tail of smaller FOs are eager participants in more modest deals. One such is Conexión Capital, whose founding capital came from the sale of

Panamco, a Latin American drinks bottler set up by Albert Staton. It focuses on early-stage investments of \$1m-10m in consumer-goods firms with novel products, and looks to stay with them for at least ten years. It recently invested in a firm promising a creamier sort of almond milk, made by rehydrating crushed-almond paste. “Baristas love it,” says Eduardo Arboleda Staton, the head of Conexión, and Staton’s grandson. Conexión also serves as a kind of merchant bank for FOs, bringing other families, particularly from Latin America, into club deals—40-50 are now in the network. “There has been a big swing away from families being just a passive source of capital,” says Mr Arboleda Staton.

Investments in hedge funds, by contrast, have been falling, and now account for only 6% of portfolios. Struggling in hostile markets and hobbled by regulation designed to quell their buccaneering urges, hedge funds have been a drag on FOs’ returns for years. A steady stream have been returning investors’ money and turning into FOs themselves, including Jon Jacobson’s Highfields Capital (which once looked after a big chunk of Harvard University’s money) and Leon Cooperman’s Omega Advisors. Mr Cooperman, a Wall Street superstar, explained that he did not want to spend the rest of his life chasing the S&P500, and that seeing a doddery Kenny Rogers on stage made him realise you’ve got to “know when to fold ‘em”. Other hedge funds, like BlueCrest, are turning into family-and-friends offices, serving the firm’s partners, traders and other staff.

Their growing heft means that FOs no longer struggle to attract the sort of talent that was once drawn to hedge funds. Ben Ingram of Berwick Partners, a recruitment firm, has seen “enormous growth” in the number of highly skilled finance professionals willing to consider working for one, thanks partly to their push into alternative investments. But those making the switch can also look forward to less regulation and public scrutiny, more control over whom they do business with and, typically, a better work-life balance. BlueCrest has lured top traders from Goldman Sachs and BlackRock

since turning into an FO.

The most eye-catching hire has been Greg Fleming, once seen as a possible future leader of both Merrill Lynch and Morgan Stanley. With backing from Viking, an investment firm, he is leading the reinvention of the Rockefeller FO—which has served multiple families since the 1970s—into a wealth manager, advisory firm, brokerage and boutique investment bank rolled into one. Mr Fleming wants to quintuple the assets managed by the new firm, Rockefeller Capital Management (RCM), to \$100bn within five years.

Big banks, like private-equity firms, are keen to work with outfits like RCM. Most have growing groups that serve FOs. UBS's is a joint-venture between its wealth-management and investment-banking arms, since it aims not only to help manage assets and risk but also to bring private-equity deals to FOs and arrange financing. J.P. Morgan is focusing on FOs with \$2bn or more at their disposal. Banks organise events to strengthen ties to well-heeled families. One gathering, arranged by Credit Suisse in Detroit in 2017 and ostensibly about urban regeneration, was reportedly attended by representatives from around 40 families worth a combined \$75bn.

Advisers from banks and consultancies are also jostling to help FOs navigate what many consider their biggest challenge: ensuring a smooth transition to the next generation. Heirs are expected to take control of two-thirds of such fortunes over the next ten to 15 years. But preparing the kids to steward assets is not easy. Children of 8% of the families in the Campden survey said they wanted no involvement in overseeing their wealth. “The threats to family wealth are primarily internal, not external,” says Mr Ciucci.

FOs play various roles in aiding succession. “It is the soft stuff that can be most helpful, preparing the children for the money rather than the money for the children,” says one executive. As well as managing financial assets, Market Street Trust Company—which serves, among others, the

descendants of Amory Houghton, who founded America's Corning glassworks—organises weekend family events designed to strengthen bonds between generations. Older members are encouraged to share inspiring stories, youngsters to air their fears about the challenges ahead.

Another way to bind the generations together is to accommodate younger family members' priorities. A growing share of FOs, currently a third, do some "impact" investing—where the goal is a measurable social or environmental benefit as well as a financial return. Mr Marcovici says FOs are more interested in this type of investing than the typical wealth manager, in part because they see it as a good way to draw in millennial heirs with a social conscience. As they do more sustainable investing, often in tandem with owners' separate philanthropic foundations, the biggest of them look increasingly like Wall Street heavyweights, only nicer, says Mr Marcovici.

Not everyone thinks their growing influence is benign, however. Brooke Harrington of Copenhagen Business School worries that the growth of FOs is undermining meritocracy in capitalism. "The bigger the apparatus they have behind them, the harder it is for the market to discipline them," she says. Chuck Collins of the left-leaning Institute for Policy Studies, in Washington, DC, frets over opacity—"they ensure ever more wealth goes off the ledger"—and their growing lobbying clout. He argues that billionaires and their FOs have worked tirelessly to exploit loopholes and rig rules to further their interests, most notably by helping to gut America's estate tax. "They are in the dynasty-protection business, trying to arrest the normal, natural process of wealth dispersal," he says.

FOS are nonetheless in expansion mode, opening satellite offices on other continents. The most popular location for new outposts is Singapore, whose government has greatly relaxed red tape in order to attract more FOS. The

rush to Asia is partly about locating closer to investment opportunities and partly, for MFOs, about proximity to a fast-growing pool of potential new clients.

China alone produced two new billionaires a week in 2017. Rich Asians had preferred to keep their money in the businesses they created, reinvesting to build conglomerates. The new generation, having made much of its money in technology and services, is more comfortable cashing out, trading assets and transferring a slab of their wealth to an investment office. In the past ten years the number of Asia-based FOs has climbed from around 50 to somewhere between 500 and 1,000.

This increased willingness to release cash from the primary family business and invest it elsewhere, combined with the rise of the do-it-yourself approach to managing wealth, suggests that the number of FOs will go on rising. With upwards of \$2trn expected to pass from entrepreneurs to their heirs over the next 15 years, the family office is entering a Gilded Age. ■



家族办公室

超级富豪的超级帮手

亿万富翁自己的投资团队正在跻身全球金融巨头之列

CNBC电视台在迪拜当地的主播侯赛因·赛义德（Hussein Sayed）站在讲台上，笑容满面地欢迎前来参加迪拜家族办公室会议的与会者。其中有亿万富翁及其后代、顾问和投资经理，零星还有几个具有投资意识的贵族，包括南斯拉夫的米迦勒王子（Prince Michael of Yugoslavia）。“我们估计在场的人身家总和可能得超过2万亿美元，”赛义德说，“但这当然没有办法确认。”

现在，作为每个自尊的亿万富翁必备的帮手，家族办公室正在蓬勃发展。它们的工作包括管理家族财富和资产，经常还会提供其他服务，像是处理支付账单这样的乏味琐事，以及制定继承计划这类棘手的大事等等。最大的一些家族办公室已成为交易大户，在重大交易上能够与全球性银行和私募股权公司展开竞争。但顾名思义，家族办公室也是私人性质的——因此人们对它们知之甚少。“我们是投资界最重要的一部分，但大多数人从未听说过。”一位家族办公室高管表示。

家族办公室源于19世纪帮助J.P. 摩根和约翰·D·洛克菲勒等美国强盗大亨管理财富的机构。有几百家家族办公室已经运作了至少三代。一些家族办公室现在为有数百名成员的大家族提供服务——比如拥有大型连锁超市欧尚集团（Auchan）的法国穆里耶兹（Mulliez）家族，成员超过600人。但大多数家族办公室的历史都不长。去年9月，瑞银和康普顿财富公司（Campden Wealth）发布了《2018年全球家族办公室调查报告》（Global Family Office Report 2018）。参与调查的311个家族办公室中，超过三分之二成立于2000年之后（见图表1），半数以上服务的是掌握财富的第一代。

家族办公室数量突增，反映了全球亿万富翁的数量（见图表2）以及他们

所控制的财富加速增长。估计目前全球亿万富翁的财富总额已接近9万亿美元。没有人知道这些财富有多少交由家族办公室管理，但三到四万亿美元是合理的猜测。有几个因素可以解释这种增长。一个因素是“变现事件”增加：创始人或其继承人从所经营业务中套现，例如通过IPO，这就产生了大量需要管理的现金。另一个是跟风：新晋亿万富豪（特别是来自亚洲的富豪）越来越觉得没有家族办公室就不算真正加入了富豪俱乐部。财富管理顾问菲利普·马尔科维奇（Philip Marcovici）表示，第三个因素是许多第三方理财机构爆出行事不透明和滥收费的丑闻，而银行又有推销自己或合作伙伴的高价产品以换取回扣的操作，让富豪们对这些机构倍感失望。“感觉就是，如果你想把财富管理好，就必须变成在自己内部进行。”

家族办公室很难定义。一些沾点边或根本没有家族财富管理业务的投资公司为了好听，也给自己贴上家族办公室的标签。一些更具进取心的大型家族办公室倒不愿接受这个听起来很沉闷的名号，而更喜欢“私人投资公司”、“资本合伙公司”这类叫法。而且每一代富豪关心的事情都不同，因此有句流行的话说：“见过一个家族办公室，就找不到第二个重样的。”但大多数家族办公室都属于以下两类之一。最纯粹的家族办公室形式是“单一家族办公室”（SFO），通常从一个家族企业中产生，一直只为这一个家族服务。SFO一般有十几名员工，运营成本较高，只有资产至少达1至1.5亿美元的家族才值得选择这种模式。康普顿的调研主管丽贝卡·古奇（Rebecca Gooch）估计，全球大约共有5300个SFO，其中四分之三在北美或欧洲。

相比之下，“多家庭办公室”（MFO）服务的家族不止一个。它们大多同时管理几个家族的理财事务，规模最大的服务几百个家族。成本共担让资产只有2500万美元的家族也可以负担得起它们的服务。一些MFO是从SFO起家，后来为寻求增长而不断扩展。其他的一开始就是由第三方资金管理公司为服务多个客户而成立。不同类型的家族办公室的合并创造了混合体。位于伦敦的Stonehage Fleming成立于2014年，是两家公司合并的产物：一个是英国弗莱明家族（詹姆斯·邦德系列的作者伊恩·弗莱明[Ian Fleming]的亲戚）的办公室，另一个是一家信托公司，服务从种族隔离制

度下出逃的南非家族。现在Stonehage Fleming服务的家族共有250多个。

有些MFO是一些家族唯一的家族办公室，对另一些家族而言则是附属服务。Sandaire是另一家总部位于伦敦的MFO，在英国保险公司Provincial被售出后成立，为原所有者斯科特家族（Scott）和其他31个家族管理资金。Sandaire的创始人（也是Provincial的创始人詹姆斯·斯科特[James Scott]的曾孙）亚历克斯·斯科特（Alex Scott）说，这些家族有些是用自己的家族办公室处理某些事务，而借助Sandaire在股票和债券的资产配置等方面的专业能力处理其他事务。

这种多样性让家族办公室规模各异。中等规模的家族办公室管理的资产规模在5亿至10亿美元之间。最大的一些家族办公室以SFO为主，管理的资产规模远大于此。乔治·索罗斯的家族办公室管理的资产就高达250亿美元。其他的大型家族办公室还有普利兹克集团（Pritzker Group），由拥有凯悦连锁酒店的普利兹克家族的后代所经营，以及德国莱曼家族

（Reimann）所有的JAB控股，该家族持有Keurig Dr Pepper和其他食品与饮料品牌的股权。不过这两家巨头都更愿意以多元化的投资公司自居，回避家族办公室的标签。最大规模的家族办公室有数百名员工，除了管理资金（或选择外部公司来管理）外，还从事各种令人眼花缭乱的工作，可能包括税务和法律服务、合规、网络安全，以及审核账单（众所周知，游艇公司若觉得它们开出的账单不会受到严格审查，就会滥收费用）。

有些家族办公室还提供更个性化的“礼宾”服务，例如安排旅行（具体到确保豪华轿车里摆放的饮料是客户喜欢的那一种），协助处理敏感家庭问题如结婚（婚前协议）或离婚事宜，或是帮助下一代做好接手家族事业的准备。有些也帮助家族打理慈善事业，尽管大多数亿万富翁都有独立的慈善基金会来协调处理他们的捐赠。

Stonehage Fleming的老板朱塞佩·丘奇（Giuseppe Ciucci）说，顶级家族办公室的目标是随时满足家族的各种需要。家族办公室的角色已经演变为一个值得信赖的家族顾问，为从投资难题到孩子行为出格等各方面提供建议。英国文化评论家彼得·约克（Peter York）将家族办公室描述为“超级富

豪的……超级帮手”。

然而，这些财务管家并不停留在过去。对于一些家族办公室来说，保住财富比增长财富更重要。在迪拜的会议上，美国投资者大卫·提斯（David Tice）说，“你们已经很富有了，而且你们致富一次就够了。”很多人点头表示同意。但很多家族办公室也不惧冲在金融最前沿。例如，普利兹克和比尔·盖茨的家族办公室据称热衷于购买担保贷款凭证（一种证券化债务）里风险最高的“股权”级产品。

家族办公室还在积极进入大麻、电竞和加密投资等多个领域。在迪拜的各个研讨会中，最吸引与会者的是关于区块链创业公司和智能合约的讨论。有些家族办公室也不惧逆势而为。会议组织者安东尼·利淘沙（Anthony Ritossa）经营的家族办公室的家族资金来自伊斯特拉半岛（Istrian）的橄榄林，据说这个家族办公室对次贷和欧洲主权债务的逆向投资非常成功。家族办公室可以灵活进行有争议的投资，因为在许多情况下，家族办公室既不对外部投资者也不对监管机构负责。例如，在美国，仅为家族或家族分支机构管理资金的FO可免于披露信息，且不必遵从投资顾问公司需遵循的其他规则。

随着家族办公室开始对购买大量股权或收购整个公司产生兴趣，拥有大量资金的开明投资者已经帮助改变了企业收购领域。私募股权在家族办公室投资组合中的份额稳步上升，目前平均占比超过五分之一，仅次于股票（见图表3）。根据调研公司PitchBook的数据，2016年完成的交易为1000亿美元，是2011年投资额的四倍。2018年早前，彭博社把这种收购的激增称作“私募股权的富有化”。康普顿近期的另一份报告总结称，家族办公室对私募股权的投资配置——包括直接投资和通过基金的投资——在2017年至2019年间可能会增加四分之三。

在收购对象的角度来看，相比银行和私募股权公司，家族办公室有几个好处，包括投资更具长期性，且一般来说不那么急于求成。家族办公室的投资期通常至少十年，而私募股权基金则希望五到七年后就退出。当塑料容

器制造商Ring Container Technologies创始人的儿子出售公司时，他选择了迈克尔·戴尔的家族办公室MSD Partners，而没有选择私募股权和同行业的公司。理由是家族办公室的投资时间更长，更在乎保留公司的文化。

家族财富目前在华尔街影响力巨大，一些在并购领域呼风唤雨的人正围绕它发展业务。高盛前合伙人拜伦·特罗特（Byron Trott）就是其中一位牵线搭桥的人。他通过自己的公司BDT Capital Partners为家族办公室带来利润丰厚的交易，并就投资和合作投资提供建议。他参与了JAB以190亿美元收购Dr Pepper Snapple的交易，并且据说与普利兹克家族和沃尔玛背后的沃尔顿家族（Waltons）关系密切。有传闻称他正在筹建一个规模高达90亿美元的新基金，为家族财富寻找投资渠道。

大批较小的家族办公室渴望能参与规模更小的交易。Conexión Capital就是其中之一，其创始资本源自出售Panamco的交易，Panamco是一家由艾伯特·斯塔顿（Albert Staton）创立的拉丁美洲饮料灌装厂。Conexión Capital专注于对那些有着新颖产品的消费品公司进行早期投资，金额在100至1000万美元，并计划至少持股十年。它近期投资的一家公司承诺能通过碎杏仁酱再水化制成一种更丝滑的杏仁露。Conexión的负责人、斯塔顿的孙子爱德华多·阿尔伯莱达·斯塔顿（Eduardo Arboleda Staton）说：“咖啡师很喜欢这种产品。”Conexión还为家族办公室提供类似商业银行的服务，将其他家族——特别是来自拉丁美洲的家族——集合起来做集资交易，现在已网罗了四五十个家族。“家族已不再只是一种被动的资本来源，它的角色已发生了很大的变化。”阿尔伯莱达·斯塔顿表示。

相比之下，对冲基金方面的投资一直在下降，现在仅占家族办公室投资组合的6%。市场状况不佳，对冲基金在其中勉强挣扎，监管机构也设置了重重障碍以遏制其开展掠夺式投机的强烈欲望，因此对冲基金多年来一直在拖累家族办公室的回报。很多对冲基金纷纷返还投资者资金，自己转做家族办公室，包括乔恩·雅各布森（Jon Jacobson）的Highfields Capital（曾管理过哈佛大学的一大笔资金）和利昂·库伯曼（Leon Cooperman）的Omega Advisors。华尔街的超级明星库珀曼解释说，他不想余生继续追逐标准普尔500企业，而看到舞台上垂垂老矣的肯尼·罗杰斯

(Kenny Rogers) 让他意识到必须要“知道何时弃牌”。其他对冲基金正在变成亲友式办公室，为公司的合作伙伴、交易商和其他员工提供服务，BlueCrest就是其中之一。

家族办公室的重要性不断增强，已无需再费力吸引那些曾被吸引到对冲基金的人才。招聘公司Berwick Partners的本·英格拉姆（Ben Ingram）表示，愿意考虑为家族办公室工作的高技能金融专业人员数量呈“巨幅增长”，部分原因在于家族办公室已向另类投资业务推进。但那些变身为家族办公室的公司未来也会受到更少的监管和公众监督，有更多的自由决定和谁做生意，而且通常能更好地平衡工作与生活。自从成为家族办公室以来，BlueCrest已经挖来了高盛和贝莱德（BlackRock）的顶级交易员。

被挖走的人才中最引人注目的是格雷格·弗莱明（Greg Fleming），他曾被认为可能成为美林和摩根士丹利未来的领袖。在投资公司Viking的支持下，他正带领洛克菲勒的家族办公室重塑业务（这个家族办公室自上世纪70年代以来一直服务多个家族），集财富管理、咨询公司、经纪机构和精品投行服务于一身。弗莱明希望新公司洛克菲勒资本管理公司（RCM）管理的资产在五年内增至原来的五倍，达到1000亿美元。

与私募股权公司一样，大银行也渴望与RCM这样的机构合作。大多数银行都在扩大服务家族办公室的团队。瑞银集团服务家族办公室的部门是由其财富管理和投资银行业务联合成立的，因为它不仅想要帮助管理资产和风险，还要把私募股权交易引入家族办公室并安排融资。摩根大通专注于和拥有20亿美元或以上可支配资金的家族办公室打交道。银行纷纷组织活动以加强与富有家族的联系。据报道，2017年瑞信（Credit Suisse）在底特律组织了一次活动，表面上是关于城市改造，但邀请了约40个家族的代表，这些家族资产合计达750亿美元。

来自银行和咨询公司的顾问也在争先恐后地帮助家族办公室应对它们眼里最大的挑战：确保财富顺利过渡到下一代。预计家族继承人将在未来10到15年内接管这些家族财富的三分之二。但让孩子们准备好管理资产不容易。在康普顿的调查中，8%的家族的下一代表示他们不想参与管理家族

财富。“家族财富的威胁主要来自内部，而不是外部。”丘奇说。

家族办公室在协助财产继承方面扮演着多种角色。一位高管说：“对顺利过渡最有帮助的是软能力，要让下一代为钱做好准备，而不是为下一代准备好钱。”Market Street Trust Company的家族客户包括美国玻璃企业康宁（Corning）的创始人艾默里·霍顿（Amory Houghton）的后代。除了管理金融资产外，该公司还组织周末家族活动来加强代际之间的联系。活动鼓励年长的成员分享鼓舞人心的故事，也让年轻人表达对未来挑战的恐惧。

加强代际间纽带的另一种方式是重视年轻家族成员关心的事务。越来越多家族办公室（目前占三分之一）会做一些“社会影响力”投资，除获得财务回报之外，还要获得可衡量的社会或环境效益。马尔科维奇说，与一般财富管理公司相比，家族办公室对这种投资更感兴趣，原因之一是它们认为这有助于吸引有社会责任感的千禧一代继承人。马尔科维奇表示，随着家族办公室不断进行更多的可持续投资（通常与家族另外的慈善基金会合作），它们当中规模最大的那些越来越像华尔街的重量级公司，但更有良心。

然而，并非所有人都认为它们影响力日渐增长是件好事。哥本哈根商学院（Copenhagen Business School）的布鲁克·哈林顿（Brooke Harrington）担心，家族办公室的壮大正在破坏资本主义的英才体制。她说：“它们背后的资产越多，市场就越难约束它们。”华盛顿特区左倾的政策研究所（Institute for Policy Studies）的查克·柯林斯（Chuck Collins）对缺乏透明度（“它们会让越来越多的财富从账面上消失”）以及它们日益增长的游说影响力表示担忧。他认为，亿万富翁及其家族办公室孜孜不倦地利用漏洞、操纵规则来为己谋利，最显著的例子就是促成了美国遗产税的取消。“他们的工作就是保护王朝延续，就是要试图遏制正常的、自然的财富扩散过程。”柯林斯说。

尽管如此，家族办公室仍处于扩张之中，在其他洲开设了许多分支机构。

新加坡是设立新分支机构的最热门地点。为了吸引更多的家族办公室，新加坡政府已大大简化了审批手续。它们一窝蜂地冲向亚洲，一方面是为了更接近投资机会，对MFO来说还有一个原因是为了接近快速增长的潜在新客户群。

2017年，仅在中国每周就有两位新的亿万富翁诞生。过去，富有的亚洲人更愿意将资金留在他们创建的企业中，再投资以建立企业集团。而新一代富豪的很多财富来自科技和服务领域，他们更愿意变现、交易资产，并将部分财富转移到家族办公室进行投资。过去十年中，总部位于亚洲的家族办公室数量从大约50个增加到500至1000个之间。

越来越多富豪愿意把资金从最初的家族企业中释放出来，投资到其他地方，再加上自助式财富管理的兴起，表明家族办公室的数量将继续增加。未来15年里，预计将有超过2万亿美元的财富由创业者传给其继承人，家族办公室正在进入镀金时代。 ■



COP24

Not all hot air

A UN climate meeting ends with guarded optimism

Hosting COP24, the latest of the UN's annual climate summits, in Katowice was meant to symbolise the transition from an old, dirty world to a new, clean one. Spiritually, the city is the home of Poland's coal miners. Today, it is replete with besuited management consultants and bearded baristas. The venue itself was on top of a disused mine in the city centre.

Ahead of the two-week powwow, which concluded on December 15th, many feared the meeting would instead highlight the unresolved contradictions involved in that transition. So it came as a relief when nearly 14,000 delegates from 195 countries managed—more or less, and a day late—to achieve the gathering's main objective: a “rule book” for putting into practice the Paris agreement of 2015, which commits the world to keeping global warming “well below” 2°C relative to pre-industrial times, and preferably within 1.5°C.

This outcome was far from assured. Setting an abstract goal, as governments had in Paris, is simpler than agreeing on how to go about reaching it. Technicalities—what counts as a reduction in emissions, who monitors countries' progress and so on—can be politically thorny. Poland's right-wing government, which presided over the talks, lacks both friends (alienated by, among other things, its anti-democratic attacks on judicial independence) and green credentials. Observers were braced for a diplomatic debacle.

The summit got off to an inauspicious start. At the outset Poland's president, Andrzej Duda, declared that his country cannot reasonably be expected to give up its 200 years' worth of coal reserves. In France, his opposite number,

Emmanuel Macron, caved in to massive protests and suspended a planned fuel-tax rise intended to help curb greenhouse-gas emissions from transport. Days earlier, Brazil had withdrawn its offer to host next year's summit after Jair Bolsonaro, the president-elect who takes office in January and who would love to follow his American counterpart, Donald Trump, out of the Paris deal, said his government had no interest.

Despite these early setbacks, negotiators resolved most of 2,800-odd points of contention in the rule book's pre-summit draft. Michal Kurtyka, the amiable Polish bureaucrat who chaired the proceedings, turned apparent haplessness into a virtue, by leaving delegates space to thrash out their differences.

Poor countries won firmer assurances that rich ones would help pay for their efforts to curb their greenhouse-gas emissions and to adapt to rising sea levels and fiercer floods, droughts, storms and other climate-related problems. The rich world, for its part, cajoled China into accepting uniform guidelines for tallying those emissions. Thus stripped of their most powerful voice, other developing countries reluctantly followed suit. If any cannot meet the standards, they must explain why and present a plan to make amends. This concession, long demanded by the Americans, may not persuade Mr Trump to keep the United States in the deal. But it could make things easier for any successor who wished to re-enter it after Mr Trump has left office.

Besides haggling over the rules, a handful of countries—including big polluters such as Ukraine—used the jamboree to announce plans for more ambitious “nationally determined contributions” (or NDCs, as the voluntary pledges countries submit under the Paris deal are known). The city councils of Melbourne and Sydney, in Australia, joined a growing number of national and local governments intent on phasing out coal. So did Israel and Senegal. In the wake of Brazil's desertion, Chile stepped in to organise next year's

summit, which convention dictates should happen in Latin America. The Paris compact has thus not come apart at the seams.

Predictably, for negotiations that need to balance the interest of nearly 200 parties, no one leaves Katowice entirely happy. Vulnerable countries, such as small island states imperilled by rising seas, worry that the findings of a recent UN-backed scientific report outlining the dire consequences of another half a degree of warming, on top of the 1°C which has happened since the beginning of the Industrial Revolution, have been underplayed. Rich countries grumble that poor ones can still get away with emitting too much carbon dioxide.

Mr Kurtyka was also unable, because of Brazilian objections, to break an impasse on carbon trading. This is an arrangement that allows big belchers of CO₂ to offset emissions by paying others to forgo some of theirs. Brazil balked at proposals intended to prevent double-counting in such trading, because it believed they penalised its large stockpile of carbon-trading instruments, such as promises not to chop down patches of the Amazon. As a result, the issue has been kicked into the long cassava.

The direction of travel is, nevertheless, correct. Earlier in the meeting Ottmar Edenhofer, a veteran German climate policymaker who is director of the Potsdam Institute for Climate Impact Research, had feared that Katowice would mark “the beginning of the end of the Paris agreement”. For all its shortcomings, the compromise which emerged is not that.

But after all is said and done, the 2°C goal (let alone the 1.5°C aspiration) still remains a distant prospect. The current set of NDCs puts the world on course for more or less 3°C of warming—and Kiribati and the Marshall Islands at risk of submersion. Campaigners, who spiced up the stodgy talks with a dash of sit-ins and marches, were right to decry the lack of ambition as unequal to the task of sparing future generations from climate

catastrophe. The rule book is itself no nostrum for the planet's man-made fever. The only real medicine would be firmer commitment to decarbonising economies. And, as Mr Macron is finding, that medicine can be bitter. ■



COP24

不全是空话

联合国气候变化大会在审慎的乐观气氛中落幕

联合国最新一届年度气候变化大会COP24（即《联合国气候变化框架公约》第24次缔约方会议）之所以选址波兰的卡托维兹（Katowice），是为了象征从肮脏旧世界向绿色新世界的转变。这座城市是波兰煤矿工人的精神家园，如今随处可见西装革履的管理顾问和蓄着大胡子的咖啡师。会场就设在市中心一处废弃的矿井之上。

在这场12月15日结束的为期两周的会议召开之前，许多人担心会议反而会凸显上述转变过程中那些尚未解决的矛盾。所以当来自195个国家的近1.4万名代表推迟了一天才结束会议，多多少少算是实现了本次会议的主要目标时，大家都松了一口气。这次的目标是制定2015年《巴黎协定》的“实施细则”。《巴黎协定》承诺将全球气温相比工业化前水平的上升幅度控制在远低于2°C以内，最好是1.5°C以内。

这个结果能否实现并无把握。比起设定一个抽象的目标（就像各国政府当年在巴黎所做的那样），就如何实现这个目标达成一致难度更大。怎样算是减少了排放，由谁来监督各国的进展，诸如此类的技术性细节在政治上可能都很棘手。主持会谈的波兰右翼政府既没有朋友（被疏远的原因之一是其对司法独立的反民主攻击），也缺乏环保方面的威望。观察家们为一场外交惨败做好了准备。

峰会开局就不顺。波兰总统安杰伊·杜达一开始就宣称，指望他的国家放弃还能维持两百年的煤炭储备是不合情理的。在法国，总统马克龙向大规模抗议屈服，暂停了意在遏制交通运输温室气体排放的燃油税上调计划。此前几天，巴西撤回了主办2019年峰会的申请，因为于1月就职的新任总统贾伊尔·博索纳罗（Jair Bolsonaro）想追随美国总统特朗普的步伐退出《巴黎协定》，他说他的政府对该协定毫无兴趣。

尽管初期有这些挫折，谈判代表们解决了于峰会前起草的规则手册中2800多个争论点中的大部分。会议由和蔼可亲的波兰官员米哈尔·库尔蒂卡（Michał Kurtyka）主持，他为与会代表留出了讨论分歧的空间，把显而易见的困局变成了好事。

贫穷国家赢得了更确定的保证：富裕国家将为它们提供资金，支持其展开行动，遏制温室气体排放、应对海平面上升以及更严重的洪涝、干旱、风暴和其他气候相关问题。而富裕国家则尽力说服中国接受以统一标准统计这些排放。如此一来，失去了最强有力发言人的其他发展中国家只得效仿。如果有不符合标准的操作，它们必须解释原因并提出补救计划。这一美国人长期以来一直要求的让步可能无法说服特朗普让美国继续参与这项协定。不过如果特朗普离任后他的继任者想重归协定，情况会变得简单一些。

除了在细则上讨价还价，包括乌克兰等污染大国在内的少数几个国家还利用这次大会宣布了更宏伟的国家自主贡献计划（NDC，即各国根据《巴黎协定》提交的自愿承诺）。在澳大利亚，墨尔本和悉尼市议会加入了越来越多的国家和地方政府的行列，决心逐步淘汰煤炭。以色列和塞内加尔亦是如此。巴西退出后，智利提出承办明年的峰会。而按照惯例，2019年的峰会应该在拉丁美洲举行。因此，《巴黎协定》并没有分崩离析。

谈判要平衡近200个缔约方的利益，可以预见没有哪方能完全满意地离开卡托维兹。工业革命开始以来，全球气温已经升高了1°C，由联合国支持的一份最新科学报告概述了如果气温再升高0.5°C会发生怎样的可怕后果。脆弱的国家，例如饱受海平面上升威胁的小岛国，担心这些后果并没有得到充分重视。富裕国家则抱怨贫穷国家排放过多的二氧化碳却仍可逃脱惩罚。

此外，由于巴西的反对，库尔蒂卡没能打破碳交易的僵局。碳交易允许碳排放大户通过付钱让其他国家减排来抵消自己的排放。巴西拒绝了旨在防止在碳交易中出现重复计算的提议，因为它认为这些提议对自己储备的大量碳交易工具不利，比如承诺不砍伐亚马逊一些地区的雨林。结果，这个

问题被束之高阁。

不过大方向是正确的。在会议初期，德国资深气候政策制定者、波茨坦气候影响研究所（Potsdam Institute for Climate Impact Research）的主任奥特马尔·埃登霍费尔（Ottmar Edenhofer）曾担心卡托维兹将标志着“《巴黎协定》终结的开始”。尽管存在种种不足，但最终达成的妥协表明并非如此。

但无论如何，将气温上升幅度控制在 2°C 以内（更不用说 1.5°C ）仍然是一个遥远的目标。目前各国的NDC会让全球在未来升温 3°C 左右，基里巴斯和马绍尔群岛将面临被淹没的危险。活动人士的几次静坐和游行给沉闷的会谈增添了一些活力，他们谴责各国缺乏雄心壮志，无力让子孙后代免受气候灾难的影响。这样的批评没错。实施细则本身并不是解决地球人为发烧的良方。唯一真正的解药是更坚定地推动经济脱碳。而且，正如马克龙感受到的那样，良药苦口啊。 ■



Technology centres

Migrating nerds

As immigrant techies shun America, Canada has rolled out the red carpet

What would induce a software developer to quit a good job in Silicon Valley and trade California's sunshine for Toronto's wintry skies? For Vikram Rangnekar, born in India and educated in America, the triggers were the restrictions placed on immigrant tech workers holding an h-1b visa (starting companies or taking long holidays is discouraged) and what looked like a 20-year wait to get the green card he needed in order to settle down. Rising anti-immigrant sentiment under President Donald Trump's administration did not help. Two years later he thinks he made the right choice. "I didn't want to spend the best years of my life on a restrictive visa."

People like Mr Rangnekar are part of an exodus of tech workers from Silicon Valley. Pushed out by the cost of living as well as by a less welcoming American government, they are being pulled in by countries such as Canada, where tech vacancies are forecast to reach 200,000 by 2020. Canada is gambling that by the time America wakes up to the cost of discouraging immigrants its tech sector will have secured some of the best talent.

The starting-point is pretty promising. Toronto already has expertise in artificial intelligence (AI) and an array of promising firms such as Wattpad, a storytelling platform with 65m readers. The city added more tech jobs in 2017 than the San Francisco Bay area, Seattle and Washington, DC, combined. Ottawa is home to Shopify, a publicly traded e-commerce platform valued at C\$19bn (\$14bn). Montreal, another AI hotbed, has Element AI, a lab co-founded by Yoshua Bengio, a specialist in deep learning—and newish labs opened by Facebook and Samsung.

Yet Canada is in the third tier of destinations globally, says a study on venture-capital investment, “The Rise of the Global Start-Up City”, co-authored by Richard Florida, an urbanologist. To move up, the government has tweaked both its permanent and temporary immigrant programmes. Applicants for permanent residence get extra points for tech skills. Temporary visa holders are told their spouses will be allowed to work. Justin Trudeau, the prime minister, often underlines that in multicultural Canada, diversity is welcomed. Publicly funded health care sometimes gets a mention. “All of this is designed to pivot Canada away from the nativist policies of Trump,” says Ravi Jain, a Toronto immigration lawyer who has many tech clients.

Such tactics seem to be working, especially with Indians, a mighty force in Silicon Valley, where they form the largest group of immigrant tech workers. Indians from America and elsewhere snapped up almost half of the new temporary visas (processing time: two weeks) that Canada began issuing in June 2017 at the behest of the tech industry. The number of Indian nationals taking the slightly longer route to permanent residency surged between 2016 and 2017—up by 83% for those who entered under a federal skills programme, up by 122% for those selected by provinces to fill specific vacancies, and up by a whopping 538% for those who entered based on work experience. “I can clearly see the reason why people are shifting to us,” says Allen Lau, the chief executive of Wattpad. “The US is becoming less friendly.”

Still, the government knows it cannot be complacent, says Ahmed Hussen, minister of immigration, refugees and citizenship. It has set up research chairs at universities, overhauled support programmes and in its most recent budget earmarked C\$2.5bn over five years in direct industry funding for innovation. It is one thing for Canada to attract disaffected immigrant tech workers from Silicon Valley. Now Maple Valley, as some call it, must make it worth their while to stay. ■



科技中心

技术咖迁移

技术移民出走美国，加拿大已经铺开了红地毯

什么会诱使软件开发人员辞去硅谷的好工作，放弃阳光明媚的加州，奔向冷飕飕的多伦多？对于出生在印度而在美国接受教育的维克拉姆·朗纳卡（Vikram Rangnekar）而言，触发因素是美国政府对持有h-1b签证的技术移民的限制（不支持他们创办公司或休长假），还有看起来他得等20年才能拿到绿卡，真正安顿下来。特朗普治下反移民情绪愈演愈烈，更是雪上加霜。两年后，他认为自己做出了正确的选择。“我不想在生命中最美好的岁月里拿着一张限制性签证。”

朗纳卡是大批从硅谷出走的技术人员中的一个。由于硅谷生活成本高企，加之特朗普政府不那么待见他们，这些技术人员正被加拿大等国吸引。预计到2020年，加拿大将有20万个技术职位空缺待填补。加拿大盘算着，等到美国意识到遏制移民的代价，加拿大的科技行业已经笼络了部分顶尖人才。

起点充满希望。多伦多已拥有人工智能（AI）领域的专业能力，还有一系列前途大好的公司，如拥有6500万读者的故事写作与分享平台Wattpad。2017年，该市新增科技工作岗位比旧金山湾区、西雅图和华盛顿特区的总数还要多。渥太华是市值190亿加元（140亿美元）的上市电商平台Shopify的总部所在地。蒙特利尔是人工智能技术的另一个温床，深度学习专家约书亚·本吉奥（Yoshua Bengio）在那里与人一起创立了实验室Element AI。Facebook和三星的新实验室也落户于此。

然而，城市学家理查德·佛罗里达（Richard Florida）等人合作的风险投资调研项目《全球创业城市的崛起》（The Rise of the Global Start-Up City）显示，就全球来看，加拿大在科技人才流入地中处于第三层级。为提升吸引力，加拿大政府对永久和临时移民政策均做了调整。技术人才在申请永

久居留时获得额外加分。临时签证持有人的配偶将可以在本地工作。总理贾斯汀·特鲁多经常强调，加拿大文化多元，欢迎多样性。加拿大的公费医疗制度有时也被提及。“这一切都是为了让加拿大远离特朗普的本土主义政策。”服务众多技术移民客户的多伦多移民律师拉维·贾恩（Ravi Jain）说。

这些策略似乎正在起效，尤其是对印度人。他们是硅谷的一股强大力量，构成了那里最大的技术移民群体。在科技行业的要求下，加拿大从2017年6月开始签发新的临时签证（审批时间为两周），其中近一半被来自美国和其他地方的印度人拿下。2016年至2017年间，对于耗时稍长的永久居留权，印度籍申请人数量激增：通过联邦技能计划来申请的人数增加了83%；由各省选择填补特定职位空缺的申请者增加了122%；凭工作经验申请的人数量更是暴增538%。“我可以清楚地看到人们转投加拿大的原因，”Wattpad的首席执行官艾伦·刘（Allen Lau）表示，“那是因为美国越来越不友善。”

然而，加拿大移民、难民和公民部部长艾哈迈德·胡森（Ahmed Hussen）表示，政府深知不能自满。加拿大政府在高校设立研究主席的职位，全面改革移民支持计划，并在最近的预算中拨出25亿加元，用于在未来五年直接资助产业创新。加拿大从硅谷吸引心怀不满的技术移民人才是一方面。现在，一些人口中的“枫叶谷”必须让自己成为一个值得这些人留下来的地方。 ■



Buttonwood

Policy à la Modi

Why foreign investors are losing interest in India

It would be wrong to say that the only people who attended English county cricket in the 1980s were scoreboard enthusiasts, old men with flasks of cold tea and red-faced types there for the all-day bar. A few oddballs went to watch the cricket. A big draw was Graeme Hick, a Zimbabwe-born batsman and a relentless runmaker for Worcestershire. He eventually qualified to play for England in 1991. In front of bigger crowds and faster bowling, he could not reproduce his blistering county form.

In cricket-mad India, a parallel might be drawn between Mr Hick and Narendra Modi, the prime minister. Mr Modi was also the object of high hopes. He was elected with a thumping majority in May 2014 on his record in Gujarat, a well-run Indian state. But on the bigger stage, the form he showed as a state minister has often deserted him. A recent clash with the central bank, the Reserve Bank of India (RBI), that led to the resignation of its governor, Urjit Patel, is the latest—and most serious—mis-step.

The rupee fell after Mr Patel resigned. But India under Mr Modi has been one of the more stable emerging markets. The stockmarket has seemed to defy gravity, thanks in large part to domestic investors steadily switching from gold and property into shares. That buying has masked the disquiet among foreign investors, who have quietly pulled money from India. The sense that Mr Modi has blown a good chance to transform India is widespread.

The hallmarks of Mr Modi's 12 years in Gujarat were ambitious projects run by honest civil servants. The results are tangible. The roads around Ahmedabad, the state's commercial capital, are excellent. The water supply

is abundant. Gujarat's 18,000 villages are connected to the electricity grid. Gujarat was already a state with lots of factories and formal jobs. One of Mr Modi's innovations was to use IT to cut through red tape for new businesses. He was project-manager-in-chief. A handful of trusted civil servants gave orders. Those further down the chain of command were held to account.

Mr Modi excels in this "project mode", says Reuben Abraham of the IDFC Institute, a think-tank. Judged by the number of toilets installed or kilometres of road laid, his time in the top job is a success. India's GDP growth rate of 6-7% on his watch is not too shabby. Yet for a poor country with a fast-expanding population, 6-7% growth is a baseline. A government in project mode will not lift it. "You need deeper, systemic reforms," says Mr Abraham. Those require a coherent strategy and policymakers capable of adapting it as conditions change. This is at odds with Mr Modi's command-and-control style.

His defenders point to some big-bang reforms. A national goods-and-services tax (GST) has replaced a mosaic of national, state and city levies that were a barrier to trade within India. The country has a newish bankruptcy code. The central bank has an inflation target and a monetary-policy committee. But these were ideas bequeathed by the previous administration. The single Modi-branded policy—canceling high-value banknotes to crush the black economy—probably did more harm than good.

And progress has been set back by the clash with the RBI. The government pressed it to remit more of its reserves and to go easy on state-owned banks with bad debts. There are two sides to every dispute. Central bankers have a habit of standing on their dignity while dodging accountability. But Mr Patel was clearly sinned against. Mr Modi has not grasped that there is little point in a bankruptcy code to aid the clean-up of banks, or a state-of-the-art monetary policy, if the government overrides the central bank when elections loom.

The sales pitch about India's potential was already wearing thin. "A lot of investors have tuned out," says Dec Mullarkey of Sun Life Investment Management. The trade dispute between America and China is just one more missed opportunity. A pickup in foreign direct investment in Indonesia, Vietnam and the Philippines may be a sign that American firms are seeking to reshape supply chains to exclude China. India ought to benefit, too. But its bewildering array of labour laws and scarcity of commercial land hold back its progress as a manufacturing hub. The GST apart, Mr Modi has done little to change that.

Mr Hick could not adapt his game to more testing conditions. His poor form for England is sometimes attributed to the burden of expectation and technical flaws. Perhaps the same goes for Mr Modi in economic policymaking. ■



梧桐

莫氏治国

为何外国投资者对印度兴趣减退

如果你以为上世纪80年代英国郡级板球比赛的观众只是些分数控、捧着凉茶瓶的老头，以及在通宵酒吧里喝得面红耳赤的人，那你可就错了。也有一些怪咖去看板球。吸引大批人前往观赛的焦点之一是格雷姆·希克（Graeme Hick），这位出生于津巴布韦的击球手为伍斯特郡（Worcestershire）队拿起分来毫不手软。1991年他终于入选英格兰国家队。不过，面对更多的观众和更快的投球，他没能重现在郡比赛中的雄风。

在痴迷板球的印度，或许可以拿希克和总理莫迪做个类比。莫迪曾经同样被寄予厚望。2014年5月，他凭借在古吉拉特邦（Gujarat）的出色政绩，以压倒性多数当选总理。但在更大的舞台上，莫迪的表现却常常有失自己之前作为邦首席部长的水准。近日他与印度储备银行（RBI，即印度央行）之间的冲突导致行长乌尔吉特·帕特尔（Urjit Patel）辞职，这是他最新也是最严重的一次失误。

帕特尔辞职后，卢比应声下跌。但是莫迪领导下的印度一直是较为稳定的新兴市场之一。股票市场似乎摆脱了地心引力，这在很大程度上要归功于国内投资者的投资持续从黄金和房地产向股票转移。而这一买入的热潮掩盖了外国投资者的不安，他们已经悄然从印度撤资。人们普遍认为，莫迪断送了让印度脱胎换骨的大好机会。

莫迪在古吉拉特邦执政12年的标志性政绩是由廉洁的公务员负责的宏大项目。成果是实实在在的。该邦的商业中心艾哈迈达巴德（Ahmedabad）周边的道路状况堪称一流。供水很充足。古吉拉特邦的1.8万个村庄接入了电网。该邦早在莫迪执政之前就已拥有大量工厂和正式工作岗位。莫迪的创举之一是利用信息技术为新企业削减繁文缛节。他扮演着项目大总管的角色，

色。由少数几个他信得过的公务员发号施令，下面各层级的官员负责实施。

智库IDFC研究所（IDFC Institute）的鲁本·亚伯拉罕（Reuben Abraham）表示，莫迪特别擅长这种“项目模式”。不管是从建造的厕所数量还是铺设的道路公里数来看，作为最高领导人的莫迪都是成功的。在他的任期内，印度的GDP增长率为6%至7%，不算太差。然而，对于一个人口快速增长的穷国来说，6%到7%的增长只是基本底线。项目模式下的政府无法做得更好。亚伯拉罕指出：“需要更深层次的系统性改革。”这种改革需要的是连贯的策略以及能够随机应变的政策制定者。而这与莫迪命令控制型的风格大相径庭。

莫迪的支持者列举出他推行的一些重大变革。过去，印度国家、邦和城市的税收各行其是，阻碍了国内贸易，现在取而代之的是国家商品和服务税（GST）。印度出台了略有新意的破产法。央行制定了通胀目标并设立了货币政策委员会。但这些思路都是上届政府的遗产。而唯一贴上莫迪标签的政策——废除大额纸币以打击黑市经济——可能弊大于利。

而他与印度央行的冲突阻碍了进展。政府向央行施压，要求其动用更多的储备金，并对坏账缠身的国有银行网开一面。当然，一个巴掌拍不响。央行官员惯于在逃避责任的同时还要维护自己的颜面。但帕特尔显然不该受如此对待。莫迪没有意识到，如果政府在选举来临之际对央行指手画脚，那么帮助整顿银行的破产法或者最先进的货币政策就毫无意义可言了。

鼓吹印度潜力的说辞已经没什么市场了。“很多投资者已经不吃这一套了。”太阳人寿投资管理公司（Sun Life Investment Management）的戴克·穆拉基（Dec Mullarkey）说。印度错失了很多像中美贸易争端这样的机会。印尼、越南和菲律宾的外国直接投资的回暖可能表明美国公司正试图打造新的供应链来排挤中国。印度照理也该从中受益。但一大堆让人晕头转向的劳动法以及匮乏的商业用地阻碍了印度成为制造业中心的进程。除了GST，莫迪在改变这种现状上无所作为。

希克的球技在更具挑战的环境中没能经受住考验。他在英格兰队的糟糕表现有时被归咎于期望值过高带来的压力和技术缺陷。或许莫迪在经济决策方面也是如此。 ■



The best young economists

Sweet and serious songs

The new stars of economics are reviving traditional tunes on unconventional instruments

“The solution in Vietnam”, said William DePuy, an American general in 1966, “is more bombs, more shells, more napalm.” But where exactly to drop it all? To help guide the bombing, the Pentagon’s whizz kids calculated the threat posed by different hamlets to the American-backed government in South Vietnam. Fed with data capturing 169 criteria, their computer crunched the numbers into overall scores, which were then converted into letter grades: from a to e. The lower the grade, the heavier the bombing.

Almost 50 years later, these grades caught the eye of Melissa Dell, an economist at Harvard University. Those letters, she realised, created an unusually clean test of DePuy’s solution. A village scoring 1.5 and another scoring 1.49 would be almost equally insecure. But the first would get a D and the second an E, thus qualifying for heavier bombing. To judge the effectiveness of the onslaught, then, a researcher need only compare the two. Simple.

Or not. Inconveniently, the scores had not survived: only the letter grades (and the 169 indicators underlying them, preserved because of an IBM lawsuit). To resurrect the algorithm that linked the two, Ms Dell embarked on what she calls a “treasure hunt”. She stumbled on an old journal article which suggested the army had removed hundreds of musty records waiting to be catalogued by the National Archives. She tracked those files to Fort McNair where a military historian dug out the matrices she needed to reverse engineer the algorithm.

That kind of tenacity is one reason why Ms Dell, who is still in her 30s, is

among the best economists of her generation. We arrived at that conclusion based on an investigative strategy somewhat less sophisticated than those for which she is celebrated: we asked around, seeking recommendations from senior members of the profession. They named over 60 promising young scholars. We narrowed that list down to eight economists who we think represent the future of the discipline: Ms Dell and her Harvard colleagues Isaiah Andrews, Nathaniel Hendren and Stefanie Stantcheva; Parag Pathak and Heidi Williams of the Massachusetts Institute of Technology (MIT); Emi Nakamura of the University of California, Berkeley and Amir Sufi of the University of Chicago Booth School of Business. Taken together, they display an impressive combination of clever empiricism and serious-minded wonkery. They represent much of what's right with economics as well as the acumen of top American universities in scooping up talent.

This is the fourth time we have assembled such a list, and a pattern emerges. The first group, from 1988, was dominated by brilliant theorists who brought new analytical approaches to bear on long-standing policy questions. Back then, theorists were treated like the "Mozarts" of the profession, according to one member of that generation. Two of these maestros have since been to Stockholm to collect Nobel prizes: Paul Krugman in 2008 and Jean Tirole in 2014.

In those days, empirical work enjoyed less prestige. As Edward Leamer of the University of California, Los Angeles noted earlier in the 1980s, "Hardly anyone takes data analyses seriously. Or perhaps more accurately, hardly anyone takes anyone else's data analyses seriously." It was easy for economists to proclaim a seemingly significant finding if they tweaked their statistical tests enough.

By 1998 theory was giving way to a new empiricism. One member of the cohort we chose that year, Harvard's Michael Kremer, was arguing that

randomised trials could revolutionise education, much as they had revolutionised medicine. Another, Caroline Hoxby of Stanford, showcased the creative potential of a “quasi-experimental” technique: the instrumental variable. She wanted to know whether competition for pupils improved school quality. But this was hard to gauge, because quality could also affect competition. To untie this knot, she employed an unlikely third factor—rivers—as an “instrument”. Places densely reticulated by rivers tend to be divided into many school districts, resulting in fiercer competition between them. If these locales also have better schools, it is presumably because of that competition. It is not because better schools cause more rivers.

This cohort’s Mozart—the empiricist with, if anything, “too many notes”—was Steven Levitt of the University of Chicago. In his view, “Economics is a science with excellent tools for gaining answers but a serious shortage of interesting questions,” as Stephen Dubner, a journalist, once put it. In pursuit of more compelling questions, he roamed freely, carrying his tools into unconventional and even quirky areas of research (penalty kicks, sumo and “The Weakest Link”, a game show). The result was “Freakonomics”, a bestseller written with Mr Dubner, and a phalanx of imitators.

Ten years later, many of our picks of 2008 also excelled in empirical work. Esther Duflo of MIT institutionalised the randomised trials that Mr Kremer helped pioneer. Jesse Shapiro of Brown University—still under 40, but we are not allowing double dipping—delighted in some of the same empirical virtuosity as Mr Levitt.

The work exemplified by these two waves of economists (and many others) amounted to a “credibility revolution” in the discipline, wrote Joshua Angrist and Jörn-Steffen Pischke, authors of the revolutionary movement’s textbook, “Mostly Harmless Econometrics”. Like many revolutions, this one

was founded on a change in the mode of production: the introduction of personal computers and digitisation, which brought large bodies of data into economists' laps.

Like all revolutions, this one was followed by a backlash. The critics lodged three related objections. The first was a neglect of theory: the new empiricists were not always particularly interested in testing formal models of how the world worked. Their experiments or cleverly chosen instruments might show what caused what, but they could not always explain why. Their failure to distinguish mechanisms cast doubt on how general their findings might be. Like jamming musicians who never write anything down, they could not know if their best grooves would return in new settings.

The second objection was a lack of seriousness. “Freakonomics” had encouraged an emerging generation of economists to trivialise their subject, their critics alleged, somewhat unfairly. “Many young economists are going for the cute and the clever at the expense of working on hard and important foundational problems,” complained James Heckman, a Nobel laureate, in 2005.

The new empiricists were also accused of looking for keys under lampposts. Some showed more allegiance to their preferred investigative tools than to the subject or question under investigation. That left them little reason to return to the same question, unless they found more neat data or a new oblique approach. This hit-and-run approach makes some scholars nervous, since even a perfectly designed one-off experiment can deliver a “false positive”.

Where does that leave today's bright young things? This year's cohort has certainly picked up its predecessors' empirical virtuosity. Their papers are full of the neat tricks that enlivened the credibility revolution. Mr Pathak

and his co-authors have compared pupils who only just made it into elite public schools with others who only just missed out, rather as Ms Dell compared villages on either side of the Pentagon's bombing thresholds. The study showed that the top schools achieve top-tier results by the simple contrivance of admitting the best students, not necessarily by providing the best education. Ms Dell and her co-author showed that bombing stiffened villages' resistance rather than breaking their resolve.

Ms Williams has exploited a number of institutional kinks in the American patent system to study medical innovation. Some patent examiners, for example, are known to be harder to impress than others. That allowed her to compare genes that were patented by lenient examiners with largely similar genes denied patents by their stricter colleagues. She and her co-author found that patents did not, as some claimed, inhibit follow-on research by other firms. This suggested that patent-holders were happy to let others use their intellectual property (for a fee).

Our economists of 2018 also show great doggedness in unearthing and refining new data. Ms Dell is interested in the economic consequences of America's decision to "purge" managers from Japan's biggest companies after 1945. To this end she is helping develop new computer-vision tools that will digitise musty, irregular tables of information from that time.

For a paper called "Dancing with the Stars", which shows how inventors gain from interactions with each other. Ms Stantcheva and colleagues painstakingly linked some 800,000 people in a roster of European inventors to their employers, their location and their co-inventors in order to find out what sorts of propinquity were most propitious. Mr Hendren has joined forces with Harvard's Raj Chetty (another of our alumni of 2008) to exploit an enormous cross-generational set of data from America's census bureau. The data link 20m 30-somethings with their parents, who can be identified because they once claimed their offspring as dependents on their tax forms.

The link has allowed Mr Hendren to study the transmission of inequality from one generation to the next.

The 2018 cohort's combination of clever methods and dogged snuffling out of data comes along with a rejection of some of the more frolicsome manifestations of earlier new empiricists. Many of them display an admirable millennial earnestness. They are mostly tackling subjects that are both in line with long-standing economic concerns and of grave public importance. Ms Williams seeks a more rigorous understanding of technological progress in medicine and health care, which many commentators casually assert was the largest factor in improving people's lives over the past century. Ms Dell is interested in the effects of economic institutions, such as the forced labour used in Peruvian silver mines before 1812. The lingering consequences of that colonial exploitation are visible, she says, in the stunted growth of Peruvian schoolchildren even today.

Ms Stantcheva studies tax, perhaps the least cute subject in the canon. As well as investigating the public opinions and values that shape today's tax systems, she also studies taxation's indirect and long-term consequences. Taxation can, for example, inhibit investments in training or scare off the inventors who drive innovation. On the other hand, successful professionals often have to work hard as a signal of their ability to their bosses, who cannot observe their aptitude directly. That rat race, she points out, limits their scope to slack off even in the face of high top rates of tax. With Thomas Piketty of the Paris School of Economics (the most obvious omission from our list in 2008) and another co-author, she has explored how tax rates affect rich people's incentives to work, to underreport income, and to bargain for higher pay at the expense of their colleagues and shareholders. When that third incentive predominates, top rates as high as 80% might be justified.

Mr Hendren's work on the market's failures to provide health insurance

was, he says, “ripped from the headlines” of the Obamacare debate. His more recent research on social mobility is almost as topical. The son of a black millionaire, he has found, has a 2-3% chance of being in prison. Among white men only those with parents earning \$35,000 or less have odds of incarceration that high. Black disadvantage is not confined to bad neighbourhoods. Mr Hendren and his co-authors have discovered that black boys have lower rates of upward mobility than white boys in 99% of America’s localities. Young black women, on the other hand, typically earn a little more than white women with similarly poor parents. This research with Mr Chetty should inform a broad swathe of thinking about race in America.

In short, our picks of 2018 are looking for the intellectual keys to important social puzzles; they are willing to move lampposts, turn on headlights or light candles to find them.

Mr Pathak provides a good example of this question-driven, issues-first approach. In his work on school choice he began by examining the matching algorithms that many American cities use to decide which pupils can attend oversubscribed schools. Previous systems encouraged parents who were in the know to rank less competitive “safety schools” above their true favourites. Mr Pathak’s research has helped promote mechanisms that allow parents to be honest.

Now that these improved formulae have caught on, Mr Pathak’s algorithmic expertise is less urgently required. A different kind of economist, committed to the algorithms more than the schools, might have dropped education for problems tractable to similar approaches in other fields. But Mr Pathak is exploring other ways to improve school quality instead.

This habit of sticking with big questions should make this generation of

scholars less vulnerable to the curse of false positives. But this is not the only way in which the new crop is helping to clean up the academic literature. One rule of thumb when reading journals is that dull results that nonetheless reach publication are probably true, but that striking, eminently publishable stories should be taken with a pinch of salt. Mr Andrews's quantitative work on these problems seeks to weigh out the appropriate salt per unit of splashiness. According to his calculations, studies showing that the minimum wage significantly hurts employment are three times more likely to be published than studies finding a negligible impact. Knowing the size of this bias, he and his co-author can then correct for it. They calculate that minimum wages probably damage employment only half as much as published studies alone would suggest.

Mr Andrews has also scrutinised the instrumental variables that featured so heavily in the credibility revolution. To work well, an instrument (such as the river networks Ms Hoxby used as a proxy for school competition) should be tightly linked to the explanatory factor under examination. Often the link is weaker than economists would like, and their efforts to allow for this may be less adequate than they suppose. Mr Andrews and his co-authors have reassessed the reliability of 17 articles published in the profession's leading journal, suggesting better ways for economists to handle the instruments they use. "No econometrician has generated more widespread excitement than him in a very long time," according to Edward Glaeser of Harvard (one of our 1998 batch).

So how have these question-driven economists tackled the biggest economic question of the past decade: the global financial crisis? That disaster posed a problem for quasi-experimental empirical methods, which work better for data-rich microeconomics than for macroeconomics, where the data are less plentiful. The scope for macroeconomic experimentation is also limited. On April Fools' Day an economist circulated an abstract purportedly co-written by Ben Bernanke and Janet Yellen in which the

former central bankers revealed they had raised and lowered interest rates randomly during their stints in office in a covert experiment known only to themselves. In reality, as Ms Nakamura points out, the Federal Reserve employs hundreds of PhDs to make sure its decisions are as responsive to the economy (and therefore non-random) as possible.

None of today's bright young macroeconomists have reinvented their sub-discipline in the wake of the Great Recession in the way that John Maynard Keynes did after the Great Depression (although Keynes was already 52 when he published "The General Theory"). If they had they would have drawn more attention from the nominators of this list.

Yet, unlike our batch in 2008, this year's group does contain two economists who have carried the credibility revolution some way into macroeconomics. Ms Nakamura, who writes many of her papers with Jon Steinsson, also at Berkeley, has used micro methods to answer macro questions. Working with the Bureau of Labour Statistics she has unpacked America's inflation index, examining the prices for everything from health care to Cheerios entangled within it. Whereas macroeconomists typically look at quarterly national data, her work cuts up time and space much more finely. She has divided America into its 50 states and the passage of time into minutes. This has let her shed light on fiscal stimulus and the impact of monetary policy as seen through the half-hour window in which financial markets digest surprising nuances from Fed meetings.

One of her most provocative papers is also the simplest. She and her co-authors argue that America's slow recovery from its recent recessions is not the result of a profound "secular stagnation" as posited by Larry Summers (one of our 1998 picks). Rather it reflects the fact that the rise in the number of working women, rapid for several decades after the war, has since slowed. In the past, the influx of women put overall employment on a strong upward trajectory. Thus after a recession, the economy had to create a lot of jobs

to catch up with the rising trend. In more recent decades, employment trends have flattened. Thus even a relatively jobless recovery will restore the economy to its underlying path.

Our final pick, Mr Sufi, is, like Ms Nakamura, exploiting voluminous data unavailable to scholars of previous downturns to understand the Great Recession. Had America merely suffered from an asset bubble in housing (like the dotcom bubble of the 1990s) or a lending mishap (like the savings and loan crisis of the 1980s), it could have weathered the storm, he feels. But high levels of household debt made the spending fall unusually severe and the policy response (a banking rescue and low interest rates) surprisingly ineffective. Mr Sufi and Atif Mian of Princeton University find evidence for their macro-view in a micro-map of debt, spending and unemployment across America's counties. The households of California's Monterey county, for example, had debts worth 3.9 times their incomes on the eve of the crisis. Spending cutbacks in counties like this accounted for 65% of the jobs lost in America from 2007 to 2009, they estimate. The Obama administration's failure to provide more debt relief for homeowners with negative equity was the biggest policy mistake of the Great Recession, they say.

Because they want to change the world, not just delight in its perversity, many of these economists engage closely with policy. Ms Stantcheva now sits on France's equivalent of the council of economic advisers. Mr Sufi is pushing for mortgage payments to be linked to a local house-price index, falling when the index does, but allowing the lenders a small slice of the homeowners' gains if the market rises. He and Mr Mian have also proposed linking student-loan repayments to the unemployment rate of recent graduates.

Intriguingly, this concern for real-world outcomes is pushing some of these young economists back towards theory. In recommending a policy reform,

an economist is saying that it serves some objective better than the status quo. That objective needs a theoretical rationale. A goal like improving well-being might seem bland and unexceptionable. But most policies hurt some people while helping others. How should society weigh the hurt against the help?

Ms Stantcheva and Emmanuel Saez of Harvard have proposed a theoretical framework that accommodates different answers to that question (utilitarian, libertarian, Rawlsian, and so on). Meanwhile Mr Hendren has calculated that the American tax system is implicitly willing to impose \$1.5-2 of hurt on rich people to provide \$1 of help to the poor. That provides one possible benchmark for evaluating new policies.

Engaging with policy can take a toll. “I’ve testified in about 15 different school-committee meetings,” says Mr Pathak. “I’ve had families shouting at me.” But it is also stimulating, he adds, not just because it helps people, but also because it enriches research. “Testifying in school-committee meetings is one of the richest sources of research ideas I’ve ever had.”

When Thomas Menino, Boston’s long-serving former mayor, expressed concern that the city’s policy of busing kids to their school of choice across the city was undermining the sense of community around some schools, Mr Pathak looked into “walk zones”, which reserve systems some places for children living within walking distance. Seemingly innocuous details of such schemes turned out to have far-reaching effects. The theoretical subtleties he uncovered proved to be “incredibly rich”, Mr Pathak says, keeping him fruitfully busy for a couple of years on something that “there’s no way we would have looked at...without interacting with Boston and the mayor.” By answering practical questions rigorously, economists can both make themselves useful and be spurred in interesting new directions.

Mozart’s first biographer claimed that the child prodigy composed his music

feverishly in his mind, without ever coming to the “*klavier*”. Many people came to believe that he could compose whole masterpieces while walking after dinner, travelling in a carriage or “in the quiet repose of the night”.

More recent musicology casts doubt on this account. Much of Mozart’s work was sketched out, or even improvised, on a keyboard; he is thought to have done little composition without one.

The theorists of the 1980s resembled the mythical Mozart of the popular imagination, completing beautiful deductive theories with their minds, before seeing how they played in the real world. The best young economists of today more closely resemble the less magical Mozart described by later scholars. Just as he walked back and forth between his compositional sketches and his piano, they move back and forth between their theoretical notation and their empirical instruments, searching for the keys to knowledge. ■



最杰出青年经济学家

中听又中用

经济学新星用非传统器乐老调新弹

“要解决越南问题，”美国上将威廉·德普伊（William DePuy）在1966年说，“就是要投放更多炸弹、更多炮弹、更多汽油弹。”但是究竟该往哪投？为了引导轰炸，五角大楼的天才小子们计算了不同的村庄分别对美国政府支持的南越政府构成了多大的威胁。他们把来自169个指标的数据输入计算机，计算机将这些数据转化成分值，再把分值转换成从A到E的字母等级。字母等级越低，轰炸越猛烈。

将近50年后，这些字母等级引起了哈佛大学经济学家梅丽莎·戴尔（Melissa Dell）的注意。她意识到，这些字母等级为验证德普伊的解决办法效果如何提供了异常清晰的工具。一个得分1.5的村庄和一个得分1.49的村庄几乎同样不安全，但是第一个会被划到D档，第二个到E档，因此后者会遭受更猛烈的轰炸。要判断轰炸的有效性，研究人员只需要在两者间作比较。很简单。

但也不简单。因为那些分值没能保留下来，只留下了字母等级（以及因IBM的一场诉讼而保留下来的169个指标），这给研究带来了不便。为了重建连接分值与等级的算法，戴尔开始了她所谓的“寻宝”旅程。她偶然发现了一篇旧的期刊文章，说军方已将数百份陈旧记录移至国家档案馆（National Archives）等待编目。她顺着这些文件的踪迹找到了麦克奈尔堡（Fort McNair），那里的一位军事历史学家翻找出了她进行反向计算所需的矩阵数据。

戴尔才30多岁，这种执着帮助她成为她这一代人中最优秀的经济学家之一。我们得出这个结论的调查策略可比她因之出名的那种要简单得多——就是四处询问，寻求资深经济学家的建议。他们列举了60多位有前途的青年经济学家。我们把名单缩小到八人，认为他们代表了经济学的未来。他

们分别是：戴尔和她在哈佛的同事以赛亚·安德鲁斯（Isaiah Andrews）、纳撒尼尔·亨德伦（Nathaniel Hendren）和斯蒂芬妮·斯坦切娃（Stefanie Stantcheva），麻省理工学院的帕拉格·帕塔克（Parag Pathak）和海蒂·威廉姆斯（Heidi Williams），加州大学伯克利分校的中村惠美（Emi Nakamura），以及芝加哥大学布斯商学院的阿米尔·苏非（Amir Sufi）。这八位经济学家从整体上展现了巧妙的实证主义和严谨的治学态度的结合，令人赞叹。他们在很大程度上既代表了经济学的正确方向，也体现了美国顶尖大学在挖掘人才方面的敏锐眼光。

这是我们第四次评选杰出青年经济学家，一种模式已显现出来。在1988年的第一次评选中，出色的理论家占据了主流，他们用新的分析方法来解决长期存在的政策问题。据那一代经济学家的一名成员说，那时理论家被视为经济学领域的莫扎特。其中两位大咖保罗·克鲁格曼（Paul Krugman）和让·梯若尔（Jean Tirole）后来分别于2008年和2014年在斯德哥尔摩获颁诺贝尔奖。

那时候，实证研究的声望较低。正如加州大学洛杉矶分校的爱德华·利莫尔（Edward Leamer）在1980年代更早些时候指出的那样：“几乎没人把数据分析当回事。或者更准确地说，几乎没人把其他任何人的数据分析当回事。”经济学家如果能够对自己的统计测试做足够的调整，就很容易宣布获得了看似重大的发现。

到了1998年，理论开始让位于新实证主义。那年我们选出的杰出青年经济学家之一、哈佛大学的迈克尔·克雷默（Michael Kremer）认为，随机测试可以变革教育，就像它们改造了医学那样。我们选出的另一位青年经济学家、斯坦福大学的卡罗琳·霍克斯比（Caroline Hoxby）展示了一种“准实验”技术的创造潜力：工具变量。她想知道招生竞争是否提高了学校的教学质量。但这很难衡量，因为教学质量也会影响招生竞争。为了解开这个结，她采用了意想不到的第三因素——河流——作为“工具”。河流密布的地方往往会分出许多学区，导致这些学区之间的竞争更为激烈。如果这种地方的学校也更好，那可能就是由于学区间竞争的存在，而不是因为更好的学校会形成更多的河流。

那一年，杰出青年经济学家中的莫扎特是芝加哥大学的史蒂文·列维特（Steven Levitt）——因为这个实证主义者奏响了“太多音符”。记者斯蒂芬·都伯纳（Stephen Dubner）曾经说过，在列维特看来，“经济学这门学科有很多寻求答案的出色工具，但却严重缺乏有意思的问题”。为了找寻更多引人入胜的问题，他信马由缰，将他的工具带入非传统甚至是古怪的研究领域（比如罚点球、相扑和电视游戏节目《智者为王》[The Weakest Link]），由此诞生了他与都伯纳合著的畅销书《魔鬼经济学》（Freakonomics），还引发了众多跟风之作。

十年后，我们选出的2008年杰出青年经济学家中，有多人同样在实证研究方面表现出色。麻省理工学院的埃斯特·迪弗洛（Esther Duflo）令克雷默帮助开拓的随机试验成为一种惯例。布朗大学的杰西·夏皮罗（Jesse Shapiro）在一定程度上和列维特一样乐于钻研实证主义技术。她现在也还不到40岁，但我们不能做重复选择。

以这两批青年经济学家（以及许多其他人）的研究为代表的工作共同推动了该学科的“可信性革命”，约书亚·安格里斯特（Joshua Angrist）和约恩-斯特芬·皮施克（Jörn-Steffen Pischke）写道。此二人撰写了有关这场革命运动的教科书《基本无害的计量经济学》（*Mostly Harmless Econometrics*）。像许多革命一样，这一次革命的基础同样是生产方式的改变：个人计算机和数字化的引入将大量数据带入了经济学家的工作。

像所有革命一样，这次革命也伴随着反对的声音。批评者提出了三个意见。第一是对理论的忽视：新实证主义者并不总是特别有兴趣去测试有关世界如何运作的形式化模型。他们的实验或巧妙选择的工具可能会显示是什么导致了什么，但并不总是可以解释其中的原因。他们不能辨别运作机制，这让人不由怀疑他们的研究发现到底有多少通用性。就像从不记录乐谱的即兴音乐家一样，他们无法知道其最好的作品是否能在新的环境中再次呈现。

第二个反对意见是欠缺严肃的态度。对于《魔鬼经济学》催生的新一代经

济学家，批评者称他们把经济学课题变成了鸡毛蒜皮——这种说法多少有点不公平。2005年诺贝尔奖得主詹姆斯·赫克曼（James Heckman）抱怨说：“许多年轻的经济学家都在搞些讨人喜欢的、精巧聪明的东西，而不去研究艰难而重要的基础问题。”

还有人批评新实证主义者就像醉汉一样在路灯下找钥匙。其中一些人看起来更醉心于自己偏爱的调查工具而不是研究课题本身。这让他们没有理由重复验证同样的问题，除非他们找到更齐整的数据或巧妙的新方法。这种“一中即走”的做法让一些学者感到不安，因为即使是设计完美的一次性实验也可能产生“假阳性”的结果。

那么如今的青年经济学家如何呢？今年的入选者无疑继承了前辈在实证方面的高超技艺。他们的论文充满了让可信性革命充满活力的巧妙技巧。帕塔克和他的共同作者将擦边进入公立名校的学生与擦边落选的学生进行了比较，类似于戴尔对分列五角大楼各种轰炸层级之上和之下的村庄所作的比较。帕塔克的研究表明，顶尖学校成绩一流靠的只是想办法招收一流的生源，而不一定是靠提供最好的教育。戴尔和她的共同作者通过研究显示，轰炸不仅没有击垮那些被炸的村庄反美的决心，反而让它们的意志更为坚定。

威廉姆斯利用美国专利体系中的一些机制性小缺陷来研究医学创新。例如，有些专利审查员的标准相较于其他人更为严格。利用这种现象，她比较了较宽松的审查员批准的基因专利和与之大体相似、但被更严格的审查员驳回的基因专利。她和她的共同作者发现，正如一些人声称的那样，专利并没有阻止其他公司从事后续研究。这表明专利持有者很乐意让其他人使用他们的知识产权（但会收取费用）。

我们的2018年杰出青年经济学家在挖掘和提炼新数据方面可谓坚持不懈。1945年之后，美国决定“清理”日本最大财阀的管理人员，戴尔对这带来的经济后果很感兴趣。为此，她正在帮助开发新的计算机视觉工具，将当时留下来的发霉的、不规范的信息表数字化。

一篇名为《与星共舞》（Dancing with the Stars）的论文展示了发明家如何从彼此的互动中获益。为撰写此文，斯坦切娃及其同事煞费苦心，将一份欧洲发明家名单中的大约80万人与他们的雇主、他们的所在地和共同发明人联系起来，以便找出哪种关系对发明最为有利。亨德伦则与哈佛大学的拉吉·切迪（Raj Chetty，另一位2008届青年经济学家）合作，利用美国人口普查局的大量跨代际数据做研究。通过人们在报税表上填写的受抚养人信息，他们把2000万30多岁的人与他们的父母联系起来。这让亨德伦得以研究不平等的代际转移。

2018届青年经济学家既掌握了巧妙的方法，又具备挖掘数据的执着精神，还摒弃了早期新实证主义者一些不够严肃的表现。他们中的许多人展现出了千禧一代那种令人钦佩的认真。他们研究的大部分课题既属于经济学长期关注的问题，又具有重大的社会意义。威廉姆斯力图获得对医学和医疗保健领域的技术进步更缜密的理解，而许多评论人士随口就断言这些进步是过去一个世纪里带来人类生活改善的最重要因素。戴尔对经济制度的影响很感兴趣，例如1812年之前秘鲁银矿中使用强迫劳工的情况。她说，即使在今天，仍可在秘鲁发育不良的学龄儿童身上看到这种殖民剥削产生的持续影响。

斯坦切娃研究的是税收制度，也许是经济学中最不讨人喜爱的课题。除了调查影响当今税收制度的公众舆论和价值观外，她还研究税收的间接和长期后果。例如，税收可能会抑制对培训的投入或吓退推动创新的发明家。另一方面，为了让无法直接观察到他们的才干的老板看到自己的能力，成功的专业人士往往需要努力工作。她指出，这种激烈的竞争使得他们即使面对很高的最高税率，也不敢懈怠。她与巴黎经济学院的托马斯·皮凯蒂（2008届最大遗珠）及另一位共同作者一起，探讨了税率如何影响富人工工作的动力、低报收入的动力，以及不惜牺牲同事和股东利益为自己争取更高薪酬的动力。当第三个动力占据主导时，高达80%的最高税率可能就合理了。

亨德伦研究提供医疗保险服务时的市场失灵，他说他的研究仿佛是从奥巴马医改辩论的“头条报道里截取的”。他较近期的有关社会流动性的研究几

乎同样热门。他发现，黑人百万富翁的儿子入狱的几率为2%到3%。而在白人中，只有父母年收入不超过3.5万美元的人才会有这么高的入狱几率。黑人的劣势并不仅限于糟糕的社区。亨德伦和他的共同作者发现，在美国99%的地方，黑人男性青少年向上流动的可能性都要低于白人男性青少年。而另一方面，父母的贫困程度相当时，年轻黑人女性的收入通常要略高于白人女性。这项与切迪合作进行的研究应该会对有关美国种族问题的诸多思考角度产生影响。

简言之，我们的2018军团正在寻找解开重要社会谜团的智慧钥匙。不管是挪开路灯、打开头灯还是点上蜡烛，他们都愿意尝试。

在这种以疑问驱动、以问题为先的做法上，帕塔克就是一个很好的例子。在他有关择校的研究中，他首先研究了在许多美国城市中使用的决定哪些学生可以挤进热门学校的匹配算法。以前的系统会让了解内情的家长把竞争力较弱的“保底学校”排在真正心仪的学校前面。帕塔克的研究推动了让家长表达真实意愿的机制。

如今这些得到改进的方案已流行开来，对帕塔克在算法方面的专业技能的需求已不再那么迫切。如果换作一个更看重算法而非学校的经济学家，可能已经放弃了教育问题，转而去其他领域里寻觅更易于使用类似方法去研究的问题。但帕塔克又开始探索改善学校质量的其他方法。

这种坚持研究重要问题的习惯应该能让这一代学者不那么容易受到假阳性的诅咒。但这并不是新一代经济学家帮助清理学术文献的唯一途径。阅读期刊有这样一个经验法则：沉闷却最终得以发表的研究结果可能是真实的，而那些结论惊人、可发表性高的文章则不能尽信。安德鲁斯对这一问题进行了定量研究，试图衡量每篇文章中不可信的部分。根据他的计算，显示最低工资显著损害就业的研究论文发表的可能性是认为这种影响可以忽略的论文的三倍。知道了这种偏差的大小，他和他的共同作者就可以纠正它。他们计算出，最低工资对就业的负面影响可能只有已发表研究所显示的一半。

安德鲁斯还仔细审视了在可信性革命中发挥至关重要作用的工具变量。一种工具若要好用（例如霍克斯比用来指示学校竞争程度的河网），就应与研究中的解释因素紧密相关。这种关联通常要比经济学家所希望的要弱，他们在研究中对这一点的考虑可能也不如他们预想得那么充分。安德鲁斯和他的共同作者重新评估了17篇发表在一流经济学期刊上的文章的可靠性，指出经济学家还有更好的方法来处理他们使用的工具。“在很长一段时间内，没有一位计量经济学家比他在经济学领域激起的涟漪更广。”哈佛大学的爱德华·格莱瑟（Edward Glaeser，我们的1998年届成员）表示。

那么，这些受问题驱动的经济学家是如何处理过去十年里最大的经济问题——全球金融危机的呢？这场灾难给准实验证方法提出了一个难题。这种方法在数据充足的微观经济学领域要比在数据不那么丰富的宏观经济学领域更有效。宏观经济实验的范围也有限。在愚人节那天，一位经济学家传播了一份号称由伯南克和耶伦合写的摘要，这两位前美联储主席在其中透露，他们在任职期间曾进行过一项仅他们知情的秘密实验，在其中随意调整利率。实际上，正如中村惠美所指出的那样，美联储雇用了数百名博士，以确保其决策尽可能地贴近经济的运行情况（从而不是随机的）。

今天优秀的青年一代宏观经济学家中，没有谁像凯恩斯在大萧条后那样，在大衰退后重新塑造了这门经济学分支（不过凯恩斯在发表《就业、利息与货币通论》时已经52岁）。如果说有的话，他们会从这份名单的举荐人那里得到更多关注。

不过，与2008年的名单不同，今年这一批入选者中确实有两位经济学家在某种程度上将可信性革命带入了宏观经济学。中村惠美与同在伯克利的乔恩·斯泰森（Jon Steinsson）共同撰写了多篇论文，她用微观方法来回答宏观问题。她与美国劳工统计局合作，剖析了美国的通货膨胀指数，研究了从医疗服务到麦片等通胀指数里包罗的各个项目的价格。宏观经济学家通常会研究全国的季度数据，但她的研究对时间和空间的划分要更细致。她按美国的50个州、按分钟来分析，通过观察金融市场在半小时内消化美联储会议上令人惊讶的微妙信息的情况，更清楚地揭示出财政刺激和货币政策的影响。

她最具争议性的论文之一同时也是最简单的一篇。她和她的共同作者认为，美国最近一次经济衰退后之所以复苏缓慢，并不像拉里·萨默斯（我们的1998届成员）认为的那样，是由严重的“长期停滞”造成的。其背后的影响因素是妇女的就业人数在经历了二战后数十年的迅速增长后已经放缓。过去，妇女涌入劳动力市场，让整体就业人数呈强劲的上升趋势。因此，衰退过后，经济体必须创造大量就业机会才能重新赶上这种上升趋势。近几十年来，就业人数增长趋于平缓。因此，即使是就业机会相对较少的复苏，也会把经济拉回到基本轨道上。

和中村惠美一样，我们的最后一位入选的青年经济学家苏非利用以往经济低迷时期的学者无法获得的大量数据来理解大衰退。他认为，如果美国仅仅是遭受了住房资产泡沫（就像上世纪90年代的互联网泡沫）或贷款事故（类似上世纪80年代的储蓄和贷款危机），它本可以化险为夷。但家庭债务高企导致支出下降异常严重，也令应对政策（银行救助和低利率）出人意料地无效。苏非和普林斯顿大学的阿蒂夫·米扬（Atif Mian）从美国各县的债务、消费和失业数据的微观地图中为他们的宏观观点找到了证据。例如，加州蒙特雷县（Monterey）的家庭在危机爆发前夕的债务是其收入的3.9倍。他们估计，2007年至2009年间美国工作岗位的流失有65%是因这类郡县内消费缩减所致。他们表示，奥巴马政府未能为负资产的业主提供更多债务减免，是大衰退时期最严重的政策失误。

我们的青年经济学家们不只以研究世界的反常现象为乐，还想要改变世界，所以他们当中有许多人密切参与政策制定。斯塔切娃现在在法国相当于美国经济顾问委员会的机构中担任顾问。苏非正在推动房贷还款与地方房价指数挂钩，让房贷还款额在指数下跌时下降，但如果房地产市场上涨，也要允许贷款机构从业主的收益中分一小杯羹。他和米扬还建议将学生贷款偿付与近期毕业生的失业率挂钩。

有意思的是，这种对于改变现实世界的关注正推动他们中的一部分人向理论回归。一位经济学家说，在推荐某项政策改革时，理论要比现状更有利实现某个目标。这个目标需要理论基础。像提升福祉这样的目标看起来

可能平淡而又无可非议。但大多数政策在帮助一些人的同时伤害了另一些人。社会该如何权衡其中的利弊呢？

斯坦切娃和同在哈佛大学的伊曼纽尔·塞斯（Emmanuel Saez）提出了一个理论框架，可采用不同的答案来回答这个问题（功利主义的、自由意志主义的、罗尔斯主义的，等等）。与此同时，亨德伦通过计算得出，美国的税收制度实际上愿意向富人收1.5至2美元的税来为穷人提供1美元的帮助。这就为评估新政策提供了一个可能的基准。

参与政策制定可能有负面后果。“我在大约15个不同学校的委员会会议上作过证，”帕塔克说，“有的家长冲我大喊大叫。”但他又说，这也令人振奋，因为这不仅能帮助别人，还能丰富研究的内容。“在学校委员会会议上作证是我的研究想法最丰富的来源之一。”

根据波士顿的政策，孩子们可乘坐校车到达他们所选择的遍布市内各处的学校。曾长期担任该市市长的托马斯·梅尼诺（Thomas Menino）表示，他担心这样的政策正在破坏一些学校周围的社区意识。为此，帕塔克研究了“步行区”政策，即给住在步行距离内的学童预留一些名额。这些方案中看似无关痛痒的细节结果却产生了深远的影响。帕塔克说，他从中发现的理论上的微妙之处原来有着“非常丰富的”研究内涵，让他这几年忙碌不已，收获颇丰，而“如果没有与波士顿和市长互动，……我们根本不会去研究这些东西”。通过为实际问题提供严谨的答案，经济学家既可以服务社会，又能受到启发，开辟出有趣的新研究方向。

莫扎特的第一位传记作者声称，这个神童根本不需要坐在钢琴前，在脑海中就能狂热地创作音乐。许多人开始相信他在晚餐后散步、乘坐马车旅行或“在安静的夜晚养神”的时候就能创作出整部杰作。

后来的音乐学研究对这种说法提出了怀疑。莫扎特的大部分作品都有草稿，有的甚至是先在键盘上即兴演奏而来；研究人员认为他的作品几乎都是坐在钢琴前创作出来的。

上世纪80年代的理论家和大众想象中神话般的莫扎特有些相似，都是先在

脑海中完成了美妙的演绎理论，然后才到现实世界中检验效果。今天最优秀的青年经济学家更像是后来的学者所描述的不那么神奇的莫扎特。就像他在作曲底稿和钢琴之间来回走动那样，青年经济学家也在理论符号和实证工具之间来回游走，寻找打开知识宝库的钥匙。 ■



The euro at 20

EUR not safe yet

The euro needs faster reform if its next 20 years are to be better than the first 20

THE BIRTH of the euro on January 1st 1999 was at once unifying and divisive. It united Europe's leaders, who hailed a new era of tighter integration, easier trade and faster growth, thinking they were building a currency to rival the dollar. But the euro divided economists, some of whom warned that binding Europe's disparate economies to a single monetary policy was an act of historic folly. They preferred a comparison with emerging markets, whose dependence on distant central banks fosters frequent crises. Milton Friedman predicted that a downturn in the global economy could pull the new currency apart.

For years the sovereign-debt crisis that engulfed Europe after 2010 seemed close to fulfilling Friedman's prediction. But the euro did not collapse. It stumbled on, often thanks to last-minute fixes by leaders who, though deeply divided, showed a steely commitment to saving the single currency. Public support for the project remains strong. Over three in five euro-zone residents say the single currency is good for their country. Three-quarters say it is good for the EU.

However, that support does not reflect economic or policy success. Euro-zone countries have never looked as if they all belong in one currency union, stripped of independent monetary policies and the ability to devalue their exchange rates. Italy's living standards are barely higher than they were in 1999. Spain and Ireland have recently enjoyed decent growth following laudable structural reforms, but their adjustments have been long and hard, and remain incomplete. In Spain the youth unemployment rate is 35%. Wage growth is slow almost everywhere.

The euro's history is littered with errors by technocrats. The worst was to fail to recognise quickly in 2010 that Greece's debts were unpayable and that its bondholders would have to bear losses. Greece has endured a prolonged depression and its economy is almost a quarter smaller than it was a decade ago. The European Central Bank has an ignominious history of setting monetary policy that is too restrictive for the euro zone as a whole, let alone its depressed areas. It was slow to react to the financial crash in 2008, arrogantly viewing it as an American problem. In 2011 it helped to tip Europe back into recession by raising interest rates too early. The ECB's finest hour—Mario Draghi's promise in 2012 to do “whatever it takes” to save the euro—was an impromptu act.

Leaders may be committed to the euro, but they cannot agree on how to fix it (see Briefing). The crisis exposed the depth of the divide between creditor and debtor countries: northern voters simply will not pay for fecklessness elsewhere. Economic stagnation helped populists to power in Greece and Italy. Because reform has been slow, the crisis could flare up again. If so, Europe will have to withstand it in a political environment that is much more divided than it was in 2010.

Technically, the path to a stable euro is clear. The first step is ensuring that banks and sovereigns are less liable to drag each other down in a crisis. Europe's banks are parochial, preferring to hold the sovereign debt of their respective home countries. Instead, they should be encouraged to hold a new safe asset, composed of the debt of many member states. Otherwise, when a country gets into debt trouble, its banks will face a simultaneous crisis, damaging the economy. Similarly, sovereigns must be shielded from banking crises. A central fund to recapitalise distressed banks is already being beefed up, but deposit insurance should also be pooled. This has been more or less agreed on in principle, but countries disagree over the speed of the transition.

Other necessary reforms are still more contentious. If the euro zone's disparate economies are to see off local economic shocks, like collapsing housing bubbles, they need a replacement for their lost monetary independence. Were countries to run a tight ship during booms, in line with the EU's rules, they would have more leeway for fiscal stimulus in crunches. But that advice is of no use to countries like Italy that are hemmed in by decades-old debts. Residents of indebted states cannot be expected to endure perpetual stagnation.

Instead, the euro zone should have some centralised counter-cyclical fiscal policy, as Emmanuel Macron, France's president, has called for. This does not mean letting countries off reform; it should not mean paying off their creditors. But it might include targeted investment spending, say, or shared unemployment insurance, to shield against deep economic downturns. The aim should be to avoid a repeat of the self-defeating fiscal contractions after the latest crisis.

This degree of risk-sharing may involve more transfers than northern voters can bear. But without it, the euro's next 20 years will be little better than the last 20. And when crisis strikes, Europe's leaders may find that political will, however substantial it was last time, is not enough. ■



欧元二十岁

欧元还不牢靠

要让未来20年好过头20年，欧元需要加快改革

欧元在1999年1月1日的问世同时带来了统一和分歧。它让欧洲各国领导人携手共迎新时代，迈向更紧密的一体化、更便利的贸易和更快的经济增长，他们认为自己打造的货币能与美元抗衡。但经济学家对欧元看法不一，他们当中的一些人警告称，在欧洲各异的经济体中实行单一货币政策是一个历史性的愚蠢举措。他们喜欢将之与新兴市场的情况做类比，后者依赖高高在上的中央银行控制，导致危机频发。米尔顿·弗里德曼（Milton Friedman）预测，如果全球经济出现衰退，这一新货币体系便可能分崩离析。

2010年之后的几年，主权债务危机席卷欧洲，弗里德曼的预测似乎差点就要应验。但欧元并没崩溃。它继续蹒跚前行，这往往多亏了各国领导人在最后关头做出的调整。尽管他们分歧严重，却在拯救欧洲单一货币上坚定不移。公众对欧元仍然支持有加。超过五分之三的欧元区居民表示，单一货币对自己的国家有利。四分之三的人认为欧元有利于欧盟。

但是，这种支持并不表示经济或政策上取得了成功。欧元区国家失去了独立制订货币政策的自由和让本国货币贬值的能力，却从未像是同属一个货币联盟。意大利目前的生活水平比1999年高不了多少。经过令人称许的结构性改革后，西班牙和爱尔兰近年来取得了不俗的经济增长，但这些调整漫长而艰巨，且仍不够彻底。在西班牙，青年失业率高达35%。在欧元区几乎所有地方工资增长都很缓慢。

欧元的历史充满了技术官僚的失误。最糟糕的一次是在2010年未能迅速认识到希腊无法偿还债务，其债券持有人将不得不承担损失。希腊就此经历了长期萧条，经济规模比十年前几乎萎缩了四分之一。欧洲央行在制订货币政策上有着不光彩的历史——它的政策往往对于整个欧元区都太过紧

缩，更不用说其中的萧条国家。欧洲央行对2008年金融危机反应迟缓，傲慢地以为那只是美国的问题。2011年，由于过早加息，它让欧洲重新陷入衰退。马里奥·德拉吉（Mario Draghi）在2012年承诺“不惜代价”拯救欧元，可谓欧洲央行的光辉时刻，但那只是一次即兴行动。

各国领导人可能决意捍卫欧元，但对于如何解决欧元的问题，他们无法达成共识。危机暴露了债权国与债务国之间的深刻分歧：北部各国的选民根本不会为其他地方不负责任的行为买单。在希腊和意大利，经济停滞助力民粹主义者上台。由于改革进展缓慢，危机可能再次突然爆发。如果是这样，欧洲将不得不在分歧远超2010年的政治环境中对抗危机。

从技术上讲，欧元要走向稳定，路径很明显。第一步是确保银行和主权国家在危机中不再那么容易相互拖累。欧洲的银行眼界狭隘，倾向于持有母国的主权债务。应鼓励它们转而持有由众多成员国的债务构成的新安全资产。否则，当一国陷入债务困境时，其银行也会同时面临危机，令经济体受损。同样，必须保护主权国家不受银行业危机的影响。目前，对陷入困境的银行进行资本重组的中央基金已得到加强，但还需建立存款保险制度。这在原则上已或多或少得到共识，但各国对于转型的速度意见各异。

其他必要的改革争议就更大了。如果欧元区内各异的经济体要抵御房地产泡沫破灭等本地经济冲击，失去货币独立性的它们就需要寻求代替机制。如果各国在繁荣期按欧盟的规定奉行严明的财政纪律，遇到危机时便有更大的余地采取财政刺激措施。但对像意大利那样数十年债台高筑的国家来说，这条建议毫无用处。不能指望负债国的居民忍受永久的停滞。

相反，欧元区应该推出一些集中规划的反周期财政政策，正如法国总统马克龙所呼吁的那样。这并不是说各国就不需要改革了，也不是说要它们还清债务。但其中可能包括有针对性的投资支出，或者共享失业保险这类措施，以防止经济陷入深度衰退。目标应该是避免重复上一次危机后那种适得其反的财政紧缩政策。

这种程度的风险共担涉及的资金转移可能超出北方各国选民愿意承受的范

围。但如果不这样做，欧元的下一个20年比过去20年就好不了多少。而当危机来袭时，欧洲各国的领导人可能会发现，无论在上一次危机中政治意愿发挥了多大的作用，这一次单凭它是不够了。■



Computer chips

Armed with a crystal ball

Arm Holdings' chip designs already power the world's phones. Its owner, Masayoshi Son, wants them to enable the rest of tech

ON THE OUTSKIRTS of Cambridge, where city fades to field, the headquarters of Arm Holdings, a chip-design firm, is expanding apace. Its latest new building is long and flat, with a façade adorned with a pattern of metal triangles. These represent the nanometre-sized silicon fins found on the surface of modern transistors. Once the office block is finished, the firm hopes, its unusual exterior will help inspire employees on their mission to dream up, transcribe and sell designs for the omnipresent computers of the future.

Arm's recipes for computer chips—it designs them but does not make any itself—are the most popular on the planet. Since it was founded in 1990, its corporate customers have sold a whopping 130bn chips based on its designs. In one sense, the business is simple. “We do drawings of engines and we sell those drawings,” says Mike Muller, one of Arm's founders who is now its chief technology officer.

Yet Mr Muller's “drawings” are anything but simple. They are computer code which give Arm's customers a blueprint for the construction of microprocessors, information-processing machines so complex that firms are happy for Arm to shoulder the burden of their fundamental design. Those clients—consumer-hardware giants such as Apple and Huawei; chip companies such as Broadcom and Qualcomm—pay Arm one-off licence fees to access the design code, add to it what they will, then pay royalties on every product they ship containing it. Apple's popular A-series mobile processors, for example, are built in this way.

This model also gives Arm and its newish owner, SoftBank, a Japanese internet and telecoms conglomerate, a way of peering into the future of tech. Masayoshi Son, SoftBank's founder, has repeatedly called the firm his "crystal ball".

Arm's model boasts both high margins and rapid growth; between 2008 and 2017 the number of Arm-processor based chips sold globally notched up a compound annual growth rate of 21%. Even so, few owners of phones, televisions, watches, voice assistants and other devices have heard of Arm, despite the fact that their gizmos are stuffed with its intellectual property.

After years spent building a dominant position in the smartphone market, Arm has its sights on new territory. SoftBank, which took Arm private in 2016 for £24.3bn (\$32bn), has instructed the company to lower its profits to around zero and instead reinvest in order to expand into other technology markets. The deal was the largest acquisition that Mr Son has made, and also one of his priciest (at a 43% premium to Arm's market value).

Mr Son has boasted that Arm could become more valuable than Google, by selling intellectual property (IP) into a world in which there could be as many as 1,000 internet-connected devices—from smart traffic sensors to utility meters to personal health trackers and so on—for every person on Earth. His switch to a focus on revenue growth, not profit, is well under way. In 2015 Arm raked in a profit of £539m on revenues a shade above £1bn; in 2017 profits were down to £325m on revenues of £1.3bn.

Money ploughed back into the firm has mainly gone into hiring staff. Arm has brought in 1,800 people in the two years since the acquisition, increasing its headcount by half; when your products are intangible, brainpower is the primary ingredient required to make more. Arm estimates that designing an advanced central processing unit from scratch takes it 300 man-years. SoftBank also signed legal contracts promising to increase

headcount in Cambridge as part of winning permission to buy Britain's biggest tech company.

Arm is betting that more and more of the processors it licenses in the coming years will be destined for cars, a market in which it presently has a share of 20% (see chart). It got its start in 1996 as "in-car" electronics grew unwieldy. Car manufacturers started asking for multiple control circuits to be bundled into one chip, in order to save space and eliminate weight and complexity. Arm designed a processor which did just that. As a result, the vast majority of cars sold globally already have at least some Arm IP in them, managing things like electric windows or dashboard displays.

The promise of self-driving cars is pushing the automotive industry to pack more technology into its vehicles more rapidly than ever before. While fully autonomous cars will not be widespread for at least a decade, pursuing the dream is fuelling high investment in automotive computation designed to handle an array of tasks less redolent of science fiction. Chips are needed to handle automated driver-assistance features such as lane-keeping that are becoming standard on new cars, for example. In-car screens which display information and entertainment will become more common, and require information processing; electric drivetrains require computation to manage battery levels and optimise their performance. "This is the most change that cars have seen since the advent of microcontrollers in the late 70s early 80s," says Lakshmi Mandyam, who runs Arm's automotive business.

When autonomous cars do arrive in the mass market, Arm anticipates a payday. It estimates that they will require ten times more computational power than an advanced smartphone does, meaning the market could give Arm the possibility of collecting ten times the royalties for each autonomous car that is built using its IP. While there will always be fewer vehicles on the roads than smartphones in pockets, the extra silicon

required means that Arm estimates that cars will become as big a market as phones (which account for 60% of its annual revenues).

Another promising area is network equipment, the connective tissue of the internet. As the cost of storing and processing data has plummeted over the past two decades, the cost of managing all the resulting traffic has rocketed. Arm is betting that the world will need more machines that are designed to shuttle data around efficiently, and to keep networks secure as they do so. The company's share of the infrastructure market has increased from 5% in 2011 to 20%.

Where Arm is weakest is in data centres, a market that is practically owned by Intel, which fabricates chips as well as designing them. It has a less than 1% share and wants to catch up. In November Amazon announced that it had built a new custom chip for its data centres using Arm's server IP, a useful handhold in the market. The handful of gigantic firms that dominate cloud computing like the idea of designing their own custom hardware based on Arm licences, because it allows them to buy fewer expensive package deals from Intel.

A hitch in Arm's plans could be that open-source processor designs, which are free of charge for any business to use, become a viable alternative to its own. A family of such designs, called RISC-V, are starting to show promise. Widespread adoption would spell trouble for Arm. Other problems could emerge if Mr Son's plans succeed and Arm IP becomes an essential component for the vast majority of computation everywhere. This might tempt the firm to raise its prices, prompting a backlash from customers.

The more cash Mr Son pumps into Arm, the higher the stakes. Its revenues are far from Mr Son's hopes of Google-like heights—the search giant's top line is a hundred times the size of Arm's. SoftBank has hinted that it might relist Arm after ramping up its ideas factory. That would presumably

generate a return for Mr Son's \$93bn Vision Fund, an investment vehicle through which he is pumping cash into an array of "frontier" technologies. SoftBank has almost finished transferring a quarter of Arm's shares into the fund.

Beyond its own profitability, Arm has another attraction for Mr Son—its ability to help prophesy tech's future. Arm typically takes eight years for a new design to go from idea to machine code that can be shipped to licencees. To keep its design pipeline full of viable new ideas, the firm must constantly forecast the computer industry's direction. To do so it uses its close, ongoing relationships with big customers. It is in constant discussion with firms that make cars, televisions, fitness trackers, drones and other products. As well as Apple, one of its biggest clients, it talks to credit-card companies such as MasterCard as well as to content distribution networks like Netflix and Disney. All are anticipating their computing requirements many years hence and need Arm's help to build them.

This has turned Arm into a sort of information clearing-house for future computing applications—hence Mr Son's crystal-ball analogy. True, it cannot give SoftBank, or his Vision Fund, specific investment advice or proprietary information. But Arm can and does tell Mr Son about the interesting new postcodes of the future, ones that might warrant investment.

Some of those new areas are especially eye-catching. Eric Hennenhoefer, who runs Arm's research division in Cambridge, says that the firm is working on designs for chips which can harvest the energy they need to run from the environment around them, instead of requiring some built-in power source. Why? When his team looked into the subject, they worked out that there is not enough lithium on the planet to build batteries for the trillions of computers with which Mr Son expects to paint the world in the coming decades.

So if his vision is to come to pass, many processors would have to get by without batteries. This might be done by harvesting energy from motion or from low-level background radiation, concepts that for now exist only in academic circles. Inside their new building, gazing out at green hills from nooks designed to aid contemplation, Arm employees are already attempting to design them. ■



计算机芯片 水晶球加持

安谋的芯片设计已经驱动了世界上绝大多数的手机。老板孙正义希望它们还能驱动科技的其余部分

芯片设计公司安谋控股（Arm Holdings）的总部坐落于剑桥市郊与田野的邻接处，而今正在快速扩建。它最新建造的一座大楼狭长而扁平，外立面装饰着金属三角图案。这些图案象征着现代晶体管表面的纳米级硅鳍。公司希望，等到这座大楼完工，其独特的外观将能激发员工为未来无所不在的计算机构思、实现及提供设计。

安谋对计算机芯片的设计——它只设计而从不自己制造芯片——在全球普及度最广。自1990年成立以来，这家公司的客户已售出多达1300亿个基于安谋设计的芯片。从某种意义上说，这种商业模式很简单。安谋创始人之一、现任首席技术官的迈克·穆勒（Mike Muller）说：“我们就是绘制发动机的图纸，然后出售这些图纸。”

然而穆勒所说的“图纸”并不简单。它们其实是计算机代码，为其客户构建微处理器提供了蓝图。这些信息处理器非常复杂，各家公司都乐于让安谋承担基础设计的重任。这些客户包括苹果、华为等消费级硬件巨头，以及博通、高通等芯片公司，它们向安谋支付一次性技术授权费以获取设计代码，再加入自己想加的任何设计，然后为每一件包含安谋设计代码的上架产品支付专利使用费。苹果广泛使用的A系列手机处理器就是以这种模式生产的。

这种模式也为安谋和它的新东家——日本互联网和电信企业集团软银——提供了一种透视科技未来的方式。软银的创始人孙正义屡屡将安谋称作他的“水晶球”。

安谋的模式同时实现了高利润和快增长；2008年至2017年间，全球基于安谋处理器的芯片销量的复合年增长率达到21%。即便如此，手机、电视、

智能手表、语音助手等设备的用户们却很少听说过安谋，尽管他们的设备都使用了安谋的知识产权。

安谋深耕多年，在智能手机市场建立起了主导地位，之后将目光投向了新领域。2016年以243亿英镑（320亿美元）将安谋私有化的软银已经指示安谋将利润降至零左右，转而再投资以拓展至其他技术市场。这是孙正义做出的最大一笔收购，43%的溢价也使之成为他最昂贵的收购之一。

孙正义宣称，今后世界上每个人都可能拥有包括智能交通传感器、水电气表、个人健康追踪器等上千个联网设备，而通过销售与这些设备相关的知识产权，安谋的市值可能超过谷歌。他已顺利开始将重心转向营收而非利润的增长。2015年，安谋营收略高于10亿英镑，却轻松实现了5.39亿英镑的利润；而2017年营收13亿英镑，利润下降至3.25亿英镑。

公司的再投资主要用于员工招聘。被收购后的两年内，安谋共吸收了1800名员工，总数增加了一半：因为如果公司生产的是无形产品，那人才便是增产的首要因素。安谋估算，从零开始设计一个先进的中央处理器需要300人花费一年的时间。软银当初还签署了法律合同，承诺增加安谋在剑桥总部的员工数，作为获准收购这家英国最大科技公司的条件之一。

安谋确信未来几年会有越来越多由它授权的处理器用在汽车上。目前它在这一市场占了20%的份额（见图表）。它于1996年涉足汽车市场。当时“车载”电子设备变得越发笨重，汽车制造商开始要求将多个控制电路集成到同一个芯片上，以节省空间、减轻重量和降低复杂度。安谋设计的处理器做到了这一点。结果是全球销售的绝大多数汽车内至少会带有一部分安谋的知识产权，管理着电动车窗或仪表盘显示器等设备。

无人驾驶汽车的前景正在推动汽车行业以前所未有的速度向汽车注入更多新科技。尽管完全无人驾驶的汽车至少十年内还不会普及，但对这一梦想的追求正刺激人们将大笔资金投向汽车计算，让汽车能够处理种种任务。这些任务并不像科幻小说描述的那般玄乎，例如，需要芯片来处理正在成为新车标配的“车道保持”无人驾驶辅助系统；显示信息和播放娱乐节目的

车载屏幕会更常见，而这需要信息处理；电力传动系统需要计算来管理电量并优化其性能。“这是自上世纪70年代末80年代初微控制器问世以来，汽车经历的最大变化。”安谋汽车业务主管拉克希米·曼德扬（Lakshmi Mandyam）表示。

安谋预计，无人驾驶汽车真正进入大众市场之日便是自己的收获之时。它估计，届时一辆无人驾驶汽车所需的计算能力将是一部先进智能手机的十倍，这意味着市场存在这样一种可能性：安谋可对每辆使用其知识产权的无人驾驶汽车收取十倍于现在的专利使用费。虽然路上的汽车总归没有口袋里的手机多，但鉴于前者需要更多芯片，安谋估计汽车将成为和手机一样大的市场（手机目前占其年收入的60%）。

另一个前景光明的领域是网络设备，即互联网的“结缔组织”。过去20年间，存储和处理数据的成本大幅下降，而管理由此产生的所有信息流的成本飞速上涨。安谋相信世界将需要更多能高效传送数据、并在传送时保证网络安全的设备。安谋在基础设施市场的份额已从2011年的5%增至20%。

数据中心是安谋最大的软肋，这个市场几乎是既设计又制造芯片的英特尔的天下。市场份额只有不足1%的安谋希望迎头赶上。去年11月，亚马逊宣布已为其数据中心研制了一款新的定制芯片，使用的便是安谋的服务器知识产权，这是撬动市场的有力支点。主导云计算的几家大型公司对于采用安谋的授权来设计自己的定制化硬件很感兴趣，因为这样就可以减少购买英特尔昂贵的一揽子产品和服务。

安谋的规划可能面临一个障碍——开源处理器设计。这种任何企业都可免费使用的设计有可能成为安谋设计的替代品。一套叫作RISC-V的这类设计已开始显现这样的潜质。它的广泛采用将会给安谋带来麻烦。如果孙正义的计划得以实现，安谋知识产权成为绝大多数计算系统中不可或缺的部分，那么又可能出现新的问题，因为安谋可能会借此涨价，进而引发顾客的强烈反应。

孙正义投入安谋的资金越多，风险就越大。安谋的营收与孙正义希望达到的搜索巨头谷歌那样的高度相去甚远——后者是前者的100倍。软银已经暗示，在提高安谋的技术创新能力之后，可能会安排它重新上市。这应该会为孙正义930亿美元的愿景基金（Vision Fund）带来回报，孙正义正通过这一投资工具向一大批“前沿”科技注入资金。软银差不多已将安谋四分之一的股份转入了该基金。

除其自身的盈利能力外，安谋还有一点吸引孙正义：能帮助预言科技的未来。安谋通常需要八年时间将一项新设计从创意转化为能出售给被授权方的机器代码。为了让自己不断研发出具有可行性的新设计，公司必须持续预测计算机行业的发展方向。为此，它会利用与大客户之间密切而持久的关系。安谋与汽车、电视、健身追踪器、无人机以及其他产品的制造商保持不间断的沟通。除了最大客户之一的苹果公司外，它还与万事达等信用卡公司以及Netflix、迪士尼等内容经销商探讨。所有这些公司都在预测自己多年后的计算需求，并且需要安谋的帮助来实现这些需求。

这使得安谋朝着类似未来计算应用的情报中心的方向转变。正因如此，孙正义将安谋比作水晶球。诚然，安谋不能为软银或孙正义的愿景基金提供具体的投资建议或独家信息。但是安谋能够且确实也让孙正义发现了未来有意思的、可能值得投资的新领域。

这些新领域中有一些尤其引人注目。负责安谋剑桥总部研究部门的埃里克·亨尼霍费尔（Eric Hennenhoefer）表示，公司正在开发设计的芯片可以从周围环境中获取运行所需的能量，而不需要内置的能源。为什么要这么做？按孙正义预期，未来几十年全世界会有数以万亿计的计算设备。但亨尼霍费尔的团队经深入研究后发现，地球上没有足够的锂来制造这么多计算设备所需的电池。

因此，如果孙正义的想法成真，许多处理器将必须能在没有电池的情况下运行。从运动或低功率的背景辐射中收集能量可能是一个办法，但这些想法目前还停留在理论阶段。在公司新大楼中，安谋的员工坐在为帮助他们冥想而设计的各个僻静角落，眺望窗外的青山。他们已经准备将这些概念

付诸于设计了。 ■



Trade deals

Going it alone

There is more than one way for the Trump administration to undermine the multilateral trading system

“SEEING POSSIBILITIES in potatoes” is the upbeat slogan of Lamb Weston Potato Products, Inc., an American exporter. But new trade deals mean that its foreign competitors have fewer obstacles blocking their view. One is the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), which came into effect on December 30th. Negotiated as the TPP between 12 countries and agreed between 11, after President Donald Trump pulled America out, the deal will phase out tariffs on frozen potato chips and mashed potato, benefiting Lamb Weston’s Canadian rivals. And another trade deal, between the European Union and Japan, to be implemented on February 1st, will do the same for its European ones.

The coming year is shaping up to be one of preferential trade deals, where two or a group of countries agree on their own trading rules. As well as CPTPP and the EU-Japan deal, America is aiming to strike several: with Japan, the EU and China. Will they act as stepping stones towards broad trade liberalisation—or, on the contrary, distort trade and divide the world into competing trade regions? And what will be the impact on the multilateral system overseen by the World Trade Organisation (WTO)?

Economists have long argued about the impact of preferential trade deals. For purists, it would be best if all trade took place under the WTO’s “most-favoured nation” (MFN) principle, which means that a tariff cut offered to one member must be offered to all, thus putting all exporters on an equal footing. Others—self-described pragmatists—fear that reliance on the MFN principle would cause gridlock. If some countries are happy with the status

quo, others might be reluctant to cut tariffs for fear of granting rivals a free ride. China, for example, could refuse to reform while benefiting from lower American and European duties.

Better, the pragmatists think, to strike smaller deals between like-minded members. That could spur laggards onwards: Brent Baglien, Lamb Weston's vice-president of government affairs, urged the United States Trade Representative (USTR), America's top trade official, to seek a deal with Japan that would eliminate its 8.5% tariff on American imported potatoes. "Once the US loses an export customer, it is extremely hard, if not impossible, to get it back," he warned.

In the post-war period American governments tended to side with the purists. But according to Anne Krueger of Johns Hopkins University, writing in the *Journal of Economic Perspectives*, by 1982 gridlock in multilateral talks meant it switched to a twin-track approach, simultaneously pushing for multilateral deals and negotiating preferential ones. Chief among these was the North American Free Trade Agreement, which came into force in 1994 and is due to be replaced by the United States-Mexico-Canada agreement (USMCA).

The approach spread. Nearly 300 preferential trade deals are now recorded by the WTO. Many go beyond tariff-cutting to include rules on state-owned enterprises, intellectual property and trade in services. Having grown into an integrated trading area, the EU became an enthusiastic proponent, striking many reciprocal deals, including with Canada, Mexico and Singapore. In June it started talks with Australia.

As such deals proliferated, economists studied their impact. One fear had been that they might divert custom from more efficient producers in third countries. But a paper by Aaditya Mattoo, Alen Mulabdic and Michele Ruta of the World Bank, published in 2017, found that shallow deals do little to

reduce trade with third countries, and deep ones tend to increase it. This, they think, is because rules on competition policy, subsidies and standards are hard to apply in a discriminatory way.

But there is also reason to fear that preferential deals weaken the impetus towards comprehensive liberalisation. Nuno Limão of the University of Maryland, and others, have found that America and the EU offered less tariff liberalisation in multilateral talks in product areas where they had already granted preferential tariffs in bilateral deals.

Though previous American administrations were sometimes frustrated with the WTO, they viewed it as the foundation of the trading system. Preferential deals were an instrument of diplomacy. TPP was intended to create a template for a trading system that might eventually include China, and perhaps give reform-minded Chinese policymakers something to aim for.

Mr Trump's trade agenda could hardly be more different. His "America First" rhetoric, threats of tariffs on allies and of withdrawal from the WTO, and policies of blocking appointments to the WTO's court and using tariffs as a national-security tool, are inimical to an even-handed system that all can support. Even if these policies turn out to be temporary, the uncertainty they cause may be permanent.

Some of the USMCA's provisions go beyond even those of the TPP, for example its rules on the movement of data across borders. And the USTR's objectives for talks with Japan, published on December 21st, are similar to those in the USMCA. But the fear is that, having all but abandoned the aim of broad trade liberalisation, America may prioritise quick, shallow deals rather than deeper ones that would strengthen global trade governance.

The complex "rules of origin" that feature in preferential deals are also

worrying. These specify the minimum share of a product that must originate in the parties to a deal if it is to qualify for reduced duties. They thus allow trade negotiators to shape supply chains and manage production. And one study found that compliance costs amounted to 3-5% of the final product price, offsetting the deal's benefits. The Trump administration has sought to use such rules to reshape car production in North America, tightening them by several notches in the USMCA. As well as restricting trade, rather than liberalising it, they will make it tricky to agree more permissive rules of origin for cars in future trade deals.

It will soon become clear how ambitious America wants to be. A deal with China that limited industrial subsidies, long a bugbear of other countries, could yet be baked into the multilateral system. One with Japan could set some useful standards and precedents. Mr Trump may decide to blow up the multilateral system and impose tariffs on America's allies. Even if he does not, success on his terms could cause long-lasting damage. ■



贸易协定

单打独斗

特朗普政府破坏多边贸易体系的方式不止一种

“在马铃薯里看到机遇。”美国出口企业兰姆·威斯顿马铃薯制品公司（Lamb Weston Potato Products, Inc）提出了这样一句积极乐观的口号。但新的贸易协定为其海外竞争对手擦亮了视野。其中一个协定是12月30日生效的《全面与进步的跨太平洋伙伴关系协定》（CPTPP）。原本在12个国家间谈判的《跨太平洋伙伴关系协定》（TPP）在特朗普宣布美国退出之后，其余11国谈判签署了这个新的协定。它将逐步取消冷冻薯条和土豆泥的关税，这对兰姆·威斯顿的加拿大对手有利。2月1日起，欧盟和日本之间的另一项贸易协定也将实施，又将助兰姆·威斯顿的欧洲对手一臂之力。

接下来这一年正在发展成为特惠贸易协定之年，即在两国或多国之间达成自己的贸易规则。除CPTPP和欧日自贸协定外，美国也计划分别与日本、欧盟和中国等签订协定。这些协定会成为迈向广泛的贸易自由化的垫脚石吗？还是会反过来，扭曲国际贸易并将世界分化为互相竞争的贸易区？这对世贸组织管理下的多边体系又有何影响？

长期以来，经济学家一直在争论特惠贸易协议的影响。对于纯粹主义者来说，最好所有的贸易都遵循世贸组织的“最惠国待遇”原则，即给予一个成员国的关税减免也要给予其他成员国，让所有出口国公平竞争。另一些自称实用主义者的人则担心依赖最惠国待遇原则会导致僵局。如果一些国家对现状感到满意，其他国家可能就会因为担心让竞争对手占便宜而不愿削减关税。例如，享受着美国和欧洲较低关税的中国可能就会拒绝改革。

实用主义者认为，更好的做法是在志同道合的国家之间签订较小范围的协定。这可以刺激迟迟未达成协定的国家加把劲：兰姆·威斯顿公司负责政府事务的副总裁布伦特·巴格林（Brent Baglien）敦促美国贸易代表（美国

级别最高的贸易官员）寻求与日本签署协定，使其免除对美国进口马铃薯征收的8.5%的关税。“美国一旦失去一个出口市场，要想再夺回来是极度困难的，即便不是全无可能。”他警告说。

在战后时期，美国政府倾向于站在纯粹主义者这一边。但根据约翰·霍普金斯大学的安妮·克鲁格（Anne Krueger）发表在《经济展望杂志》（Journal of Economic Perspectives）上的文章，到1982年，多边贸易协定谈判陷入僵局让美国开始双轨并行，在推动多边贸易协定的同时展开特惠协定的谈判。其中的主要一项是于1994年生效的《北美自由贸易协定》，该协定将被《美墨加贸易协议》（USMCA）取代。

这种方式传播开来。据世贸组织数据，现在共有近300项特惠贸易协议。许多协议不仅削减关税，还对国有企业、知识产权和服务贸易做出了规定。已成长为一体化贸易区的欧盟积极参与特惠贸易协定谈判，与加拿大、墨西哥和新加坡等国签订了多项互惠协定。去年6月又启动了与澳大利亚的谈判。

随着这类协定的激增，经济学家开始研究其影响。一种担心是它们可能会使协定国减少从生产效率更高的第三国生产者那里进口产品。但是，世界银行的阿迪蒂亚·玛图（Aaditya Mattoo）、阿伦·穆拉布迪克（Alen Mulabdic）和米歇尔·鲁塔（Michele Ruta）在2017年发表的一篇文章指出，那些浅层的协定在减少与第三国的贸易方面影响不大，而深层的协定往往还会增加与第三国的贸易。作者认为，这是因为竞争政策、补贴和标准方面的规则难以以不平等的方式实施。

但也有理由担心特惠协定会削弱推动全面自由化的动力。马里兰大学的努诺·利茅（Nuno Limão）以及其他人的研究发现，如果美国和欧盟在已签订的双边协定中对一些产品领域已经给予了特惠关税，那么他们在参与多边谈判时，对这些领域给予的关税自由化程度就更低。

虽然以往各届美国政府有时也对世贸组织感到沮丧，但仍视其为贸易体系的基础。特惠协定被用作一种外交工具。TPP原本是想要创立一个贸易体

系的模板，最终可能会纳入中国，并可能向立意改革的中国决策者提供一个努力的目标。

特朗普的贸易政策与之前天差地别。他大谈“美国第一”，威胁对盟国提高关税，威胁退出世贸，阻止世贸法庭法官的任命，把关税用作一种国家安全工具，这些政策都不利于建立一个能得到广泛支持的公平体系。即便它们只是暂时的，造成的不确定性也可能是永久的。

USMCA包含的一些规定甚至超出了TPP的范围，例如关于数据跨境传输的规定。12月21日发布的美国贸易代表与日本谈判的目标与USMCA的内容类似。但令人担心的是，美国已经基本放弃了广泛贸易自由化的目标，它可能会优先考虑能快速达成的浅层贸易协定，而非能加强全球贸易治理的深层贸易协定。

基于复杂的“原产地规则”的特惠待遇也令人担忧。它们规定，进口产品的组成部分必须要有一定比例产自某个贸易协定成员国，才能享受优惠关税。因此，“原产地规则”让贸易谈判者得以塑造供应链并管理生产。一项研究发现，合规成本占最终产品价格的3%至5%，抵消了关税优惠的好处。特朗普政府将USMCA中的相关规则收紧了几个层级，试图以此重塑北美的汽车制造业。这些规则除了会限制而非放开贸易，还会让未来的贸易协定更难达成更宽松的汽车原产地规则。

很快就会知道美国的野心有多大。它与中国达成的限制产业补贴的协议（中国的这种补贴一直都是令其他国家头疼的问题），可能会被引入多边体系。美国与日本的协定可以建立一些有用的标准和先例。特朗普可能会决定破坏多边体系，对美国的盟友征收关税。即使他不这样做，他所认定的成功也可能造成长期损害。 ■



Schumpeter

Shirt tales

Robots will help Chinese firms cope with rising wages and the trade war

FEW ITEMS of clothing convey seriousness quite like the white-collar shirt. It took the exuberance out of the Elizabethan ruff and put the starch into Victorian Britain. It defined a sense of upward mobility, whether for bank clerks, Japanese salarymen or anyone keen to push around paper and professional underlings.

But few white shirts are sold as earnestly as those at the PYE stores in China. You half expect the shop assistants to whip out a slide rule rather than a tape measure. The name PYE, the brand enthuses, “combines the Chinese character for flair with its homonym, the mathematical constant π .” Its white shirts are named, unfashionably, after mathematicians; Euclid and Newton for ones with a Western collar, Zu and Liu for Mao-like Mandarin ones.

Esquel, owner of PYE and a big shirtmaker for Hugo Boss, Tommy Hilfiger and other global brands, is not just serious about its shirts. It is also concerned with the upward mobility of its 56,000-odd employees, half of whom work in factories in China. Unusually for the textile and apparel industry, it is keen to raise their pay and productivity via mechanisation. As a private firm, it can do so with long-term thinking that borders on Confucianism. But it also has a hard-headed determination to adapt in the face of a tighter domestic labour market and a trade war with America. Other Chinese manufacturers are doing the same, meaning that these twin threats could, counter-intuitively, make them stronger.

The garment trade is not where you usually find stories of business success

that are also inspiring, especially in cut-throat China. The supply chain is brutal. The work is repetitive; piece work makes it all the more soul-sapping. It is relatively hard to automate soft materials like textiles; making Esquel's shirts involves up to 65 fiddly sub-processes, such as stitching sleeves and cuffs. As soon as labour costs rise, textile and garment factories tend to fly away, seeking cheaper fingers to work to the bone, be they in Bangladesh or Ethiopia. Esquel plans instead to keep lots of its work in China.

Textiles is not the only Chinese manufacturing industry to face rising wages, high turnover of workers and an ageing population; electronics does too, for instance. In some cases, such difficulties are exacerbated by the trade war; Japanese firms have reportedly shifted production of devices for cars, such as radios, from China to Mexico where they can evade tariffs.

Yet even if American tariffs rise further, many Chinese companies are betting heavily on automation to remain competitive. In 2017 China's installations of industrial robots rose by 59% to 138,000, more than in America and Europe combined. While downplaying its controversial "Made in China 2025" industrial policy, to soothe the fears of the Trump administration, the Chinese government is happy to throw money at existing manufacturing industries in order to help them tool up. That will help keep the robot revolution running.

Walk through Esquel's biggest factory in Foshan in the Pearl River Delta and it is clear that even here the robots are coming. The hundreds of workers sitting, heads down, in pink caps are a sight to behold. They are also outnumbered by machines. On some lines, robotic arms swish, trimming collar bottoms and pressing plackets. The devices do fiddly jobs like making sure that tiny pearl-coloured buttons for Banana Republic have the word Banana on the top. Israeli cameras, adapted from military devices, use artificial intelligence to scan for flaws in the fabric, automating one of the most mind-numbing of jobs.

Some workers have been displaced but productivity has improved, keeping the firm's profits stable despite a tripling since 2006 of its average monthly wage in China, to 4,500 yuan (\$650). At first workers reacted to the machines rather as English Luddites eyed automated looms. But now they help design them. Esquel managers joke that they do so out of laziness—they want to make their jobs easier. Take "Sister Yan", a matron in black dress and sensible shoes, who started on the factory floor aged 21. She worried about the shoddy quality of many of the hand-stitched garments, and helped the firm's engineers to design mechanisms to do the job better. Now she is a senior manager, and with "Brother Ming", the chief engineer, shares credit for several industrial patents. Tian Ye, an Esquel executive, quips that the increasingly tech-savvy seamstresses are no longer strictly blue-collar workers but nor are they yet white-collar ones either. Instead, he says, they are "checked or striped".

Automation is also expected to help Esquel in the trade stand-off with America. Despite the frictions, Marjorie Yang, Esquel's chairman, is in effect doubling down on China. She touts a 2bn yuan investment in a new factory in Guilin, a picturesque region, including a yarn-spinning division so high-tech that visitors are not allowed to walk the floors. So far Esquel's products have been spared American tariffs. American clients are nervous, so if need be the firm could shift some production to its factories outside China, such as in Mauritius, while moving other lines back home.

Two factors are likely to encourage manufacturers in China to remain loyal to their home market. The first is its sheer size. Willy Shih of the Harvard Business School says this enables them to practice and refine their production processes on a scale that allows them to keep cutting costs. The other is the skill of the robots themselves. He says there is so much "embedded knowledge" in today's machine tools that China can quickly start creating products that may have taken a generation to develop previously, such as cars with top-of-the-range automatic transmissions.

It is worth remembering this amid the fears about a trade-war-related slowdown in China's factory activity. If Esquel is any guide, Chinese firms may use the opportunity to become even more efficient, rather than wilting in the face of adversity. In the long run, that would make China's economy as a whole more resilient. ■



熊彼特

衬衫的故事

机器人将帮助中国企业应对工资上涨和贸易战的挑战

没什么衣服能像白领衬衫那样板正严肃。它抛去了伊丽莎白时代轮状皱领的繁复，又给维多利亚时代的衬衫增添了几分挺括。无论是对银行职员、日本工薪族，还是那些热衷于文书工作和指使下属的人，白领衬衫都象征着向更高社会层级的流动。

但在中国，很少有人像“派”衬衫专卖店那般一本正经地销售白衬衫。看店员的架势，你还以为他们抽出的会是一把计算尺而不是一条卷尺。这个品牌热情洋溢地介绍说，“‘派’字取自中文里‘气派’的派，又与数学常数π同音。”它的白衬衫以数学家的名字命名：西式领衬衫叫欧几里得领和牛顿领，中山装式的立领衬衫叫祖冲之领和刘徽领，听着都不怎么时尚。

大型衬衫生产商溢达集团是“派”衬衫的东家，它也为Hugo Boss、Tommy Hilfiger等跨国品牌做代工。溢达不仅在做衬衫这件事上很认真，对自己5.6万多名员工的发展也很上心，这些员工有一半在中国的工厂工作。溢达十分热衷于通过机械化来提高员工的薪酬和生产率，这在纺织和服装行业里很不寻常。作为一家非上市企业，它可以以一种近乎儒家思想的长远思维来追求这一目标。但它同时也以冷静务实的态度，决意适应一个更吃紧的本国劳动力市场和中美贸易战带来的挑战。其他中国制造商也在这样做，这意味着这种双重威胁反而可能让它们变得更强大。

在服装行业通常找不到令人兴奋的商业成功故事，特别是在竞争激烈的中国。供应链十分残酷。工作是单调的重复，计件工作更是让人精神颓丧。纺织品等软材料相对较难实现自动化处理，溢达的衬衫生产有多达65个精细繁琐的工序，例如缝合袖子和袖口。一旦劳动力成本上升，纺织品和服装工厂就会去别处寻求更廉价的劳动力来拼命干活，不管是在孟加拉还是埃塞俄比亚。而溢达却计划继续把大部分生产留在中国。

纺织业并非中国制造业中唯一面临工资上涨、工人流动率高和人口老龄化困扰的部门，比如电子产品行业也是如此。在某些情况下，贸易战加剧了这些困境。据报道，日本企业已将收音机等车载设备的生产从中国转移到了墨西哥以绕开关税。

然而，即便美国进一步提高关税，许多中国公司也在大力押注自动化以保持竞争力。2017年，中国的工业机器人安装量增长59%，达13.8万台，超过了美国和欧洲的总和。虽然中国政府在淡化颇有争议的“中国制造2025”产业政策，以缓解特朗普政府的担忧，但它很乐意向现有制造业投资，以帮助它们提升装备水平。这将有助于继续推进机器人革命。

溢达最大的工厂位于珠江三角洲的佛山，穿行其中时你会清楚地看到，即使在这里机器人也已开始大量部署。成百上千戴着粉色帽子的工人坐在工位上埋头工作，颇为壮观。但机器人的数量比工人更多。在一些生产线上，机械臂嗖嗖地修剪着领座、压平门襟。这些设备做了很多精细工作，像是确保香蕉共和国品牌服饰的珠光小纽扣上印有Banana这个词。改装自军用设备的以色列摄像头运用人工智能扫描布料中的瑕疵，自动化了最乏味的工作之一。

一些工人已被机器人取代，但生产率也已提高。尽管自2006年以来公司中国工厂的月平均工资增长了两倍，达到4500元，但公司的利润仍保持稳定。起初，工人对机器人的反应和英国路德派对待自动织布机的态度如出一辙。但现在，他们开始帮着设计机器人。溢达的经理开玩笑说，工人这么做是为了能偷点懒，让自己的工作更轻松。穿着黑色连衣裙和低跟鞋的中年女士颜姐（音译）21岁就进厂工作了。她担心许多手工缝制的服装质量不过关，就帮助公司的工程师设计了机械装置来更好地完成工作。现在她是一名高级经理，与总工程师明哥（音译）共同拥有几项产业专利。溢达的高管田野打趣说，女工们越来越懂技术，已不再是严格意义上的蓝领工人，但也还算不上白领，或者可以说是“格子或条纹领”工人。

自动化也有望在中美贸易对峙中帮助溢达。尽管两国存在摩擦，但溢达的董事长杨敏德实际上却在把对中国的投资翻倍。她大力宣传自己投资20亿

元人民币在风景如画的桂林新建的一家工厂，其中包括一间高科技纺纱车间，访客不得入内。到目前为止，溢达的产品还没被美国加征关税。但美国客户很紧张，因此如果有需要的话，公司可能会将一些生产转移到它在中国以外的工厂，例如毛里求斯，同时将其他生产线转回国内。

有两个因素很可能会促使中国制造商继续忠于本国市场。首先是本国市场的庞大規模。哈佛商学院的史兆威（Willy Shih）表示，庞大的市场规模能让制造商规模化地实践和完善生产流程，从而持续降低成本。另一个因素是机器人本身的能力。史兆威说，今天的机器有很多的“嵌入式知识”，中国可以迅速着手创造过去可能需要一代人的时间才能开发出来的新产品，例如具有顶级自动变速器的汽车。

在担心中国的制造业因贸易战而衰退时，有必要记住这一点。如果说溢达的经验能提供什么参考的话，那就是中国企业应该利用这个机会进一步提升效率，而不是在逆境中萎靡不振。从长远来看，这将让整个中国经济具备更强的韧性。 ■



The economy

Oh, for an assembly-line job

Worries about unemployment mount, but China has buffers of a kind

THE FACTORY town known as iPhone city used to pulse with life as workers got off their shifts. These days the complex that churns out roughly half of all Apple smartphones is quieter. A staff dormitory just beyond its gates is empty, its entrance sealed with barbed wire. A barbecue restaurant, a noodle shop and, fittingly, a mobile-phone outlet have all closed. At a karaoke bar where workers would croon into the wee hours on rest days, the owner was recently seen packing up his speakers.

The giant complex on the edge of the central city of Zhengzhou is run by Foxconn, Apple's Taiwanese manufacturing partner. It remains one of the world's busiest factories. But it is well off its peak, when as many as 350,000 people kept production humming around the clock. Workers say they are down to eight hours a day, five days a week. That means they are not doing the overtime that accounts for much of their pay. "It feels like they're forcing us to quit," says a six-year veteran.

Cao Yingying, a woman at a nearby recruitment centre, says they stopped hiring for Foxconn in late October because of Apple's disappointing sales. They still have other electronics factories as clients, but they are all suffering. "Washing machines, fridges, vacuum cleaners. Everyone now has these, and they last longer," she says. "So factories have fewer orders."

A slowing economy is putting pressure on jobs in China (though Apple's woes may involve other factors, too—see Business section). The official unemployment rate is stable at around 5%, but as always this figure is a poor guide. Surveys in the manufacturing and service sectors show that

companies have been cutting staff since at least September. Wage growth is tepid compared with the sizzling norm of a few years ago. In November profits at industrial firms fell for the first time in nearly three years.

When China's leaders met in December to map out economic policy for 2019, they said their priority would be to stabilise employment. They are anxious about social stability in a year studded with sensitive anniversaries. Among them will be the 30th of the Tiananmen protests, which involved economic grievances as well as political ones. Suppression of labour unrest has become even harsher in recent months. In one case, police detained more than 30 students and activists who had tried to help workers organise a union at a firm in the southern city of Shenzhen.

Worries about jobs are, so far, focused on the export sector. Trade matters less to Chinese growth than it once did, but it still, directly and indirectly, supports as many as 180m jobs, nearly one-quarter of formal employment, the government estimates. The trade spat with America has plunged firms into uncertainty. Exporters cut their demand for new hires in the third quarter by 53% compared with a year earlier, say researchers at Renmin University in Beijing. In December export orders fell at their sharpest rate in more than three years.

A second area of concern is the high-tech sector. As investors turn cautious, jobs are coming under threat. The starker example is Ofo, a bike-sharing company previously feted as an innovator. Today it is battling to survive. Search engines, online travel agencies and e-commerce websites have all reportedly trimmed staff. This could be bad news for this year's record number of university graduates (students in Zhengzhou are pictured at a job fair last year). Wang Xing, head of Meituan Dianping, a company known for its food-delivery app, captured the gloom last month with this line on his micro-blog: "2019 might be the worst year of the past decade, but it might also be the best year of the coming decade."

Industries undergoing cyclical slumps are a final area of concern. With the stockmarket down 30% in the past year, financial firms, especially brokerages, have cut staff. A property slowdown has led several big developers to freeze hiring.

How would China cope with a big rise in unemployment? In 2008 when the global financial crisis struck, millions of migrants left coastal factories and returned to the countryside. They did not have to wait long for prospects to improve. Half a year later the government revved up growth with a massive stimulus programme.

A similar exodus is less likely this time. The economy is profoundly different, in ways that should cushion workers from the slowdown. Services, from restaurants to couriers, now account for more of the economy than manufacturers, and they are more labour-intensive. But service jobs are even less secure than those in factories. Workers in China's vast gig economy—driving cars for hire, delivering food or trucking packages between cities—rarely get overtime pay or unemployment insurance, says Geoffrey Crothall of China Labour Bulletin, an NGO. Older people struggle. On a street in Zhengzhou, a man in his late 40s glumly surveys a board plastered with job ads. “They want young lads for the courier jobs. Faster on their bikes, faster on their smartphones,” he says.

China's economic situation differs from the financial tsunami of 2008 in another crucial way. This time the troubles have built up gradually, giving the government time to ready its defences. It has already started to help beleaguered companies. In December the State Council announced that firms which refrain from firing staff can get 50% refunds on unemployment-insurance payments. Officials have hinted that they will offer subsidies for those buying home appliances, a boost for manufacturers. And after initially taking a hard line in its trade dispute with

America, China has softened somewhat. That helped pave the way to talks between the two countries last week in Beijing that augured well for a deal, however fragile.

The government is also boosting its own recruitment. At a labour centre in northern Zhengzhou, once used for hiring Foxconn workers, the biggest ad is for jobs in Hami, a city in Xinjiang, the north-western region where officials have incarcerated vast numbers of ethnic-Uighur Muslims for “re-education”. Hami is looking for auxiliary police. “Join us to realise your dreams”, says the poster, with a picture of officers brandishing machine guns. Applicants, who must be between 18 and 35, are promised monthly salaries of at least 6,100 yuan (\$890), roughly the wages at Foxconn when the going was good. ■



经济

新流水线梦想

人们对失业的担忧在加剧，但中国还算有些缓冲

以往，每到工人下班那会儿，这个被称作“iPhone城”的工业区便充满了活力。如今这个生产了全球大约一半的苹果手机的园区没那么热闹了。距离厂门仅一步之遥的一栋员工宿舍已是人去楼空，带刺的铁丝网拦住了入口。一家烧烤店、一家面馆和一家近水楼台的手机专卖店全都关了张。过去工人们到了休息日便会在一家KTV唱到深夜，最近人们却看到歌厅老板在打包音箱。

这个大型园区位于郑州郊外，由苹果的台湾制造合作伙伴富士康运营。虽然目前这里仍是世界上最繁忙的工厂之一，但早已过了巅峰期。最高峰时，多达35万名员工在这里昼夜不停地生产。工人们说，现在他们的工作时间降到了一周五天，一天八小时。这意味着无班可加了，而他们收入的很大一部分来自加班费。“感觉他们像是在逼我们走人。”一位干了六年的老员工说。

附近一家招聘中心的女员工曹莹莹（音译）说，由于苹果的销量令人失望，他们在去年10月底就不再为富士康招工了。他们倒是还有其他一些电子产品工厂客户，但日子也都不好过。“现在家家户户都有洗衣机、冰箱、吸尘器，这些东西现在也更经用了，”她说，“所以工厂订单也没那么多了。”

经济放缓正给中国的就业带来压力（尽管苹果的困境可能还有其他原因）。官方公布的失业率维持在5%左右，但一如往常，这个数字没什么指导意义。对制造业和服务业的调查显示，至少从去年9月份起，企业一直在裁员。与几年前如火如荼的平均增速相比，工资增长不温不火。11月，工业企业利润出现了近三年来首次下滑。

上个月，中国领导人在开会制定2019年经济政策时表示，首要任务是稳定

就业。这一年里会有多个敏感的周年纪念日，令他们担心社会稳定。这之中包括天安门事件30周年，当年这一抗议活动不仅仅源于政治上的不满，也有经济上的。近几个月来，政府加强了对劳工骚乱的压制。在一起事件中，警方拘留了30多名学生和活动人士，他们试图帮助工人在深圳一家企业里组建工会。

迄今为止，人们对就业的担忧主要集中在出口领域。尽管贸易对中国经济增长的影响较以往已有所减弱，但中国政府估计，贸易仍然直接或间接地支撑了多达1.8亿个就业岗位，几乎占到正式就业的四分之一。与美国的贸易争端让一些公司前途未卜。中国人民大学的研究员表示，去年第三季度出口企业对新员工的需求同比减少了53%。12月，出口订单出现了三年多来的最大降幅。

第二个令人担忧的领域是高科技。随着投资者变得谨慎，就业正面临威胁。最明显的例子莫过于之前被追捧为创新者的共享单车公司Ofo。如今它正经历着生死考验。搜索引擎、在线旅行社和电子商务网站据说都在裁员。这对今年人数创记录的大学毕业生来说可能是个坏消息（上图为去年学生们在郑州参加招聘会的情景）。以外卖平台闻名的美团点评的CEO王兴上个月在自己的饭否主页上写道：“2019年可能会是过去十年里最差的一年，但却是未来十年里最好的一年。”悲观情绪可见一斑。

最后一个令人担忧的领域是正在经历周期性衰退的行业。去年股市下跌30%，以券商为代表的金融企业纷纷裁员。房地产市场放缓，几家大型开发商暂停了招聘。

中国将如何应对失业率大幅上升？2008年，当全球金融危机来袭时，数百万农民工离开沿海地区的工厂返回农村。他们并没有为景气好转而苦等太久。半年后，政府便出台大规模刺激计划，推动了经济增长。

这一次，类似的返乡潮不太可能出现。经济局面已与从前大不相同，应该能够缓冲经济放缓对工人的冲击。目前，从餐饮到快递的服务业在经济中的占比超过了制造业，其劳动密集度也更高。但是服务业的工作比工厂里

的岗位更加没有保障。非政府组织中国劳工通讯的杰弗里·克罗索尔

(Geoffrey Crothall) 指出，中国开出租、送外卖、开城际送货车等庞大零工经济中的工人很少有加班费或失业保险。年纪大一些的人处境艰难。在郑州的一条街上，一位年近五旬的男子查看着一块广告牌上贴满的招聘信息，神色阴郁。“他们想招年轻小伙子当快递员，”他说，“小伙子车子骑得更快，智能手机也用得更溜。”

中国目前的经济形势与2008年金融海啸时还有一个重要的不同之处。这一次问题是逐步积累的，政府有时间做好防御准备。政府已经开始帮助陷入困境的公司。上个月，国务院宣布，不裁员的企业可以获返还50%的失业保险费。官员们透露，他们将向购买家用电器的消费者提供补贴，这对制造商来说是一种鼓舞。另外，在对美贸易争端中最初采取了强硬路线之后，中国的态度已有所缓和。这为两国上周在北京举行的会谈铺平了道路。举行会谈对达成协议是个好兆头——不论是如何脆弱的协议。

政府自身也在促进就业。在郑州北部一个曾用来为富士康招工的劳工市场里，最大的一则广告是新疆哈密市的招工信息。在新疆，官员们监禁了大量维吾尔族穆斯林，让他们接受“再教育”。哈密正在招聘辅警。海报上写着“加入我们，实现梦想”，并配有一幅警官手持机关枪的图片。应聘者年龄须在18岁到35岁之间。岗位承诺月薪至少6100元，大致相当于富士康光景红火时的工资水平。 ■



Peak smartphone

Bad news for Apple. Good news for humanity

The maturing of the smartphone industry should be celebrated, not lamented

WHEN APPLE cut its revenue estimate for the last quarter of 2018 because of unexpectedly slow sales of iPhones, markets convulsed. The company's share price, which had been sliding for months, fell by a further 10% on January 3rd, the day after the news came out. Apple's suppliers' shares were also hit. Last week Samsung, the world's largest maker of smartphones by volume, which also sells components to other smartphone-makers, said its sales were weaker than expected for the quarter, too.

Analysts reckon that the number of smartphones sold in 2018 will be slightly lower than in 2017, the industry's first ever annual decline. All this is terrible news for investors who had banked on continued growth (see Business). But step back and look at the bigger picture. That smartphone sales have peaked, and seem to be levelling off at around 1.4bn units a year, is good news for humanity.

People have voted with their wallets to make the smartphone the most successful consumer product in history: nearly 4bn of the 5.5bn adults on the planet now have one. And no wonder. They connect billions of people to the internet's plethora of information and services. Phones make markets more efficient, compensate for poor infrastructure in developing countries and boost growth. Yes, they can be used for wasting time and spreading disinformation. But the good far outweighs the bad. They might be the most effective tool of development in existence.

The slowdown does not reflect disenchantment; quite the contrary. It is the result of market saturation. After a decade of rapid adoption, there is

much less scope to sell handsets to first-time buyers as so few of them are left. That hits Apple the hardest because, despite a relatively small market share (13% of smartphone users), it captures almost all of the industry's profits. But Apple's pain is humanity's gain. The fact that the benefits of these magical devices are now so widely distributed is something to be celebrated.

What about the people who still lack a smartphone? Sales of 1.4bn units a year implies 2.8bn users who replace their handsets every two years, or 4.2bn who replace them every three years. The reality is somewhere in between, and replacement cycles are lengthening as new models offer only marginal improvements. Many phones are used for longer than three years, often refurbished or as hand-me-downs. So even with flat sales, the longer gaps between upgrades mean that overall penetration is still rising. People who already have phones benefit, too. For all but the most obsessive gadget fans, the slowing treadmill of upgrades comes as a welcome relief.

Does that mean innovation is slowing? No. The latest phones contain amazingly clever technology, such as 3D face-scanners and cameras assisted by artificial intelligence. But as with mature technologies such as cars or washing machines, extra bells and whistles no longer make a deep impression.

More important is that smartphones support extra innovation in other areas. Deploying apps and services on an immature platform whose prospects are uncertain is risky; on a mature one it is not. Smartphones thus provide a foundation for today's innovations, like mobile payments and video streaming, and for future ones, such as controlling "smart" home appliances or hailing robotaxis.

As computers become smaller, still more personal and closer to people's bodies, many techies reckon that wearable devices, from smart watches to

augmented-reality headsets, will be the next big thing. Even so, finding another product with the scope of the smartphone is a tall order. The smartphone retains its promise as the device that will make computing and communications universal. The recent slowing of smartphone sales is bad news for the industry, obviously. But for the rest of humanity it is a welcome sign that a transformative technology has become almost universal. ■



智能手机销量触顶

苹果的坏消息，人类的好消息

智能手机行业走向成熟。哀哉？乐哉！

由于iPhone出乎意料地滞销，苹果公司调低了2018年第四季度的收入预期，引发市场震荡。1月3日，也就是这一消息传出后第二天，苹果已持续下滑数月的股价进一步下跌10%。其供应商的股价也受到打击。上周，全球销量最大的智能手机制造商三星（也向其他智能手机制造商销售零部件）表示2018年第四季度销售额也低于预期。

分析师认为，2018年智能手机销量将略低于2017年，这是该行业首次出现年度销量下滑。对于指望手机销量持续上升的投资者来说，这些消息很糟糕。但不妨后退一步，放眼全局。智能手机的销量见顶，可能停留在每年约14亿部的水平，这对普罗大众来说是个好消息。

人们用自己的钱包投票，让智能手机成为史上最成功的消费产品：全球55亿成年人中有近40亿拥有智能手机。这不足为奇。智能手机将数十亿人与互联网上形形色色的信息和服务连接起来。它们提升了市场效率，弥补了发展中国家基础设施的不足，促进了经济增长。诚然，人们也会用手机消磨时间和传播虚假信息。但其利远大于弊。它们可能是人类现有的最高效的发展工具。

销售放缓并不代表魅力尽失。恰恰相反。这实则是市场饱和的结果。经过十年的快速普及后，以首次购买者为对象的手机销售空间大幅缩窄，因为这样的消费者已所剩不多。这对苹果的打击最大，因为尽管其市场份额相对较小（占智能手机用户的13%），却几乎拿走了整个行业的利润。然而，苹果之痛正是大众之利。如今人类能普遍享受这些奇妙设备带来的便利，值得庆祝。

那些仍然没有智能手机的人呢？每年售出14亿部，意味着28亿用户每两年换一次手机或42亿用户每三年换一次手机。现实介乎这两者之间。而且由

于新机提升不大，人们的换机周期也在变长。许多手机的使用时间超过三年，常常是被翻新或转给他人使用。因此，即使销售持平，换机间隔拉长意味着智能手机的整体渗透率仍在上升。已经有手机的人也会受益。除了科技产品狂人，不需要频繁更换手机让其余人都更感轻松。

这是否意味着创新在放缓？并不是。最新的手机搭载了精妙的技术，例如3D人脸扫描器和人工智能相机。但是，与汽车或洗衣机等成熟的技术一样，新添加的花哨功能已无法让消费者惊艳。

更重要的是智能手机支持了其他领域的创新。在前景不明的不成熟平台上部署应用和服务是有风险的；反之则安全得多。因此，智能手机为现在与未来的创新提供了基础，无论是移动支付和视频流媒体，还是控制“智能”家电或网约无人驾驶出租车。

随着计算设备变得更小、更个性化、更贴身，许多技术人员认为，从智能手表到增强现实头盔的可穿戴设备将是下一大热门领域。即便如此，要找到另一个影响力能媲美智能手机的产品也是极为困难的。智能手机不负使命，成为普及计算和通信的设备。近期智能手机销售放缓对行业本身来说显然是个坏消息，但对于社会大众而言则是个令人欣喜的迹象，说明这项变革性技术已几乎惠及所有人。 ■



Burgernomics

Pick of the menu

Against the dollar, other currencies are at their cheapest in 30 years

THE BIG MAC, the flagship burger of the McDonald's fast-food chain, is a model of consistency. Composed of seven ingredients, the double-decker sandwich is produced in nearly identical fashion across more than 36,000 restaurants in over 100 countries. This consistency is the secret sauce in the Big Mac index, The Economist's lighthearted guide to exchange rates. According to our latest batch of data, almost every currency is undervalued against the dollar. The result is that the greenback itself looks stronger, relative to fundamentals, than at any point in three decades.

The Big Mac index is based on the theory of purchasing-power parity (PPP), which states that currencies should adjust until the price of an identical basket of goods—or in this case, a Big Mac—costs the same everywhere. By this metric most exchange rates are well off the mark. In Russia, for example, a Big Mac costs 110 roubles (\$1.65), compared with \$5.58 in America. That suggests the rouble is undervalued by 70% against the greenback. In Switzerland McDonald's customers have to fork out SFr6.50 (\$6.62), which implies that the Swiss franc is overvalued by 19%.

According to the index most currencies are even more undervalued against the dollar than they were six months ago, when the greenback was already strong. In some places this has been driven by shifts in exchange rates. The dollar buys 35% more Argentinian pesos and 14% more Turkish liras than it did in July. In others changes in burger prices were mostly to blame. In Russia the local price of a Big Mac fell by 15%.

It is not unusual for emerging-market currencies to look weak in our index.

But today the dollar towers over rich and poor alike. The pound, for example, looked reasonably priced five years ago. Today Americans visiting Britain will find that Big Macs are 27% cheaper than at home.

Such deviations from burger parity may persist in 2019. Exchange rates can depart from fundamentals owing to monetary policy or changes in investors' appetite for risk. In 2018 higher interest rates and tax cuts made American assets more attractive, boosting the greenback's value. That was bad news for emerging-market economies with dollar-denominated debts. Their currencies weakened as investors grew jittery. At the end of the year American yields began to fall as the global economy decelerated and investors anticipated a more doveish Federal Reserve. But the dollar has so far remained strong.

Although PPP is a poor predictor of exchange rates in the short-term, it stacks up better over long periods. An analysis of data going back to 1986 shows that currencies deemed undervalued by the Big Mac index tend to strengthen, on average, in the subsequent ten years (and vice versa). Something for investors to chew on.

To explore the full interactive version of the Big Mac index, visit Economist.com/bigmac ■



汉堡经济学

菜单中的精华

各国货币兑美元汇率跌至30年来最低水平

麦当劳快餐连锁的王牌汉堡“巨无霸”堪称一致性的典范。全球100多个国家的3.6万多家麦当劳餐厅用几乎一模一样的方法制作这种用到七种原料的双层肉饼夹心面包。这种一致性就是本刊的非正式汇率指南——巨无霸指数——的“秘制酱料”。根据最新的一组数据，几乎所有货币兑美元的汇率都被低估了。其结果就是，相对于基本面，美元看起来比过去30年的任何时候都更强势。

巨无霸指数是基于购买力平价（PPP）理论，即各国货币应该会自行调整，直到一篮子相同商品（在我们这里就是一个巨无霸汉堡）的价格在所有地方都相同。根据这个标准，大多数货币的汇率都远远偏离了这一目标。例如，巨无霸在俄罗斯的售价是110卢布（1.65美元），在美国是5.58美元。这表示卢布相对于美元被低估了70%。在瑞士，人们吃个巨无霸得花6.50瑞士法郎（6.62美元），这表示瑞士法郎被高估了19%。

该指数显示，大多数货币相对于美元被低估的程度比六个月前更甚，而那时美元就已经很强势了。在某些地方，这是汇率变动造成的。例如和去年7月相比，美元兑阿根廷比索和土耳其里拉分别上涨了35%和14%。而在其他地方，汉堡价格变化是主要原因。俄罗斯的巨无霸价格下降了15%。

在我们的指数中，新兴市场的货币看起来较疲弱，这不稀奇。但如今不管是富国还是穷国的货币，在美元面前都显得太过便宜了。以英镑为例，五年前它的价格看着还很合理。今天，身在英国的美国人会发现那里的巨无霸价格比本国便宜27%。

这种偏离汉堡平价的情况在2019年可能会持续下去。由于货币政策的影响或投资者风险偏好的变化，汇率可能会偏离基本面。2018年，美国的加息

和减税政策令该国资产的吸引力增加，提升了美元的价值。这对背负美元计价债务的新兴市场经济体来说是个坏消息。随着投资者越来越紧张，这些经济体的货币已走弱。去年年底，随着全球经济减速，加上投资者预期美联储的政策立场会更温和，美国国债收益率开始下降。但截至目前美元仍然强势。

虽然购买力平价在短期内并不能很好地预测汇率，但在长期内形成的预测就比较靠谱了。对早至1986年的数据进行分析后发现，平均来看，在巨无霸指数中显示被低估的货币往往会在之后十年里走强（反之亦然）。这一点值得投资者仔细考虑。

欲浏览完整巨无霸指数的交互式版本，请访问Economist.com/bigmac■



Indonesia's e-commerce binge

Island shopping

Local champions are battling Chinese-backed firms

PITY THE Indonesian courier. Delivering a package on the archipelago can be a daunting task. The country's 13,466 islands stretch across almost 3,000km and to reach a distant atoll might mean waiting weeks for a boat. Many people in remote areas lack a formal address; their roads are nameless and their houses often without number. Those with addresses sometimes rely on local landmarks—"the house by the big tree", for example. Even in big cities many streets have the same name.

Yet e-commerce startups and their investors are willing to tackle logistical headaches to become established in a promising market. Since 2015, when estimates began, the value of goods sold online has roughly doubled each year, to \$8-12bn presently. Only about 15% of Indonesia's population of 265m are believed to shop online but that should rise along with incomes and internet use. A report jointly written by Google and Temasek, Singapore's sovereign wealth fund, has forecast that the market will be worth \$53bn by 2025.

Competition among firms is already fierce. In the absence of Amazon, which has not ventured into Indonesia, two local companies, Tokopedia and Bukalapak, are thriving, and Chinese-backed regional companies have moved in. One is Shopee, a Singapore-based firm and subsidiary of Sea, a publicly-traded technology company that counts Tencent, China's internet giant, as a big shareholder. Another is Lazada, another Singapore-based e-commerce firm, owned by Alibaba. Both count Indonesia as their biggest market.

Tokopedia, Shopee and Bukalapak earn most of their revenues from selling advertising space on their platforms to online vendors, and from flogging extra services, such as data analytics. Bukalapak also charges commissions to some bigger brands. Only Bukalapak discusses its profits in Indonesia (it is in the red).

Each firm has distinct advantages. Tokopedia boasts reach. Partnerships with local logistics firms let it deliver to 93% of Indonesia's 7,000 or so districts. It also has substantial financial resources. In December it secured \$1.1bn in a funding round led by SoftBank, a Japanese internet and telecoms firm, and by Alibaba. Its value is reportedly \$7bn. And Tokopedia is growing faster than the market; sales on its platform quadrupled between 2017 and 2018.

Tokopedia and Bukalapak possess most local knowledge. The value of this, many point out, is demonstrated by the foray of Uber, a ride-hailing firm, into South-East Asia which ended last year when it sold its business to Grab, a startup based in Singapore. Local entrepreneurs have "lived the problems they are trying to solve", notes an investor in Bukalapak.

Useful information can be gleaned, for example, from Bukalapak's vast network of offline intermediaries. It has 400,000 "agents" around the country. Typically they run small, pre-existing neighbourhood shops in rural or suburban areas and act as a gateway to online shopping. At agents' stores a customer can place online orders, pay for goods and collect them, and the agent takes a cut of sales.

Lazada is betting heavily on running its own logistics empire. Its warehouse on Jakarta's outskirts is one of the country's biggest. About 1,000 employees help dispatch and restock thousands of goods, from groceries to laptops. Lazada has nine other similar centres across Indonesia and plans to build more. With warehouses pre-stocked with the goods its vendors sell, it offers

lower delivery costs and faster speed. Its network reaches 80% of the country, says Ashwath Ramesh, head of its logistics division.

Indonesians who shop online are as accustomed to doing so through their smartphones as are Chinese e-commerce consumers, and Shopee is investing in mobile. Its app lets customers chat online with buyers, a feature that Taobao, a Chinese e-commerce platform, launched. Around 60% of Shopee's sales happen after such an interaction. In addition, it allows buyers to follow their preferred sellers, tapping into the social e-commerce market, in which people sell goods on platforms such as Twitter and Facebook.

The battle among these firms is now for market share. Shoppers outside the big cities will be increasingly important—in 2017 such buyers accounted for 30% of the value of online sales, according to McKinsey, a consultancy, but by 2022 they will account for roughly half. For many, trust is still a worry as online fraud is particularly prevalent in Indonesia. Lazada therefore uses a cash-on-delivery model. Shopee's chat feature also helps alleviate the problem; so too do Bukalapak's agents. Tokopedia has opened three centres in small cities where customers can learn about e-commerce and vendors can take business classes. Wooing Indonesia's online shoppers takes many forms. ■



印尼的电商狂潮

海岛购物

本土冠军大战中资公司

印尼的快递员怪可怜的。在这片群岛上递送包裹可是项艰巨的任务。该国13,466个岛屿绵延近3000公里，要去边远的珊瑚环礁可能要等几个星期才有一班船。许多住在偏远地区的人没有正式的地址：他们所在的道路没有名字，房屋往往也没有门牌号。有地址的有时全靠当地的地标，例如“大树旁的房子”。而即使在大城市里，也有许多街道重名。

然而，电子商务创业公司和投资者愿意解决物流难题，以求在这个充满希望的市场上站住脚。自2015年有估算数字以来，印尼的网络销售额每年大约翻一番，目前为80至120亿美元。据信，印尼2.65亿人口中仅约有15%会在网上购物，但这个数字应该会随着人们收入和互联网普及率的提高而上升。谷歌和新加坡主权财富基金淡马锡联合撰写的一份报告预测，到2025年，印尼网购市场的规模将达到530亿美元。

企业之间的竞争已非常激烈。在亚马逊缺席印尼市场的情况下，两家本地公司Tokopedia和Bukalapak蓬勃发展，同时中资区域性企业纷纷涌入。其中一家是总部位于新加坡的虾皮购物（Shopee），其母公司是上市科技公司Sea，中国互联网巨头腾讯是Sea的大股东。另一家是来赞达（Lazada），也是新加坡的电子商务公司，为阿里巴巴所有。这两家公司都视印尼为自己的最大市场。

Tokopedia、虾皮购物和Bukalapak的大部分收入来自向网店销售其平台广告位以及推销其他额外服务，如数据分析。Bukalapak还向一些较大品牌收取销售提成。只有Bukalapak谈到了自己在印尼的盈利情况（目前处于亏损）。

每家公司都有自己的优势。Tokopedia胜在覆盖面广。它与当地物流公司建立了合作关系，这使它的递送服务覆盖了印尼约7000个地区的93%。其

财务资源也相当充裕。去年12月，它在阿里巴巴及日本互联网电信公司软银领投的一轮融资中获得11亿美元的投资。据报道，Tokopedia目前估值70亿美元。该公司的增长速度超越市场平均水平；其平台销售额在2017年至2018年间翻了两番。

Tokopedia和Bukalapak最了解本地市场。许多人指出，这方面的价值从网约车公司优步试图抢占东南亚市场的结局上可见一斑——优步去年把这块业务出售给了新加坡创业公司Grab。Bukalapak的一位投资者指出，本地企业家“对自己试图解决的问题是有亲身体会的”。

举例来说，Bukalapak可以从中庞大的线下中介网络收集有用的信息。它在印尼有40万名“代理商”，他们一般在农村或郊区经营现成的街边小店，充当网购门户的角色。顾客可以在代理商的店里下订单、支付货款及提取货物，代理商从销售额中提成。

来赞达正大笔投资自建物流帝国。它在雅加达郊区的仓库是印尼最大的货仓之一。大约1000名员工负责从日用杂货到笔记本电脑等数千种商品的发货和补货。来赞达在印尼各地还有九个类似的仓储中心，并计划建造更多。仓库会提前备好网店销售的商品，来赞达因而可以降低递送成本，提高速度。其物流部门负责人阿斯沃思·拉姆什（Ashwath Ramesh）表示，公司的网络覆盖全国80%的范围。

印尼人和中国的电商消费者一样，习惯用智能手机网购。虾皮购物正向移动端注资。其应用可让顾客与买家在线聊天，这是中国电商平台淘宝之前推出的一项功能。虾皮购物约60%的销售发生在此类互动之后。此外，该应用还提供让买家关注心仪卖家的功能，借此打入社交电商市场（商家在推特和Facebook等社交平台上销售商品）。

目前，这些公司之间争夺的是市场份额。大城市以外的购物者将变得越来越重要。根据咨询公司麦肯锡的数据，2017年这些购物者占网上销售额的30%，但到2022年他们将占大约一半。对于许多人来说，诚信仍是一个令人担心的问题，因为网络欺诈在印尼尤为猖獗。因此，来赞达采取了货到

付款的模式。虾皮购物的聊天功能也有助于缓解这一问题，Bukalapak的代理商模式也有同样的作用。Tokopedia在小城市开设了三个中心，顾客可以在那里了解电子商务，供应商可以参加业务课程学习。对印尼网购消费者的争夺可谓八仙过海，各显神通。■



Buttonwood

How the mighty fall

The fate of the dollar will shape financial markets in 2019

OVER THE holidays those who like their Christmas films free of seasonal cheer may have fixed on “The Lion in Winter”, with Peter O’Toole as Henry II and Katharine Hepburn as Eleanor, his estranged wife. Henry decides that none of his sons by Eleanor is a suitable heir and condemns them to death. Locked in a cellar as his father approaches, Richard resolves not to cower. “As if the way one falls down mattered,” mocks one of his brothers. “When the fall is all that is,” replies Richard, “it matters”.

Back at work, investors might usefully apply this aphorism to the fate of the dollar. In a volatile period for financial markets, it rose by 7% against a broad basket of currencies in 2018 and by 4% against a narrower group of rich-country currencies (see chart). One of the more robust principles of foreign-exchange trading is that what goes up must eventually come down. The dollar is over-valued on benchmarks, such as *The Economist’s* Big Mac Index (see Graphic Detail). It is due a fall. When that is all that is left, the manner of its falling will matter a great deal.

The bear case for the dollar is based on an expectation that GDP growth in America will slow markedly. Last year, it was boosted by tax cuts. That stimulus will fade. Interest-rate increases by the Federal Reserve will bite harder. A lower oil price is a factor. It hurts investment in America’s shale regions, but is a boon for oil-importing countries in Asia and Europe. America’s stockmarket is relatively dear. Its tech darlings no longer seem invulnerable. In short, an exceptional period for America’s economy is coming to an end. The dollar ought to lose ground, too.

But not just yet. In November Mansoor Mohi-uddin of NatWest Markets set out three pre-conditions for a decisive turn in the dollar: a “pause” by the Fed, a deal to end America’s trade dispute with China and signs of a pickup in the euro-zone economy. The first is now less of a hurdle. The Fed’s boss, Jerome Powell, hinted on January 4th that it might postpone further interest-rate increases. Talks on trade with China have resumed. But the economic data from Europe remain weak. Interest rates in America may not rise much further, if at all, but they are nevertheless higher than in Japan or the euro zone. Owning the dollar is still rewarding.

How might that change? Broadly, there are two scenarios. In the first, trade-war clouds begin to disperse. Tax cuts and looser monetary policy in China start to stimulate private-sector spending. That stirs other Asian economies, which in turn bucks up activity in the euro zone, which relies heavily on emerging-market demand. Bond yields rise in the expectation that interest rates will go up in Europe. They fall in America, as traders start to price in rate cuts. The dollar drifts down against the euro. A softish Brexit boosts the pound. Capital is pushed into emerging markets, in search of better returns. Stockmarkets rally, especially outside America. Everyone breathes a sigh of relief. It feels like 2017 again.

In the second scenario, the gap between GDP growth in America and elsewhere also narrows. But in this case, it does so solely because of a slowdown in America, rather than better news elsewhere. The trade dispute escalates. The continued uncertainty means China’s tax cuts are saved, and not spent. Further weakness in China causes other emerging markets to falter. The soft spot in the euro-zone economy turns out to be not temporary, but a reflection of weak export demand. Risk assets sell off across the board. The dollar falls sharply against the yen and the Swiss franc, habitual boltholes for the panicky. The euro stays weak. A shortage of safe-harbour currencies leads to a rising price for gold.

How closely reality conforms to one or other of these scenarios depends a lot on what happens in China. A trade deal with America would boost emerging-market currencies against the dollar, as would an effective fiscal stimulus. The path the dollar takes against rich-country currencies depends on the slowdown in America, says Kit Juckes of Société Générale, a French bank. If it is sudden, the dollar falls against the yen. If it is gradual, it falls against the euro.

How the dollar falls will be shaped by events and in turn will shape them. Investors who are wary of selling out of risk assets are advised by strategists at J.P. Morgan to take out some insurance by buying the yen, Swiss franc and gold—the assets that are likely to go up should things get rough. If a fall is all that is left, it matters that you have something to cushion it. ■



梧桐

巨人跌落

美元的命运将塑造2019年的金融市场

圣诞节里，也许有些不想看应景电影的人选择了看《冬狮》（The Lion in Winter）。其中彼得·奥托尔（Peter O'Toole）饰演亨利二世，凯瑟琳·赫本（Katharine Hepburn）饰演与他分居的妻子埃莉诺（Eleanor）。亨利断定他和埃莉诺所生的儿子中没一个人适合继承大统，并判他们死刑。父亲步步紧逼，被囚禁在地下室中的理查决意不再退缩。“好像倒下的方式很重要似的。”他的一个兄弟嘲笑道。理查回答说：“如果只能倒下，那方式是很重要。”

假期结束复工后，投资者或许可以用这句警句般的台词来贴切地形容美元的命运。在金融市场的动荡期，2018年美元相对广泛的一篮子货币上涨了7%；相对较小范围的富裕国家货币上涨了4%（见图表）。有涨必有跌是外汇交易中相对更稳固的法则之一。按《经济学人》的巨无霸指数等标准，美元是被高估了。它理应下跌。如果美元下跌在劫难逃，那么它的下跌方式将非常重要。

看跌美元源于对美国GDP增长显著放缓的预期。去年，减税政策推动了GDP增长。但这种刺激会逐步消退。美联储加息将会雪上加霜。油价下跌也是一个原因。这对美国页岩油产区的投资是个损害，对亚洲和欧洲的石油进口国却是个利好。美股目前相对昂贵。美国的科技宠儿们似乎不再坚不可摧。总之，美国经济的非凡时期即将结束。美元应该也会失势。

但还没到时候。去年11月，NatWest Markets的曼苏尔·毛希丁（Mansoor Mohi-uddin）阐述了美元出现决定性转折的三个先决条件，分别是美联储“暂停加息”、中美就结束贸易争端达成协议，以及欧元区显现经济复苏的迹象。第一个条件目前来看问题不是太大。1月4日，美联储主席杰罗姆·鲍威尔（Jerome Powell）暗示美联储可能会推迟进一步加息。与中国的

贸易谈判已经恢复。但欧洲的经济数据依然疲弱。美国的利率即使上调，幅度也不会太大，但还是高于日本或欧元区的利率。美元仍然值得持有。

但这一点可能会如何改变？大体有两种可能的情形。在第一种情况下，贸易战的阴云开始消散。中国的减税措施和更为宽松的货币政策开始刺激私营企业的支出。这带动了其他的亚洲经济体，它们反过来又提振了非常依赖新兴市场需求的欧元区的经济活动。对欧洲加息的预期带动债券收益率上升。而由于交易员们开始在定价中考虑美联储降息的可能，美国的债券收益率下跌。美元对欧元汇率缓慢下跌。英国的软脱欧推动英镑走强。资本被注入新兴市场，以寻求更好的回报。股市反弹，尤其是在美国以外。每个人都松了一口气。感觉像回到了2017年。

在第二种情况下，美国与其他地区之间GDP增长的差距同样缩小了。但这种缩小完全是因为美国的经济放缓，而不是其他地区的形势有多好。贸易争端升级。持续的不确定性让中国的减税所得被储存起来，而未用于支出。中国经济进一步疲软导致其他新兴市场衰退。人们发现欧元区经济中的弱点并非一朝一夕的事情，而是出口需求疲软的表现。风险资产被全面抛售。美元对日元和瑞郎这类惯常的避险货币大幅下跌。欧元依然疲软。避险货币短缺导致黄金价格上涨。

现实会更符合上述两种情形的哪一种，很大程度上将取决于中国的事态。中美达成贸易协议将提振新兴市场货币对美元的汇率，有效的财政刺激也有同样的作用。法国兴业银行的基特·朱克斯（Kit Juckes）表示，美元对发达国家货币的走势取决于美国经济放缓的方式。如果经济突然放缓，美元对日元会下跌。如果经济放缓是渐进的，美元对欧元就会下跌。

美元下跌的方式将受多种事件的影响，反过来又会影响这些事件。摩根大通的策略师们建议，对出售风险资产持谨慎态度的投资者可以通过购买日元、瑞郎和黄金来获得一些保险。如果形势恶化，这些资产可能会升值。如果美元下跌在所难免，有个缓冲物就很重要。■



American stock exchanges

Crashing the party

Another contender seeks to take on finance's craftiest oligopoly

ON JANUARY 7TH nine of America's largest brokers and banks said they planned to launch a new equities exchange, dubbed the Members Exchange (MEMX). Though it has yet to gain approval from the Securities and Exchange Commission (SEC), the share prices of Intercontinental Exchange (ICE), Nasdaq and CBOE, the parent groups of America's largest exchanges, fell by 2-3%. But MEMX is merely their latest reason to fret.

For more than a century stock exchanges were utilities: not-for-profit, self-regulated and owned by their broker members. Starting in the 1990s most became companies, often listed on their own exchanges. The New York Stock Exchange (NYSE) became publicly traded in 2006. Around the same time the SEC created the National Market System—rules designed to foster competition. Chief among these was Rule 611, the “order-protection rule”, which requires brokers to route trades to the exchange that displays the best price.

Together with advances in technology, the reforms enticed new entrants and created what looks like a fragmented market. America now has 13 equity exchanges and 44 off-exchange centres such as dark pools (platforms run by banks and others that match large orders privately). NYSE's share of equity trading has shrunk from 72% to 24% in a decade; off-exchange venues account for 36%. Meanwhile listing and transaction fees have dried up as fast-growing companies delay before tapping public markets or go private.

But incumbents have bounced back: revenues and earnings at Nasdaq and ICE (which owns NYSE) have jumped since 2014. This is partly because of

diversification, says Kyle Voigt of KBW, a bank. Both have bought European peers; they now make more money from trading and clearing derivatives than equities. But it is also because the market is less competitive than it seems. ICE, Nasdaq and CBOE have swallowed up all but one equity exchange and now account for 95% of public trades.

This re-consolidation has its origins in the reforms of 2005, which left exchanges with significant regulatory power. Eager to offer brokers some protection, the SEC capped transaction fees. But platforms have become remarkably canny at squeezing their customers in other ways. Three of their methods stand out.

First, the three exchange families have continued to run their various exchanges separately, even though some are very small. Two of NYSE's five have less than a 1% market share; Nasdaq's smallest pair do not reach 3% between them. Yet complying with Rule 611 means brokers have little choice but to track prices on every platform. "Most large institutions will tell you they won't trade with brokers who aren't members of all 13 exchanges," says Rich Steiner of RBC Capital Markets, a bank. Brokers must pay connection fees (among a growing range of charges) for every one.

Secondly, as well as the (slow and shaky) public feed of their data demanded by regulations, they also offer a higher-quality, dearer private one. They charge more for higher-speed connections, even enabling customers to rent computers within the exchange, allowing them to shave milliseconds off their execution time.

And finally, exchanges typically offer rebates to brokers based on their order volume. Such sweeteners amounted to nearly \$700m at Nasdaq in 2017. They then charge fees for accessing quotes and make a profit by pocketing the difference. More important, two market participants reckon, operators use rebates to try to lure quotes to specific exchanges, so as to keep more of

the total market pie in the family. Ordinary investors complain that all this informational asymmetry and artificial complexity favours high-frequency traders.

MEMX is not the first attempt to shake up the market: IEX, an independent equity exchange that launched in 2016, vowed to be the first venue “built for fairness”. It offers no rebates and seeks to repulse high-speed traders by routing incoming orders over a “speed bump”—a coil of fibre-optic cable that slows access to the market by 350 microseconds. IEX now trades more in value daily than the London Stock Exchange, says Brad Katsuyama, its co-founder. But its market share in America is below 3%.

Still, its arrival—and investors’ growing irritation—may have prodded the regulator into action. “It is time to put ‘exchange’ back in the Securities and Exchange Commission,” said Robert Jackson, one of its commissioners, in September. The SEC has since rejected requests to raise fees by NYSE and Nasdaq, and hosted a heated discussion with market participants about the cost of data. It has also said it will examine whether rebates make the market less efficient. Customers are once again pitted against exchanges. “It’s round two,” says John Ramsay of IEX.

The launch of MEMX could be the start of round three. It harks back to the times when exchanges were member-owned, promising to offer low-cost data and connectivity. But MEMX will also pursue profits, says Jamil Nazarali of Citadel Securities, a founding member. That will require scale. Its founders, which rank among America’s biggest sellers of securities, may seek to attract liquidity by bringing their order books onto the exchange—though that could lead customers to worry about potential conflicts of interest.

It is too soon to declare victory to the new contenders. Direct Edge and BATS, two low-cost challengers created by industry heavyweights a decade

ago, merged in 2014 and sold out to CBOE in 2017 after rapidly gaining market share. And the latest bout of competition may be slow to start. With America's government partially shuttered, the SEC's approval procedures are on hold. Gridlock on Capitol Hill could delay the opening bell. ■



美国证券交易所

踢馆

又一个竞争者尝试挑战金融行业最狡猾的寡头垄断

本月7日，美国最大的九家经纪商和银行表示计划推出一个全新的股票交易所，名为“会员交易所”（Members Exchange，以下简称MEMX）。虽然尚未获得美国证券交易委员会的批准，但美国最大几个交易所的母公司——洲际交易所集团（ICE）、纳斯达克和芝加哥期权交易所（CBOE）——的股价已下跌了2%到3%。不过，MEMX只是让它们烦恼的又一个新对手而已。

曾经在长达一个多世纪的时间里，证券交易所一直是一种公用事业：非营利、自我监管、由证券经纪商会员所有。从上世纪90年代开始，它们大多变成了公司，通常在自家交易所上市。纽约证券交易所于2006年上市。大约在同一时间，美国证交会推出了旨在促进竞争的“全国市场系统”规则（National Market System）。其中最主要的是611号规则，即“指令保护规则”，要求经纪商把交易转至报价最优的交易所。

这些改革（加之技术进步）吸引了新进者，创造了一个看似分散的市场。美国现在有13个股票交易所、44个场外交易中心，包括“暗池”（由银行和其他机构经营的私下匹配大宗交易的平台）。纽交所股票交易的份额在十年内从72%缩减至24%，而场外交易的份额达到36%。与此同时，由于迅速发展的企业推迟上市或转而私有化，交易所的上市和交易费收入已枯竭。

但传统交易所已经反弹：纳斯达克和拥有纽交所的洲际交易所集团的收入和盈利自2014年以来大幅上涨。投资银行KBW的凯尔·沃格特（Kyle Voigt）表示，这一定程度上是因为业务多元化。这两家交易所都收购了欧洲同行，现在它们的衍生品交易和清算业务比股票交易更赚钱。但还有一个原因是市场并不像看起来那样竞争激烈。洲际交易所集团、纳斯达克

和芝加哥期权交易所几乎吞并了所有股票交易所，只有一家股票交易所除外。这三家目前控制了95%的公开市场交易。

这种重新整合起源于2005年的一系列改革措施，交易所借此取得了相当程度的监管权。急于给经纪商提供一些保护的美国证会对交易费用设立了上限。但各个交易平台在通过其他方式压榨客户上变得极为精明。它们主要有三种方法。

首先，三个交易所集团继续让旗下各个交易所独立运营，即使其中一些规模很小。纽交所的五家公司中有两家的市场份额还不到1%；纳斯达克旗下最小的两家公司市场份额总共不到3%。然而，要遵照“611号规则”行事的经纪商别无选择，只能追踪每个平台的报价。“大多数大型金融机构都会告诉你，经纪商如果不是全部13家交易所的成员，它们是不会与之交易的。”加拿大皇家银行资本市场（RBC Capital Markets）的里奇·史坦纳（Rich Steiner）表示。除名目不断增加的各种收费之外，经纪商必须向每家交易所支付连接费。

其次，这些平台除了按法规要求提供公开数据传输外（缓慢且不稳定），还提供质量更高也更贵的私有数据传输。它们对更高速的连接收取更高的费用，客户甚至还可以在交易所内租用计算机，以便争夺毫秒之差。

最后，交易所通常会根据委托交易量向经纪商提供回扣。2017年在纳斯达克，这类甜头总计近七亿美元。然后，交易所再就查询报价收费，从两者的差额中获利。有两位市场参与者认为，更重要的是，交易所以回扣利诱，把报价引向特定交易所，从而把更多市场份额保留在自家交易所集团内。普通投资者抱怨这种信息不对称和人为的复杂性对高频交易者更有利。

MEMX并非企图改变市场的首个尝试：2016年，独立股权交易所投资者交易所（以下简称IEX）开张，誓言要成为第一个“为公平而成立”的交易所。它不提供回扣，并且让交易指令行经“减速带”（使指令抵达延迟350微秒的一卷光缆）来排除高速交易商。其联合创始人布拉德·胜山（Brad

Katsuyama) 表示，IEX目前的日交易金额已超过伦敦证券交易所。但它在美国的市场份额还不到3%。

尽管如此，IEX的出现加上投资者不满情绪与日俱增可能刺激了监管机构采取行动。“是时候把‘交易’放回美国证交会的工作议题中了。”证交会委员罗伯特·杰克逊(Robert Jackson)去年9月说。美国证交会此后驳回了纽交所和纳斯达克提高收费的请求，并与市场参与者就数据成本问题展开了激烈的讨论。它还表示将审查回扣会否降低市场效率。客户再次对战交易所。“这是第二回合。”IEX的约翰·拉姆塞(John Ramsay)说。

MEMX的推出可能会开启第三回合的战斗，重回交易所归其成员所有的年代，承诺提供低成本的数据和连接。但城堡证券(Citadel Securities，参与组建MEMX的九个机构之一)的贾米尔·纳扎拉利(Jamil Nazarali)表示，MEMX也将追求利润。这就需要规模。MEMX的创立者是美国最大的几家券商，它们可能会把各自的交易委托账本拿到MEMX，从而吸引流动性，不过这可能会令客户担心潜在的利益冲突。

现在就宣布新手获胜还为时过早。十年前，一些行业巨头创建了Direct Edge和BATS这两个低成本挑战者，两者在迅速攫取市场份额后于2014年合并，又在2017年被芝加哥期权交易所收购。况且，最新回合的竞争可能启动缓慢。由于美国政府部分关门，美国证交会的审批程序陷入停顿。国会山上的僵局可能导致开市钟迟迟不能敲响。■



University admissions

How straight is the gate?

Selectivity and equality are often thought to conflict; but there is contrary evidence

AMONG THE gilets jaunes on French streets last month were students protesting against the way the government is changing the university admissions system from one that admits pretty much everybody to one in which there is a modicum of selectivity. Objectors complain that the changes are inegalitarian. But figures from the OECD, a rich-country club, show that some of the most equal countries in Europe have the most selective systems, and vice versa.

Finland's tertiary education system is one of the most selective in Europe. Only a third of those who apply get in. Yet Finland also has one of the highest levels of intergenerational mobility in Europe, whether measured by educational outcomes or by the difference between parents' and children's social class. Finland's tertiary education system enjoys an unusual degree of autonomy: most of its universities are independent of the state.

France's university system, by contrast, has been run as an arm of the state since Napoleon decreed that it should be so in 1808, and it is one of Europe's least selective systems. University entrance is regarded as a right; students can sign up for courses in subjects they know nothing of. Last year's reforms, which allow universities to require students to take remedial classes if deemed necessary, will make little difference to that.

Yet despite France's inclusive tertiary system, the country performs poorly in terms of intergenerational mobility, whether measured by educational outcomes or professional class. That may be partly because only 40% of

students in France graduate within the expected period for their course, which is wasteful of resources and rough on morale. Drop-out rates tend to be higher among disadvantaged students.

Finland's approach to universities also pays off in terms of quality. It tops the Universitas 21 index, which ranks 50 countries by quality of university, controlled for GDP per head. France comes in at 19, below Greece and China. ■



大学招生 门有多窄？

筛选与平等往往被视为互相矛盾，但有证据表明并非如此

上月在法国街头参与“黄马甲运动”的人群里，有些学生抗议政府改变大学录取制度：以前几乎人人都可以读大学，现在引入了些微选择性。反对者抱怨说这样的改变有失平等。但是，由富裕国家构成的经合组织（OECD）的数据显示，欧洲一些最平等的国家有着最挑剔的招生体系，反之亦然。

芬兰的高校系统是欧洲筛选率最高的体系之一，只有三分之一的申请者被录取。但芬兰同时也是欧洲代际阶层流动性最高的国家之一，无论是以教育成果还是以父母与子女的社会阶层差异来衡量。芬兰的高等教育体系高度自治，大多数大学都不受国家管控。

相反，自拿破仑在1808年颁布法令规定法国的大学体系隶属于国家以来，法国大学一直如此运作，是欧洲最不挑剔的体系之一。读大学被视为一种权利，学生可以报读自己一无所知的专业。去年的改革允许大学要求学生在必要时参加辅导班，并不会给现状带来多大改变。

然而，尽管法国的高等教育体系“有教无类”，但法国在代际阶层流动性方面却表现不佳，无论是以教育结果还是职业阶层衡量都是如此。这在一定程度上可能是因为法国只有40%的学生在预期的课程时限内毕业，既浪费资源又让人受挫。弱势社群的学生辍学率往往更高。

在质量方面，芬兰的大学体制也表现优秀。在Universitas 21指数中，芬兰名列前茅。该指数按大学质量对50个国家进行排名，并根据人均GDP做调整。法国排在第19位，低于希腊和中国。 ■



Construction

The house made of wood

Buildings produce a huge amount of carbon. Using more wood would be greener

THE SECOND little pig was unlucky. He built his house from sticks. It was blown away by a huffing, puffing wolf, which promptly gobbled him up. His brother, by contrast, built a wolf-proof house from bricks. The fairy tale could have been written by a flack for the construction industry, which strongly favours brick, concrete and steel. However, in the real world it would help reduce pollution and slow global warming if more builders copied the wood-loving second pig.

In 2015 world leaders meeting in Paris agreed to move towards zero net greenhouse-gas emissions in the second half of this century. That is a tall order, and the building industry makes it even taller. Cement-making alone produces 6% of the world's carbon emissions. Steel, half of which goes into buildings, accounts for another 8%. If you factor in all of the energy that goes into lighting, heating and cooling homes and offices, the world's buildings start to look like a giant environmental problem.

Governments in the rich world are now trying to promote greener behaviour by obliging developers to build new projects to "zero carbon" standards (see International section). From January 1st 2019 all new public-sector buildings in the European Union must be built to "nearly zero-energy" standards. All other types of buildings will follow in January 2021. Governments in eight further countries are being lobbied to introduce a similar policy.

These standards are less green than they seem. Wind turbines and solar panels on top of buildings look good but are much less productive than

wind and solar farms. And the standards only count the emissions from running a building, not those belched out when it was made. Those are thought to account for between 30% and 60% of the total over a structure's lifetime.

Buildings can become greener. They can use more recycled steel and can be prefabricated in off-site factories, greatly reducing lorry journeys. But no other building material has environmental credentials as exciting and overlooked as wood.

The energy required to produce a laminated wooden beam is one-sixth of that required for a steel one of comparable strength. As trees take carbon out of the atmosphere when growing, wooden buildings contribute to negative emissions by storing the stuff. When a mature tree is cut down, a new one can be planted to replace it, capturing more carbon. After buildings are demolished, old beams and panels are easy to recycle into new structures. And for retrofitting older buildings to be more energy efficient, wood is a good insulator. A softwood window frame provides nearly 400 times as much insulation as a plain steel one of the same thickness and over a thousand times as much as an aluminium equivalent.

A race is on to build the world's tallest fully wooden skyscraper. But such edifices are still uncommon. Industry fragmentation, vicious competition for contracts and low profit margins mean that most building firms have little money to invest in greener construction methods beyond what regulation dictates.

Governments can help nudge the industry to use more wood, particularly in the public sector—the construction industry's biggest client. That would help wood-building specialists achieve greater scale and lower costs. Zero-carbon building regulations should be altered to take account of the emissions that are embodied in materials. This would favour wood as well

as innovative ways of producing other materials.

Construction codes could be tweaked to make building with wood easier. Here the direction of travel is wrong. Britain, for instance, is banning the use of timber on the outside of tall buildings after 72 people died in a tower fire in London in 2017. That is a nonsense. Grenfell Tower was covered in aluminium and plastic, not wood. Modern cross-laminated timber panels perform better in fire tests than steel ones do.

Carpentry alone will not bring the environmental cost of the world's buildings into line. But using wood can do much more than is appreciated. The second little pig was not wrong, just before his time. ■



建筑业

木头盖的房子

建筑物造成了大量碳排放。多用木材会更环保

第二只小猪真倒霉。他用木板盖了栋房子，结果一只狼猛吹一通，就给吹倒了，他自己随后也被狼吞下了肚。而他的兄弟用砖盖了间房，防住了狼。这则童话的作者可能是个建筑行业的宣传员，这个行业十分偏爱砖、混凝土和钢材这些建材。然而在现实世界中，如果有更多建筑公司效仿爱用木材的那只小猪，将有助于降低污染、减缓全球变暖。

各国领导人在2015年齐聚巴黎，一致同意争取到本世纪下半叶实现温室气体净零排放。这绝非易事，而建筑业更让这件事难上加难。仅水泥生产就占了全球碳排放的6%。一半用在了建筑业的钢材的占比为8%。如果再算上用于家庭和办公照明、采暖和制冷的能源，全世界的建筑就开始显现为一个巨大的环境问题了。

如今富裕国家的政府正尝试推行更绿色的生产生活方式，要求开发商按照“零碳”标准建设新项目。自今年1月1日起，欧盟所有新建公共建筑必须达到“近零能耗”标准。到2021年1月，其他所有类型的建筑物都将遵循这一标准。在另外八个国家，人们正在游说政府推出类似的政策。

这些标准并没有表面上那么绿色。安装在屋顶上的风轮机和太阳能电池板看着不错，但效率远不及风电场和太阳能电站。而且这些标准针对的只是建筑在使用过程中产生的排放，而并不涉及建设过程产生的排放。而一般认为，在一栋建筑整个生命周期的总排放量中，这部分排放占到了30%到60%。

建筑可以变得更绿色。它们可以增加再生钢材的使用，还可以在工地外的工厂中预制组件，大大减少对货运的需求。但各种建筑材料中，具有最让人兴奋的环保特性却也最受忽视的还是木材。

生产一个层压木梁和一个强度相近的钢梁，前者消耗的能源是后者的六分之一。由于树木在生长过程中会从大气中吸收碳，木构建筑也就能通过储存碳来帮助实现负排放。每砍伐一棵成材的树，就可以再补种一棵，继续捕集更多碳。旧建筑被拆除后，木梁和木板也很容易回收，用来建造新建筑。而如果想翻新旧建筑，让它们更节能，木材也是种很好的隔热材料。软木窗框的隔热效果几乎是相同厚度的碳钢窗框的400倍，是相同厚度铝制窗框的1000多倍。

一场争相建造全球最高全木构摩天大楼的竞赛已经打响。但这样的宏伟建筑仍不多见。由于行业分散、争夺合约的恶性竞争和低利润率，大多数建筑公司在达到法规要求之外已没什么钱来投资于更环保的施工方法。

政府可以帮助推动建筑业使用更多木材，特别是在公共部门这一建筑业的最大客户之中。这会帮助专业木构建筑建造商扩大规模、降低成本。零碳建筑法规应做出修改，计入建筑材料生产过程中的碳排放。这会让木材受到青睐，也会鼓励人们以创新方法生产其他建材。

相关部门或许可以调整建筑规范，让用木材建房变得更容易。而目前这方面的走向是错误的。例如，2017年伦敦一幢大楼起火造成72人丧生后，英国禁止高层建筑外立面使用木材。简直荒唐。格伦费尔大楼（Grenfell Tower）的外墙材料用的是铝和塑料，不是木材。在耐火试验中，现代的交错层压板材的表现优于钢制板材。

单靠木工行业并不能将全世界建筑带来的环境成本降至符合需要。但使用木材能带来的好处远超出人们已认识到的程度。第二只小猪并没有错，只是超前了。■



Bartleby

The spy who hired me

When employer health programmes go too far

THE NEW YEAR is the moment when people vow to improve their fitness. They join gyms, swear off alcohol and adopt detox diets. These resolutions usually do not last beyond January.

But some employers try to help their workers stick to their goals by offering “wellness” programmes. One of the longest-running examples began in 1979 at Johnson & Johnson (J&J), an American health-care company. The plan promotes weight loss, smoking cessation and efforts to reduce blood pressure. The firm claims it reduced medical costs by \$400 an employee per year, and resulted in fewer workers suffering from heart disease or high blood pressure.

Yet an examination of the data by Martin Cherniack of the University of Connecticut* found that in 2005-08, a sharp jump in alcohol use, depression and stress among J&J employees occurred. This coincided with a period when the firm had a target of lifting productivity by 9% a year. So the employees may have been leaner and fitter, but it is possible that workplace pressure to produce more meant greater stress.

All this suggests that employee well-being is a rather more complex topic than can be tackled by a programme devoted to exercise and healthy living. A study by RAND Europe, a research institute, found that obvious bad habits such as smoking and high alcohol use were in fact not associated with lower productivity, while obese workers were no more likely to take time off than anyone else. The biggest productivity problems were associated with lack of sleep, financial concerns and mental-health issues—factors that may well

be directly linked to work-related stress.

It seems reasonable for companies to expect some level of economic return on any wellness programme that they provide. But the trade-off should not be too blatant. Making employees fitter so you can work them a lot harder seems rather like drilling your infantry on an assault course before sending them to face the machine guns. A better impact on morale (and thus productivity) might occur if workers felt that their managers had a genuine interest in their welfare.

Any health programme that tries to alter workers' behaviour at home also raises privacy issues. There is a long tradition of employers taking an overly paternalistic attitude towards their staff. Titus Salt, a Victorian philanthropist, built a model village for his workers but banned alcohol from the village, smoking on the pathways and "loud behaviour". Henry Ford, the car maker, had a "sociology department" that would make unscheduled calls on workers to monitor their lifestyles; those who failed to make the grade were paid lower wages.

The modern equivalent of those practices revolves around technology. Some companies persuade their workers to wear a Fitbit or other device to monitor things such as their level of exercise, heart rate and sleep patterns. BP America introduced Fitbits in 2013. Those who reach certain goals, such as walking 1m steps a year, qualify for extra health benefits.

In a health system dependent on private insurance, there may be a case for giving workers such incentives, provided take-up is voluntary. There is a parallel with car insurance, where vehicle owners pay lower premiums if they are willing to have their driving monitored.

But there is less excuse in a country like Britain, which has a public health service. Nevertheless, research published in 2017 showed there had been a

37% leap in the share of British workers who had been offered a wearable device by their employer. Many people, however, will regard these as a spy on their wrists, transmitting information back to the boss. A PwC survey in 2016 found that 38% of British employees did not trust their firms to use the data collected in a way that workers would benefit.

At least you can take a Fitbit off (and some workers have reportedly strapped them to their dogs to boost their activity scores). A few firms, such as Mindshare, a media agency in Sweden, and Three Square Market, a tech firm in Wisconsin, have already moved on to the next stage: implanting a chip under a worker's skin. Employees gain a way to open doors and pay for meals in the canteen, but what do they lose in return? There is nothing wrong with employers offering a bit of fitness coaching. But nobody wants their boss to turn into a stalker.

* The Productivity Dilemma in Workplace Health Promotion, Scientific World Journal, 2015 ■



巴托比

雇我的间谍

当雇主的健康计划做过了头

新年是人们立誓提高身体素质的时候。他们走进健身房，发誓戒酒，采用排毒养生食疗。而这些决心一般坚持不到2月份。

但一些雇主推出了“健康”项目，试图帮助员工坚持实现目标。其中一个推行时间最久的项目是美国医疗保健公司强生于1979年启动的。它提倡减肥、戒烟和降血压。强生称此举每年为每位员工减少了400美元的医疗费，患心脏病或高血压的员工也减少了。

不过，康涅狄格大学的马丁·切尼克（Martin Cherniack）分析相关数据*后发现，2005年至2008年，强生员工饮酒、抑郁和精神紧张的情形激增。而正是在这一时期，公司制定生产率年增幅9%的目标。因此，员工们可能变得更精瘦、更健康了，但提高生产率的职场压力也可能让员工更加紧张。

所有这些都表明，员工福祉是个相当复杂的话题，不是一个注重锻炼和健康生活方式的项目就能解决的。研究机构兰德欧洲（RAND Europe）的一项研究发现，吸烟和酗酒等明显的坏习惯实际上与工作效率低下并无关联，而肥胖的员工请假的可能性也并不比其他人高。影响工作效率的最大因素与睡眠不足、财务方面的担忧和心理健康问题有关，而这些因素很可能与工作压力直接相关。

对企业来说，期望自己提供的任何健康计划都能产生一定的经济回报似乎也合情合理。但这种交换的动机不该太过赤裸裸。如果让员工更健康只是为了让他们加倍辛劳地为自己工作，那这就像在野战训练场操练步兵一番后，再派他们顶着机关枪的弹雨冲锋陷阵。如果员工感觉到老板们是真诚地关心他们的福祉，那么他们的士气（以及生产率）可能就会受到更正面的鼓舞。

任何试图改变员工居家行为的健康计划还会引发隐私问题。长期以来，雇主惯于以过于家长式的态度对待员工。维多利亚时代的慈善家提图斯·索尔特（Titus Salt）为他的工人们建立了一个示范村，但禁止在村里饮酒、在路上吸烟或“大声喧哗”。汽车制造商亨利·福特有一个“社会学部门”，会不定期给员工打电话，监督他们的生活方式，不达标的员工会被降薪。

现代的这些监控措施则是通过技术实现的。一些公司说服员工佩戴Fitbit手环或其他设备来监控他们的运动水平、心率和睡眠模式。BP美国公司在2013年开始使用Fitbit。那些达到特定目标的人，比如每年走满100万步，可以获得额外的健康福利。

在依赖私人保险的医疗体系中，给予员工这样的激励可能还有其道理，如果员工是自愿参加这种项目的话。这与汽车保险类似——如果车主愿意接受驾驶监控，就可以支付较少的保费。

但在英国这样提供公共医疗服务的国家，这么做的理由就没那么充分了。尽管如此，2017年发表的研究显示，在英国，由雇主提供可穿戴设备的员工比例激增了37%。不过，许多人会认为这些设备就是他们手腕上的间谍，会把信息传回给老板。普华永道2016年的一项调查发现，38%的英国员工不相信自己的公司会以对他们有利的方式使用收集到的数据。

至少你还能摘下Fitbit（据说有的员工为了提高运动评分，把它绑在自己的狗身上）。一些公司，如瑞典的媒体公司传立媒体（Mindshare）和威斯康辛州的科技公司Three Square Market，已经进入了下一个阶段：在员工的皮肤下植入芯片。员工多了一种开门和在餐厅里付饭钱的方式，但他们为此失去了什么？雇主提供一些健康指导没有错，但没人会希望自己的老板变成跟踪狂。

* 《提升职场健康过程中的生产率困境》，《科学世界期刊》，2015年 ■



Tackling corruption

Judge dread

America's extraterritorial legal campaign against business is undermining its own authority

FOR EUROPEAN firms operating in Asia, or Latin American and Asian firms hustling in Africa or the Middle East, business risks abound. Surprisingly high on the list of things that keep bosses awake with cold sweats at night is falling foul of America's Department of Justice (DOJ) or its Treasury Department.

The United States leads the world in punishing corruption, money-laundering and sanctions violations. In the past decade it has increasingly punished foreign firms for misconduct that happens outside America. Scores of banks have paid tens of billions of dollars in fines. In the past 12 months several multinationals, including Glencore and ZTE, have been put through the legal wringer. The diplomatic row over Huawei, a Chinese telecoms-equipment firm, centres on the legitimacy of America's extraterritorial reach (see Business section).

America has taken it upon itself to become the business world's policeman, judge and jury. It can do this because of its privileged role in the world economy. Companies that refuse to yield to its global jurisdiction can find themselves shut out of its giant domestic market, or cut off from using the dollar payments system and by extension from using mainstream banks. For most big companies that would be suicidal.

Wielding a stick is often to be applauded. Were it not for America's tough stance against FIFA, for instance, the dodgy officials who ran world football would not have been brought to book. But as the full extent of extraterritorial legal activity has become clearer, so have three glaring

problems.

First, the process is disturbingly improvised and opaque. Cases rarely go to court and, when they are settled instead, executives are hit with gagging orders. Facing little scrutiny, prosecutors have applied ever more expansive interpretations of what counts as the sort of link to America that makes an alleged crime punishable there; indirect contact with foreign banks with branches in America, or using Gmail, now seems to be enough. Imagine if China fined Amazon \$5bn and jailed its executives for conducting business in Africa that did not break American law, but did offend Chinese rules and was discussed on WeChat.

Second, the punishments can be disproportionate. In 2014 BNP Paribas, a French bank, was hit with a sanctions-related fine of \$8.9bn, enough to threaten its stability. In April ZTE, a Chinese tech firm with 80,000 employees, was banned by the Trump administration from dealing with American firms; it almost went out of business. The ban has since been reversed, underlining the impression that the rules are being applied on the hoof.

Third, America's legal actions can often become intertwined with its commercial interests. As our investigation earlier this month explains, a protracted bribery probe into Alstom, a French champion, helped push it into the arms of General Electric, an American industrial icon. American banks have picked up business from European rivals left punch-drunk by fines. Sometimes American firms are in the line of fire—Goldman Sachs is being investigated by the DOJ for its role in the 1MDB scandal in Malaysia. But many foreign executives suspect that American firms get special treatment and are wilier about navigating the rules.

America has much to be proud of as a corruption-fighter. But, for its own good as well as that of others, it needs to find an approach that is more

transparent, more proportionate and more respectful of borders. If it does not, its escalating use of extraterritorial legal actions will ultimately backfire. It will discourage foreign firms from tapping American capital markets. It will encourage China and Europe to promote their currencies as rivals to the dollar and to develop global payments systems that bypass Uncle Sam. And the DOJ could find that, having gone all guns blazing into marginal cases, it has less powder for egregious ones. Far from expressing geopolitical might, America's legal overreach would then end up diminishing American power. ■



打击腐败

骇人的判官

美国在商界的治外执法正在破坏自身权威

对于在亚洲经营业务的欧洲公司，或在非洲或中东运营的拉美和亚洲公司，商业风险大量存在。在让老板们胆颤心惊、夜不能寐的各种忧虑中，害怕触怒美国司法部或财政部出乎意料地排在前面。

在惩戒腐败、洗钱和违反制裁的行动上，美国领世界之先。过去十年，美国越来越多地对外国公司在美国境外发生的不当行为做出惩罚。众多银行已支付数百亿美元的罚款。在过去12个月里，包括嘉能可和中兴通讯在内的几家跨国公司都经历了一番司法煎熬。围绕中国电信设备公司华为的外交争议集中在美国治外法权的合法性上。

美国已自命为商界的警察、法官和陪审团。它能如此行事是因为它在世界经济中的特权地位。拒绝向美国全球司法管辖权屈服的公司可能会发现自己被拒于其庞大的国内市场之外，或被禁止使用美元支付系统，当然也就无法通过主流银行进行交易。对大多数大公司而言，这是自取灭亡。

这种挥舞大棒的举动常常值得称许。例如，若非美国对国际足联采取强硬立场，那些操控世界足坛的贪腐官员就不会被绳之以法。但随着美国治外法权的触角更清晰地显露出来，有三个问题也愈加明显。

首先，其执法过程随性且不透明，令人不安。案件很少进入法庭审理，而一旦以和解告终，相关高管又会被禁言。毫无审查压力之下，对于何种与美国的关联可令一项控罪受到美国的惩处，美国检方的解释愈加宽泛：现在，只要是与在美拥有分支机构的外国银行有间接联系，或使用了Gmail，似乎就够定罪的了。想象一下，假如有一天中国对亚马逊罚款50亿美元并监禁其高管，因为他们在非洲开展的业务虽未违反美国法律，却有违中国法规，并且他们还曾在微信上讨论这些业务。

其次，惩罚的力度可能过头。2014年，法国巴黎银行因违反制裁而被罚89亿美元，足以威胁其稳定。去年4月，拥有八万员工的中国科技公司中兴通讯被特朗普政府禁止与美国公司交易，几乎导致其破产。此后禁令被撤销，让人觉得法规的执行未免草率。

第三，美国的法律行动往往与其商业利益交织一起。正如我们本月稍早时的调查所解释的那样，针对法国领军企业阿尔斯通行贿问题的长期调查顺势促成了美国工业巨头通用电气对阿尔斯通的收购。美国的银行在欧洲竞争对手深受巨额罚款之累时抢得业务。有时美国公司也会被瞄上，比如高盛因卷入马来西亚的1MDB丑闻而正被司法部调查。但是，许多外国高管怀疑，面对美国法规，美国公司享有特殊待遇，也更懂得钻其中的空子。

作为反腐斗士，美国很值得引以为傲。但是，为了自身和他人的利益，美国需要寻找一种更透明、更适度和更尊重他国主权的方法。如若不然，它不断扩大治外法权的行动终将适得其反。这将令外国公司对美国资本市场望而却步，促使中国和欧洲推广自己的货币抗衡美元并开发绕过美国的全球支付系统。此外，美国司法部可能发现，对小案火力全开，再面对大案时就会弹药不足。美国的越界执法非但不会展示其地缘政治影响力，反而会最终削弱自身势力。 ■



America's extraterritorial reach

The French resolution

General Electric's takeover of Alstom shows how America's commercial interests and a corruption investigation became intertwined

OVER THE past decade, American legal and regulatory authorities have subjected scores of large foreign companies to extraterritorial actions. Paying large fines, which can exceed \$1bn, has often been the only way finally to settle such accusations of serious misconduct—typically, corruption or breaching sanctions—outside America. As a result, many bosses and executives are quietly paranoid about the long arm of American sheriffs.

Such cases, however, rarely go to trial, and the firms involved are limited in what they can say about them; surprisingly little is known about how the process works. *The Economist* has identified an exception: Alstom, a French power and transport group that faced an American legal action in 2010-15 and which sold the bulk of its assets to General Electric (GE) in a deal that was announced in 2014 and closed in late 2015.

The case of Alstom and GE is important for three reasons. First, the sums involved are huge: Alstom faced a \$772m fine, among the largest ever in a foreign corruption case prosecuted by America. GE paid \$17bn to buy the Alstom assets; their subsequent underperformance explains part of the American conglomerate's present dire straits, including the \$23bn loss it reported in October 2018.

Second, multiple sources of information mean that a reliable account can be constructed of how a legal process and a commercial one jointly produced a particular outcome for GE. A senior former Alstom executive closely involved in the scandal, Frédéric Pierucci, has published a book earlier this

month called “Le Piège Américain” (“The American Trap”). Mr Pierucci is no angel: he is a convicted criminal who, Alstom documents show, knew bribes were being paid to win a contract for a power plant in Indonesia. But we have reviewed American court documents and material from several French parliamentary inquiries (the last of them conducted in 2018), and spoken to industry executives.

Last, the case raises uncomfortable questions about American officials’ uncompromising techniques. It suggests that foreign companies may receive more lenient treatment if they pass into American ownership. The possibility of a link between Alstom’s legal woes and the sale of its crown jewels to GE has vexed French policymakers, not least Emmanuel Macron, France’s president.

Mr Pierucci’s private hell began in April 2013 when he was handcuffed upon arrival at New York’s John F. Kennedy Airport. The Frenchman knew his employer, Alstom, was in the midst of a protracted tussle with American authorities over bribery allegations. Having expected to be released rapidly, perhaps on bail, he did not share his predicament with his wife for four days. This legal wrinkle was no reason to push back his expected return by the weekend, he thought. Things did not turn out as he planned: Mr Pierucci did not emerge from prison until September 2018.

At around the same time, in 2013, Alstom was racing into commercial heavy weather. Its imperious chief executive, Patrick Kron (pictured below), who had by then presided over the company for a decade, deemed some of its units below scale to compete globally. He had good reason to be looking for a buyer for its flagship power division, which accounted for nearly three-quarters of the group’s revenues: demand was sagging for the turbines it sold to electricity-generation plants across the world, performance had been woeful for years and debt had swollen. And across the Atlantic, the chief executive of GE at the time, Jeff Immelt, was searching for a big end-of-

reign deal.

But the process of Alstom dismantling itself was being buffeted by an investigation dating from 2010 by America's Department of Justice (DOJ) into exactly how it had managed to bring home billions of dollars in contracts outside America. The French firm had been dragging its feet in responding to the DOJ, infuriating prosecutors. They suspected Alstom of paying a total of at least \$75m in bungs in Egypt, Saudi Arabia, the Bahamas, Taiwan and Indonesia, which won it \$4bn in contracts. Some of the bribes, including those Mr Pierucci had been involved with in Indonesia from 2002, had been paid by an American subsidiary, and Alstom had financed itself partly in America, giving American authorities their justification to chase Alstom in France and to punish it with a fine far greater than European corruption statutes might have levied. At the time, investors fretted that this could exceed \$1bn, damaging the company's balance-sheet and forcing a fire sale of its assets.

The prospect of this, and Mr Pierucci's legal troubles, weighed on Mr Kron as he pondered Alstom's future in mid-2013. The arrest shocked Alstom's top brass: around 30 senior executives were subsequently warned against travelling to America lest they share Mr Pierucci's fate. By spring 2014 at least three of his former associates at Alstom had been arrested by American authorities to bring pressure on the company to co-operate with the DOJ. Court documents suggest that prosecutors ended up with 49 hours of covertly-taped conversations inside Alstom, courtesy of executives-turned-informants.

Two elements of what happened next are disturbing. First is the treatment of Mr Pierucci. Now 51, heavy-set with a tall forehead and a provincial twang, the former industrial-equipment salesman could be typecast as an accountant, not the orange-jumpsuited prisoner he became upon his arrival

in America.

After three months in a Rhode Island high-security prison packed with violent offenders, he faced a plea hearing. The choice was stark. One route was to plead innocent and face trial; a risky proposition, since prosecutors in Mr Pierucci's case were pushing for charges which would translate into prison sentences ranging from 15 to 19 years. He was advised that preparation for the trial would take three years and would cost millions of dollars.

That left the option of pleading guilty, co-operating with the authorities, and facing only a few more months of prison. Mr Pierucci says he admitted that he was guilty of bribing Indonesian officials—which emails cited by the DOJ suggest he was aware of, even if he did not instigate the crime—on the understanding that he would receive a sentence of no more than six months, most of which he had served. But despite this he was detained for another year, then spent over three years out on bail from June 2014 to October 2017, and then went back for another year in jail. He says he spent over 250 days at one point without seeing direct sunlight or breathing outside air.

Part of Mr Pierucci's outrage reflects America's harsh judicial system: a legal playbook devised to bring down mobsters and racketeers has since been repurposed for the corporate world. Europe's approach to white-collar criminals is softer, for better or worse. But Mr Pierucci's claim that he was an “economic hostage” carries weight. DOJ officials have indeed linked his imprisonment to Alstom's failure to co-operate with their inquiry.

The broader worry is that the DOJ's investigations distorted Alstom's sale process, giving an edge to a potential American purchaser. The French parliament has returned time and again to the circumstances of the deal with GE. For a country that once blocked the takeover of a yogurt firm,

Danone, on the basis of its strategic importance, the sale to a foreign rival of a firm that maintained turbines for France's nuclear power stations and submarines remains highly sensitive.

According to executives there at the time, Alstom first explored a deal with GE just after Mr Pierucci's guilty plea in July 2013. Legal pressure on Alstom, and on Mr Pierucci, seemed to ease once it became possible that much of his employer would come under GE's ownership. For one thing, the arrest of executives stopped. The fourth to be detained in the case, while in the American Virgin Islands, was seized one day before news of the deal became public on April 24th 2014. Two months later, in the same week that Alstom's top brass signed off on the sale to GE, Mr Pierucci's long-standing bid to be released on bail was approved, after 14 months inside.

There is no suggestion of wrongdoing by GE itself, merely that American supremacy in imposing anti-corruption norms globally may have given American firms an advantage. GE had an edge over non-American firms vying to buy Alstom's assets, such as Siemens of Germany and Mitsubishi of Japan, insofar as their legal departments may have been less well-versed in negotiating American legal settlements.

That mattered. In the purchase agreement, GE agreed to pay whatever fine was meted out to Alstom Power for past wrongdoing, even though the fine the French firm faced also related to past activities of other parts of the group. Foreign rivals interested in joining the bidding would also have to gauge the size of that potential legal liability, but may have been at a disadvantage: GE, like other American firms, employs multiple former DOJ staffers, according to their LinkedIn profiles. (Later, the DOJ decreed that what remained of Alstom in France should pay the fine, not GE.)

An American group such as GE could also help Alstom navigate judicial waters. Lawyers for GE conferred with the French firm's lawyers ahead of

its agreement with the DOJ, long before the deal formally closed. The DOJ settlement mentions how GE promised to “implement its compliance programme and internal controls” at Alstom. In American courts, such assurances may carry more weight coming from well-known local firms, not foreign ones. Unlike Siemens, which has also felt the weight of the DOJ on corruption charges, Alstom was able to avoid an intrusive American “monitor” being embedded inside the firm. Insofar as the aim of American prosecutors was to wean Alstom off its wayward behaviour, the job could in effect be outsourced to GE.

Mr Kron has been repeatedly asked by parliamentarians if legal pressure—perhaps on him personally— influenced his decision to sell most of Alstom to GE. He forcefully denies this, dismissing links between the sale and the DOJ investigation as the work of conspiracy theorists. But the theory has gained traction in high places. Questioned by parliament in 2015, the then economy minister, Emmanuel Macron, said it had been “his heartfelt belief” that pressure from the DOJ had weighed on Mr Kron. “Personally, I was myself convinced of the causal link between the investigation and Mr Kron’s decision [to sell to GE], but we have no proof,” he said.

On December 19th 2014, at an extraordinary meeting of shareholders in Paris, Mr Kron got formal support for the sale. Disheartened retail shareholders in the auditorium cheered those who opposed the deal (institutional shareholders had backed it). One asked Mr Kron if Alstom’s legal troubles had forced this unexpected event. “Stop banging your head trying to find fictitious arguments to justify a good deal,” Mr Kron replied. “This kind of masochism is terrible!” Both GE and Alstom declined to comment for this article; the DOJ did not respond to calls for comment.

The Alstom purchase has backfired dramatically for the American group. Troubles at GE’s power division explain in part why its shares have collapsed

by two-thirds in the past five years (see chart). Mr Immelt's successor, John Flannery, an architect of the Alstom deal, was fired on October 1st, after a year in the hot seat. Alstom lives on at home in France as a smaller group, and is trying to persuade European regulators to allow its last big business unit to be absorbed by Siemens.

Looking back, Mr Kron, who stepped down as Alstom's boss a few months after its main assets were sold, sees what happened at GE as vindication that his thinking was guided by commercial logic, not judicial pressure. Insofar as GE overpaid for Alstom's assets, the deal counts as a resounding victory for the French group's erstwhile shareholders.

Yet the method by which America secured a legal settlement was brutal. In order to be legitimate, a legal process must be transparent and independent—and be seen to be so. In this case, the legal process and the commercial one became uncomfortably intertwined. On the very same winter day in 2014 that the sale to GE was approved by shareholders, Alstom's lawyers signed documents admitting charges brought by the DOJ. They agreed to settle these with the \$772m fine. Alstom's legal troubles were now over, just as the company, as it once was, ceased to exist. ■



美国的治外执法长鞭

法国巨头的和解之旅

GE收购阿尔斯通表明美国的商业利益和反腐调查盘根交错

过去十年中，美国的司法和监管机构已对许多外国大公司发起治外执法。对于这些涉嫌在美国境外发生的严重不当行为（通常是腐败或违反制裁令）的指控，企业最终往往都只能通过支付可能超过10亿美元的巨额罚款达成和解。因此，许多企业老板和高管们私下对美国执法机构挥舞的长鞭有种种猜疑。

然而，这些案件很少进入庭审，涉案公司也被限制对外公布案情，因此人们对案件过程所知少之又少。《经济学人》找到了一个例外：法国电力和交通集团阿尔斯通（Alstom）。它在2010至2015年间面临美国的法律诉讼，并将大部分资产出售给了通用电气（GE）。这笔交易于2014年宣布，2015年末完成。

阿尔斯通和GE的这个案例很重要，有三个原因。首先，该案所涉金额巨大：阿尔斯通面临7.72亿美元的罚款，是美国对外国企业的腐败起诉中罚款金额最多的案件之一。GE出资170亿美元收购阿尔斯通的资产，这些资产后来表现不佳，一定程度上导致了GE目前的困境，GE于去年10月公布的230亿美元的亏损也受此拖累。

其次，凭借多个信息来源，我们可以可靠地还原出法律程序和商业程序是如何合力给GE带来了这样的结果。阿尔斯通的前资深高管弗雷德里克·皮埃鲁奇（Frédéric Pierucci）曾深陷这桩丑闻。他本月稍早时出版了一本书，叫《美国陷阱》（Le Piège Américain）。皮埃鲁奇并非全无差错，他是一名被定了罪的罪犯。阿尔斯通曾为了赢得印度尼西亚一家发电厂的合同而行贿，该公司的文件显示，皮埃鲁奇对此知情。但我们也查阅了美国法院文件和法国议会若干次调查的材料（最后一次调查是在2018年），并访问了行业高管。

最后，美国官员在这宗案件中的强硬手段引发了令人不安的问题。该案表明，如果外国企业的所有权转给了美国公司，就可能获得更宽大的处理。阿尔斯通面对麻烦的官司与其将拳头业务出售给GE之间可能存在关联，这让法国政策制定者甚为恼火，尤其是法国总统马克龙。

皮埃鲁奇个人的厄运始于2013年4月，他在抵达纽约的约翰·肯尼迪机场时被戴上了手铐。这位法国人知道他的雇主阿尔斯通很长时间以来一直在与美国当局就贿赂指控纠缠不清。他以为自己很快就会获释，也许是被保释，所以接下来的四天里他都没有告知妻子自己被捕了。他以为这点法律上的小波澜不会推迟自己原定周末回家的计划。但事情没有如他所愿：他直到2018年9月才出狱。

大约在2013年的同一时间，阿尔斯通加速滑入业务上的寒冬。专横的首席执行官柏珂龙（Patrick Kron，见下图）当时已执掌公司十年之久，他认为公司部分业务的规模不足以参与全球竞争。他有充分的理由为公司的电力部门寻找买家：这个占公司收入近四分之三的旗舰部门向全球的发电厂销售涡轮发电机，但需求正在萎缩，多年来业绩糟糕，债务膨胀。而在大西洋彼岸，时任GE首席执行官的杰夫·伊梅尔特（Jeff Immelt）正在寻找一笔自己收山之前的大买卖。

但是，阿尔斯通剥离自身业务的行动受到了美国司法部一项调查的冲击。该调查始于2010年，目的是追究阿尔斯通是如何在美国境外将数十亿美元的合同收入囊中的。这家法国公司对美国司法部的调查一直不积极合作，激怒了检察官。他们怀疑阿尔斯通在埃及、沙特阿拉伯、巴哈马、台湾和印度尼西亚至少支付了共计7500万美元的贿赂，从而赢得了价值40亿美元的合同。部分贿款是由阿尔斯通在美国的一家子公司支付的，其中包括皮埃鲁奇卷入其中的、自2002年开始的在印度尼西亚的贿赂。再加上阿尔斯通还在美国进行了部分融资，这给了美国当局正当的理由在法国追究阿尔斯通的责任，并对其处以远高于根据欧盟反腐法案可能施加的罚款。当时，投资者担心罚款可能会超过10亿美元，进而损害公司的资产负债表，迫使他们甩卖资产。

到了2013年年中柏珂龙思考阿尔斯通的未来时，罚款可能造成的影响以及皮埃鲁奇的官司问题让他深感担忧。皮埃鲁奇被逮捕一事令阿尔斯通高层大受震动，大约30名高管随后被警告不要前往美国，以免遭受同样的厄运。到2014年春天，美国当局至少逮捕了三名皮埃鲁奇在阿尔斯通的前同事，借以向该公司施压，逼其配合司法部调查。法庭文件显示，在被发展为线人的几名高管的帮助下，检察官最终获得了阿尔斯通内部谈话49小时的秘密录音。

接下来发生的事情有两方面令人不安。首先是皮埃鲁奇受到的对待。这位现年51岁的前工业设备销售员体格健硕、高额头，说话带地方口音，一副会计师的模样，而不是抵达美国后那个身穿橙色连体囚服的囚犯。

皮埃鲁奇被关在罗德岛戒备森严的监狱，里头关押的都是暴力罪犯。被关了三个月之后，他出席了一次认罪协议听证会。面前的选择很严酷。一条路是不认罪，接受审判。这很冒险，因为该案检察官指控的罪名一旦成立，他将被判处15至19年监禁。而且律师告诉他，准备审判将需要三年时间，花费数百万美元。

这样就只有认罪这条路可走了。与当局合作，再坐几个月的牢就可以出去了。皮埃鲁奇说，他承认贿赂了印尼官员——司法部用作证据的电子邮件表明他对行贿一事知情，即使此事不是由他授意去做的。他选择认罪是因为他以为这样就会获判不超过六个月的刑期，而他被拘留的时间已经可以抵消大部分刑期。但尽管如此，他还是又被拘禁了一年，随后在2014年6月至2017年10月的三年多里获保释出狱，之后又回监狱坐了一年牢。他说，他曾连续250多天见不到太阳或呼吸不到室外的新鲜空气。

皮埃鲁奇的愤怒一定程度上反映了美国司法制度之严厉：原本意在打击暴徒和敲诈勒索者的法律已调转枪头指向商界。不论好坏，欧洲对待商业罪犯还是比较温和的。但皮埃鲁奇声称他是“经济人质”的说法有一定道理。美国司法部官员确实将对他的判罚与阿尔斯通不配合他们的调查联系了起来。

更广泛的担忧是美国司法部的调查扭曲了阿尔斯通出售资产的流程，为潜在的美国买家创造了优势。法国议会已多次讨论阿尔斯通与GE达成协议的情况。法国曾经以战略重要性为由阻止了外国企业收购酸奶公司达能，对该国而言，把一家为法国核电站和潜艇维护涡轮发动机的公司卖给外国竞争对手仍是一件非常敏感的事。

据当时的高管说，2013年7月皮埃鲁奇认罪之后，阿尔斯通首次与GE探讨了收购协议。在阿尔斯通向GE出售大部分资产成为可能之后，阿尔斯通和皮埃鲁奇身上的法律压力似乎都有所缓解。至少，没有其他高管再被逮捕了。案件中第四个被拘留的高管是在美属维尔京群岛被捕，那是2014年4月24日收购交易消息公布的前一天。两个月后，阿尔斯通的高层签署了出售协议，在同一周，已被拘留14个月的皮埃鲁奇一直在申请的保释获准。

GE本身并没有显现任何不当行为，只是美国在全球进行反腐执法的强势做法可能给美国企业创造了优势。相对于德国的西门子和日本的三菱等非美国企业，GE在竞购阿尔斯通的资产时享有优势，那些公司的法律部门在按照美国法律谈判和解方案方面可能没有GE那么轻车熟路。

这一点很重要。在收购协议中，GE同意支付阿尔斯通电力（Alstom Power）因过往不法行为所招致的任何罚款，即便其所面临的罚款也与阿尔斯通集团其他部门过往的行为有关。有兴趣加入竞标的外国竞争对手也必须衡量收购中可能涉及多大的法律责任，但它们可能有个劣势：从领英档案可以看出，GE与其他美国公司一样，聘用了多名前司法部官员。

（后来，司法部判定应由法国阿尔斯通的剩余部门来支付罚款，而不是GE。）

GE这样的美国集团还可以帮助阿尔斯通应对司法环境。早在收购正式结束之前很久，GE的律师在阿尔斯通与司法部达成协议之前就与这家法国公司的律师进行了磋商。美国司法部的和解协议中提到，GE承诺在阿尔斯通“执行其合规程序和内部控制”。在美国法院，这种来自知名本地企业的保证可能会比外国企业更有分量。西门子也感受到了美国司法部反腐败

指控的压力，不过和西门子不同，阿尔斯通避免了在公司内部安插一个美国“监视机构”的情况。如果美国检察官的目的是让阿尔斯通断绝其不端行为，那么这项工作实际上可以外包给GE。

法国议会的议员们一再要求柏珂龙解释法律上的压力——也许是针对他个人的压力——是否影响了他做出将阿尔斯通大部分资产出售给GE的决定。他强烈否认这一点，把收购交易和美国司法部调查之间的联系斥为阴谋论者的幻想。但是这个想法已经受到了政府高层的关注。时任经济部长的马克龙2015年在议会回答质疑时说，“他发自内心地认为”美国司法部的压力影响了柏珂龙。“就个人而言，我坚信调查与柏珂龙决定（向GE出售资产）之间存在因果关系，但我们没有证据。”他说。

2014年12月19日，在巴黎举行的临时股东大会上，柏珂龙得到了对出售资产的正式支持。会议厅里，沮丧的散户股东为那些反对这笔交易的人加油助威（而机构股东表示支持）。有人问柏珂龙，是否是阿尔斯通的法律问题迫使集团令人意外地出售资产。“别再挠破头要为一笔好交易去找些子虚乌有的理由了，”柏珂龙答道，“这种受虐癖很可怕！”GE和阿尔斯通都拒绝就本文发表看法，美国司法部也没有对评论请求作出回应。

收购阿尔斯通对GE产生的影响大大出乎意料。过去五年中GE的股价下跌了三分之二，其电力部门的麻烦要负部分责任（见图表）。伊梅尔特的继任者约翰·弗兰纳里（John Flannery）一手策划了阿尔斯通的收购案，他在这个棘手的位置上干了一年后于去年10月1日被解雇。在出售资产后，阿尔斯通以较小的规模继续在法国发展，并正试图说服欧盟监管机构允许西门子收购其最后一个大型业务部门。

柏珂龙在主要资产被出售的几个月后卸任。回首过去，他认为GE后来的情况证明他的决定是基于商业逻辑，而不是司法压力。就GE对阿尔斯通的收购价格过高这一点而言，这笔交易对阿尔斯通的前股东来说是一个巨大的胜利。

然而，美国实现诉讼和解的方法是蛮横的。为了保证合法性，法律程序必

须透明、独立，并且要能被外界看到。在此案中，法律程序和商业程序互相交错，令人不安。2014年的一个冬日，GE的收购要约得到了阿尔斯通股东的批准，就在同一天，阿尔斯通的律师签署文件，承认了美国司法部提出的指控。他们同意以支付7.72亿美元的罚款来达成和解。阿尔斯通的法律纠纷就此落幕，正如曾经的阿尔斯通集团也已不复存在。■



European banking

Open plan

The promised financial revolution is still on the horizon

FEW EXPECTED an overnight sensation. Still, January 13th 2018 was supposed to mark a big step towards exposing the European Union's banking systems to digital competition. The EU's revised payment services directive (PSD2) came into effect; so did a British variant, Open Banking, the fruit of an investigation by the national competition watchdog. A year on, there is little sign of a stampede to switch banks. Yet progress is quietly being made.

In essence, the new rules seek to ensure that digital technology sharpens competition, by loosening banks' grip on customers' financial data, but without compromising security. They allow third parties, whether tech firms or other banks, to gather information from several accounts—with customers' permission—in one place, so that people can manage their finances better. They also make it easier for third-party firms to pay online merchants directly from customers' accounts.

Open Banking is obligatory only for Britain's nine biggest banks, although others have signed up. Not all of these were ready at the start. "For the past 200 years banks have focused on keeping customer data and not letting anyone else get at it," says Emmet Rennick of Oliver Wyman, a consulting firm. "In the past year or two they've been told, 'That's not the game'. But they have improved their act. Some are rolling out their own aggregation apps. The average response time of banks' APIs—the software which gives access to the permitted data—to queries from third parties was halved between July and November.

Even so, Jaidev Janardana, chief executive of Zopa, a British online lender, says that the biggest improvement would be a slicker connection between Zopa's smartphone app and those of would-be borrowers' banks. (Applicants used to have to send PDFs of bank statements to confirm their incomes; now Zopa can look through banks' APIs.) Only half the applicants who reach this stage complete it: at banks with the clunkiest apps, a mere 15-20% do.

How banks' APIs will function elsewhere in Europe is also a thorny question. Until that is answered, "important parts of the political and regulatory landscape will remain unclear," says Daniel Kjellen of Tink, a Swedish account aggregator. Last year the European Banking Authority, a regulator, drew up technical standards, due to come into force in September. Banks are supposed to have APIs in place well before then, so that third parties can test them and regulators approve them.

Financial-technology firms worry, for example, that banks will redirect customers to their own apps to authorise the use of data. This could make the process cumbersome and put people off new services. Another concern is that standards may proliferate, raising third parties' costs and doing little to unify Europe's banking markets. The Berlin Group, which involves dozens of banks and financial firms, has published a common framework. Some regulators are also promoting national standards.

An open question is how much appetite Europeans have for more open banking. People are notoriously loth to abandon their banks. Yet there are signs of latent demand: Yolt, an aggregator owned by ING, a Dutch bank, already boasts more than 500,000 British users; online banks are making a splash. In 2019 banks and upstarts alike may get closer to an answer. ■



欧洲银行业

开放计划

承诺的金融革命才刚刚起步

没什么人指望这事能一步登天。不过，2018年1月13日这天还是被设想成欧盟银行系统向数字化竞争敞开所迈出的一大步：欧盟的支付服务指令第二版（PSD2）生效；与此同时，由英国竞争监管机构的调研成果所催生的一个类似的规定“开放银行服务计划”（Open Banking）也在当天生效。如今，一年过去了，并没有出现什么客户蜂拥换银行的情况。不过进步正在悄然发生。

本质上，这些新规定试图在不损害安全性的前提下，放松银行对客户金融数据的控制，以确保数字技术促进竞争。它们允许第三方——无论是科技公司还是其他银行——在客户许可的情况下把多个账户的信息集中到一起，这样人们就能更好地管理自己的财务。新规还令第三方公司能更便捷地从客户的账户直接向在线商家付款。

开放银行服务仅对英国最大的九家银行强制执行，不过其他银行也已参与进来。并非所有的银行一开始就已准备就绪。“过去200年里，银行一直致力于保管客户数据，不让他人获取，”咨询公司奥纬（Oliver Wyman）的埃米特·伦尼克（Emmet Rennick）表示，“在过去的一两年里，它们却被告知‘不能这么干了’。”但银行的做法已经有所改进。一些银行正在推出自己的聚合应用。从去年7月到11月，银行API（即提供对开放数据访问的接口）对第三方查询的平均响应时间缩减了一半。

即便如此，英国家贷平台Zopa的首席执行官杰德夫·贾纳尔达纳（Jaidev Janardana）表示，最大的进步还是Zopa的智能手机应用与准借款人的手机银行应用之间的连接变得更顺畅了。（过去，申请者必须发送银行对账单的PDF文件来证明自己的收入情况，现在Zopa可以通过银行的API查看。）进行到这一步的申请者只有一半最终完成贷款。而在那些应用最不

好用的银行，这个比例只有15%到20%。

银行的API将如何在欧洲其他地方发挥作用也是个棘手的问题。瑞典账户聚合平台Tink的丹尼尔·凯伦（Daniel Kjellen）表示，在这个问题得到解答之前，“政治和监管形势的重要环节不会明晰”。去年，监管机构欧洲银行管理局（European Banking Authority）起草了技术标准，预计将于9月开始执行。而银行应该在此之前早早将API准备就绪，这样就可以由第三方测试并由监管机构批准。

金融科技公司有自己的担心，例如，银行会将客户重新导向它们自己的应用，来授权数据使用。这可能会导致流程变得繁琐，让人们对新服务望而却步。另一个担忧是标准可能层出不穷，这不仅会增加第三方的成本，也几乎无助于统一欧洲银行市场。由数十家银行和金融公司组成的柏林集团（Berlin Group）公布了一个通用框架。一些监管机构也在推广国家标准。

欧洲人对更开放的银行服务有多大兴趣还是个未知数。人们是出了名地不愿意改换银行。但潜在的需求也开始显现：荷兰银行ING旗下的聚合平台Yolt号称已经拥有超过50万名英国用户；网上银行正在吸引大量关注。2019年，各家银行和新兴企业可能都会更快知道问题的答案。■



The global car industry

The big freeze

Carmakers scramble to prepare for a chilly future as sales in China shrink

DETROIT'S MOTOR show, which opened on January 14th, is taking place in the winter for the last time before the event moves to the summer months in 2020. Escaping an icy chill is also at the forefront of the minds of the carmakers gathered there. A rash of recent announcements about restructurings, a new alliance between Ford and Volkswagen (VW) and the likelihood of more to come are aimed at avoiding pain in an industry heading for a downturn and preparing for longer-term upheavals. The risk is that none of them proves to have been big or radical enough.

Cutting costs is a priority for many firms as car sales look likely to fall, and the need to invest in new technology becomes more urgent. Earlier in January Ford unveiled the European end of a global effort to cut costs by \$14bn a year, which may see 24,000 of its 200,000 workers laid off. Jaguar Land Rover (JLR), owned by Tata Group of India, also said that it will lay off 4,500 employees as part of a plan to save £2.5bn (\$3.2bn). On January 15th Ford and Volkswagen gave details of a cost-sharing alliance that Jim Hackett, Ford's boss, calls the "next industry-transforming event". The next day poor preliminary results sent Ford's shares sliding, emphasising the plan's urgency.

All carmakers are worried that a global slowdown could turn into a rout as cyclical declines and a trade war bite at the same time. Their foremost concern is that years of bumper growth in the most profitable markets is coming to an end. Both America and Europe are still on a high in terms of sales (see chart) but China, a vital source of profits for most firms, is causing a severe headache. The world's largest car market shrank for the first time in

over 20 years in 2018. Sales fell by 2.8% to 28.1m vehicles and slid by 13% in December, giving a taste of what may be in store this year.

Trade troubles and other problems could add to the cyclical pain. Donald Trump has foreign carmakers in his sights. To redress what he regards as an iniquitous trade deficit with Europe, he has threatened import tariffs on its cars. UBS, a bank, reckons that the worst case—tariffs of 25%—would see the American market shrink by 12% next year. Europe faces not only the disruption of Brexit but declining sales of diesel-powered vehicles.

Even if coping with these problems were not enough, carmakers also need to make big investments in electric cars, autonomous vehicles and “mobility” services, such as car-sharing and ride-hailing. Take-up of the latter could cause car sales to plummet. Bain & Co, a consulting firm, says that America’s driving-age population is not growing (a trend mirrored in the rest of the world), while a generational switch to mobility services, such as robotaxis, will hit sales further. The firm reckons that the American market, currently 17m cars a year, could shrink to 10m by 2025.

Even before the latest round of announcements, carmakers had been downsizing and leaving loss-making countries or market segments. They have then been reassigning investments to where they make most difference. GM announced big lay-offs and factory closures last year and in 2017 sold Opel, its European arm, to France’s PSA, for example. The French firm, loss-making until Carlos Tavares took over in 2014, has stopped making less profitable models. Also in 2017, Fiat Chrysler Automobiles (FCA’s chairman, John Elkann, sits on the board of *The Economist*’s parent company) likewise stopped making saloon cars in America to concentrate on higher-margin SUVs. Ford is said to be considering an exit from South America.

Cutting costs and boosting profits to shore up balance-sheets is one way of insuring against a turbulent future. Another is to share costs. The tie-up between Ford and vw is the most prominent recent example of the web of alliances that characterise the car industry. Some alliances are explicitly aimed at preparing for the future. In 2017, for example, Toyota teamed up with Mazda and Denso, a Japanese partsmaker, to develop EVs.

Yet Ford and vw disappointed many investors who had hoped their alliance might be closer. There had been rumours of imminent collaboration on electric vehicles, autonomy and mobility services, but the two firms in fact said they would make only conventional vans and pick-ups together. They have firmly ruled out equity ties that could deepen their relationship.

Pressure for alliances or full mergers among firms is unlikely to go away. Consolidation may be the only way to bring the scale of cost savings that the industry needs in order to take on American tech giants, such as Google, that have transport in their sights. Both Sergio Marchionne, FCA's boss until he died unexpectedly last year, and Carlos Ghosn, who built the Renault-Nissan-Mitsubishi alliance, the world's biggest carmaker (who is detained in a Japanese prison on charges of financial misconduct), have in the past called for more consolidation. Sanford C. Bernstein, an equity research firm, says that 2019, too, will be a year of "endless M&A rumours" as demand wobbles and costs soar.

Yet big alliances, not to mention crossborder transactions, are fiendishly hard to handle. Mr Ghosn's detention has put in serious doubt the future of the world's biggest tie-up. Indeed, many believe the charges against him have been trumped up by Nissan as a way to block his plans for a full merger. Mr Marchionne's death has robbed the industry of a big personality who wanted consolidation and who had proved that a big transatlantic deal could work.

Most car bosses who remain are not the sort of imposing characters who could initiate and see through a mega-merger. The only candidate is probably Mr Tavares, who has turned around both PSA and Opel in quick time. But his hands are full completing that deal. As the cold bites, the industry may struggle to cope. ■



全球汽车产业

大寒流

中国市场萎缩，汽车制造商手忙脚乱地迎接寒冬

底特律车展于1月14日开幕。这是该车展最后一次在冬季举行，明年会改在夏季。参展的汽车制造商最关注的也是如何逃离席卷汽车行业的凛冽寒冬。近期一些企业纷纷发布了重组计划，福特也与大众结成了新联盟，其他车厂可能也会有类似举动。种种这些都是为了让自己在行业步步走向衰退的情况下免吃苦头，并为长期的动荡做好准备。风险在于这些举措到头来还是不够大刀阔斧。

鉴于汽车销售行将下降，而投资新技术的需求变得愈加迫切，削减成本便成了许多公司的首要任务。福特力图在全球范围内每年削减140亿美元成本，1月稍早时该公司公布了它在欧洲的减支计划，其20万工人中可能会有2.4万人因此被解雇。印度塔塔集团旗下的捷豹路虎（JLR）也表示将裁员4500人，作为节省25亿英镑（32亿美元）计划的一部分。福特和大众为分担成本而成立了联盟，福特的老板吉姆·哈克特（Jim Hackett）称之为“下一个改变行业的事件”。1月15日，两家公司公布了联盟的细节。次日，福特公布了糟糕的初步估算年度营收数字，导致公司股价下滑，突显了该计划的紧迫性。

所有的汽车制造商都担心，在周期性衰退和贸易战的两相夹击下，全球范围的行业放缓可能会演变成一场大溃败。最让它们忧虑的是，在那些最有利可图的市场中，持续多年的大幅增长行将结束。美国和欧洲的汽车销量仍处于较高水平（见图表），但在对大多数公司都是重要利润来源的中国，情况十分令人头疼。2018年，这个全球最大的汽车市场录得20多年来首次萎缩，新车销量下滑2.8%，至2810万辆，12月下滑了13%，从中可以想见今年可能会是怎样的年景。

贸易争端和其他问题可能会加剧周期性困境。特朗普已经盯上了外国汽车

制造商。为了纠正他认为存在于美欧之间极不公平的贸易逆差，他威胁要对欧洲汽车加征进口关税。瑞银（UBS）估计，如果最坏的情况发生——即美国决定加征25%的关税，那么明年美国汽车市场将萎缩12%。欧洲不仅面临英国脱欧带来的冲击，还有柴油车销售下滑的状况。

就算解决了这些问题也还不够，汽车制造商还需要大笔投资于电动汽车、无人车和“轻松出行”服务，例如汽车共享和网约车服务。人们对这类服务的认可和接受可能导致汽车销量骤降。贝恩咨询公司（Bain & Co）表示，美国的驾龄人口目前停止增长（世界其他地区也出现了类似的趋势），而随着一代人转向机器人出租车之类的出行服务，汽车销售将进一步受创。美国市场目前的汽车年需求量为1700万辆，贝恩估计到2025年可能会缩减到1000万辆。

在最新一轮重组公告发出之前，汽车制造商就已经在缩减规模并撤离业务亏损的国家或细分市场，然后将投资重新分配到效益最佳的地方。例如，通用汽车于去年宣布了大规模裁员和关闭工厂的决定，2017年它将旗下的欧洲子公司欧宝出售给了法国的标致雪铁龙集团（PSA）。在卡洛斯·塔瓦雷斯（Carlos Tavares）于2014年接任之前，这家法国公司一直在亏损，如今它已停止生产利润较低的车型。同样在2017年，菲亚特·克莱斯勒汽车公司（FCA，其董事长约翰·埃尔坎[John Elkann]为《经济学人》母公司的董事会成员）同样决定停止在美国生产轿车，而专注于生产利润率更高的SUV。有传言称福特正在考虑退出南美市场。

要想顶住未来的动荡，削减成本、提高利润以支撑资产负债表是一个办法。另一个是分摊成本。汽车行业已形成一个联盟网络，福特与大众之间的合作便是近期最突出的例子。一些联盟的成立明言是为将来做准备。例如，2017年，丰田与马自达和日本零件制造商电装（Denso）决定合作开发电动汽车。

不过，许多投资者之前都希望福特和大众的联盟能更紧密，结果令他们失望。有传言称这两家公司即将在电动汽车、无人驾驶和出行服务方面展开合作，但事实上两家的说法是它们只会合作生产传统的厢式货车和皮卡。

它们坚决表示不会建立起可能会深化彼此关系的股权联系。

要求企业间形成联盟或完全合并的压力不大可能消失。谷歌已盯上了交通运输业。要对抗谷歌之类的美国科技巨头，汽车行业成本节约就需要达到一定的规模，而整合也许是实现这一规模的唯一途径。去年意外去世的FCA老板塞尔吉奥·马尔乔内（Sergio Marchionne）和打造了全球最大汽车制造商雷诺-日产-三菱联盟的卡洛斯·戈恩（Carlos Ghosn，因涉嫌财务不端行为被日本警方收监）过去曾呼吁进行更多的整合。证券研究公司盛博（Sanford C. Bernstein）表示，由于需求动荡和成本飙升，2019年同样会是充斥着“无休止的并购传闻”的一年。

然而，大型联盟极难驾驭，更不用说跨境的并购交易。戈恩被拘一事让人严重怀疑这个全球最大的合作联盟未来的走向。事实上，许多人认为是日产捏造了对他的指控，为的是阻止他推行完全合并的计划。马尔乔内去世后，汽车行业就少了一号既想推进整合、又成功证明了跨大西洋的大规模交易切实可行的大人物。

大多数仍旧在位的车企老板都不是那种意志坚决、能够发起并完成巨型合并的人。快速扭转了标致雪铁龙和欧宝局面的塔瓦雷斯也许是唯一的候选人，但他正为了完成对欧宝的收购而忙得不可开交。寒潮来袭，汽车行业恐怕难以应付。■



Digital media

Primal screens

Parents may loathe them, but they are here to stay

“TURN OFF media, turn on life”, urges the promotional video from South Korea’s Nori Media Education Centre for the Prevention of Internet Addiction, an organisation funded by a mixture of private and public money. Its manager, Kwon Jang-hee, is passionate about protecting children from the ill effects of the internet, and above all of smartphones, which he considers most damaging of all because of their omnipresence. Parents do not understand how dangerous the internet is, he says, pointing to a study by Seoul National University that detected similarities between the brain activity of cocaine addicts and computer-games enthusiasts. If he had his way, youngsters would have to wait for their smartphones until they had graduated from high school.

In one of the world’s most highly connected societies there is little chance that he will get his wish, but plenty of South Korean parents agree that their children are overdosing on screens. A recent government survey on smartphone and internet addiction put the share of three- to nine-year-olds at high risk of addiction at 1.2% and that of teenagers at 3.5%. That may not seem a lot, but when it happens the effects can be devastating. Some of these children are on their phones for at least eight hours a day and lose interest in offline life. Having tried and failed to wean them from their devices, their desperate parents turn to the government, which offers various kinds of counselling, therapy and, in extreme cases, remedial boot camps.

Hong Hyun-joo, who works on the boot-camp programme for the regional government of Gyeonggi, South Korea’s most populous province, says the kids undergoing the treatment are usually aged 14-16, with about the same

number of boys and girls. They hand in their smartphones when they arrive at the boot camp and spend 12 days living in dormitories, eating regular meals and engaging in lots of sport and group activities. The aim is to increase their self-esteem and get them to make friends. They mostly start off sullen but gradually become more co-operative. The claimed “cure” rate (meaning a return to more normal usage) is 70-75%. But the camps can take only a few hundred children a year, not remotely enough to meet demand. That would take a lot more money.

South Korea is thought to have the world’s highest rate of problematic internet use among both children and adults, but concern about children’s growing use of digital media in the West is also rising, especially in America. In 2015, the latest year for which internationally comparable figures are available, nine out of ten 15-year-olds across the OECD had access to a smartphone. They spent an average of 18½ hours a week online, nearly five hours more than in 2012, so the figure is probably even higher now. About 16% of these kids were extreme users, defined as spending more than six hours a day online. The number of children who did not use the internet at all was vanishingly small.

Moreover, children are starting on digital devices at ever younger ages. In Germany 67% of 10- to 11-year-olds already have their own smartphones, rising to 88% for 12- to 13-year-olds, according to Bitkom, an industry association. In Britain 83% of 11- to 12-year-olds and 96% of 13- to 14-year-olds have their own phones, says Childwise, a research outfit. What do these kids do on their smartphones? “Stuff,” says John, a 12-year-old living in north London. That turns out to mean sending messages and talking to his friends, watching video clips, playing computer games and going on Snapchat and Instagram. His ten-year-old sister does not have a smartphone yet, but uses an internet-enabled iPad. Their parents ration the children’s screen time (as the vast majority of parents do), but sometimes there is room for negotiation.

Infants and toddlers use digital devices such as tablets when they can barely speak, let alone read and write. The American Academy of Paediatrics used to advise parents to keep children under two away from screens altogether, but now says that video chatting is acceptable even for the very young. For two- to five-year-olds, it reckons, an hour a day of high-quality programming is fine. Some experts think it is still being way too conservative.

Opinions on the effects of children's digital-media habits are deeply polarised. At one extreme, Jean Twenge, a psychology professor at San Diego State University, says it all with the title of her recent book, "iGen: Why Today's Super-Connected Kids are Growing up Less Rebellious, More Tolerant, Less Happy—and Completely Unprepared for Adulthood—and What That Means for the Rest of Us". The smartphone, she argues, has radically changed the lives of the generation of American children born between 1995 and 2012, wherever they live and whatever their background. She thinks excessive use of the internet and social media makes them lonely and depressed and poses serious risks to their physical and particularly their mental health, sometimes to the point of driving them to suicide.

Others note that similar warnings were sounded when television started to spread in the second half of the 20th century. At the time it was widely believed that if children spent long hours watching it every day, they would become dumb, fat and lazy. Now watching TV together is seen as a valuable family activity for parents and children. When technologies such as the radio, the written word or printed books were new, they were also demonised to begin with.

Some of the risks attached to internet use have barely started to be considered. For example, children are already generating large amounts of data, beginning when they are still in the womb as their parents put the

first scan of the baby online, and continuing across multiple channels as the child is constantly recorded interacting with devices and programmes. These data can never be retracted. They will be available to third parties and there is no telling how they will be used. The effects may not become clear until many years after the event, says Monica Bulger of Data & Society, a research organisation that studies the social and cultural impact of data-heavy technologies.

Its founder, Danah Boyd, in a book called “It’s Complicated: The Social Lives of Networked Teens”, concedes that spending too much time online can be bad for adolescents, if only because it leaves less time for other activities. But she also argues that since most young people these days have fewer opportunities and less time to get out and see their friends, they need somewhere else to talk among themselves in private. The internet offers them such a forum. Certainly the youngsters themselves seem to appreciate it. Across the OECD, 84% of 15-year-olds say they find social networks online very useful, and more than half of them feel bad if they cannot get online.

Daniel Kardefelt-Winther of the Innocenti research office of Unicef, the United Nations’ children’s agency, looked at all the evidence he could find on how children’s use of digital technology affected their mental well-being, their social relationships and their physical activity, and found less cause for alarm than is often suggested. Most of the studies he examined seem to show that the technology helps children stay in touch with their friends and make new ones. In the 1990s and early 2000s, when the internet was relatively new, such benefits seemed less clear because it seemed to isolate people, but now that almost everybody is online, it has become a busy and sociable place.

What spending so much time looking at screens does to children’s health is hard to gauge. Although it clearly reduces physical activity, which may be bad for their general well-being and cause weight gain, the causal direction

is not clear. It may be that children put on weight because they eat too much unhealthy food, perhaps egged on by advertising they have seen on some screen or other, and become less active as a result.

The relationship between the use of digital technology and children's mental health, broadly speaking, appears to be U-shaped. Researchers have found that moderate use is beneficial, whereas either no use at all or extreme use could be harmful. But in either case the effects are very small, and children generally prove surprisingly resilient to moderate or even high levels of screen time. Although there are clear instances of overuse, terms like "addiction" or "compulsive use" may be overblown. There is no real evidence that spending too much time online severely impairs the user's life in the longer term, as drug abuse often does.

This is not to say that there is no need for concern. Mental-health problems represent the largest burden of disease among young people. One study across ten OECD countries found that a quarter of all young people had a mental disorder. Even a small addition to that share would be a bad thing. And heavy users of social media and video games often suffer from sleep deprivation, which seems to be associated with anxiety and depression. But again it is not clear which is the cause and which the effect.

Cyberbullying is also becoming more prevalent, though it directly affects a relatively small proportion of children, and experts think it is generally less damaging than the physical kind. And people on social media try to make their lives seem more glamorous than they really are, which can make children feel left out.

Sonia Livingstone, a professor of social psychology at the London School of Economics, has spent decades looking at the relationship between children, media and the internet. She concludes that screens are often held responsible for the broader anxieties of parents living in a high-stress

environment, without much evidence that they do great harm. What worries her more is that screens are becoming part of the middle-class armoury for perpetuating social advantage, with children from well-off homes being enrolled in private classes to learn skills like “How to be a YouTuber”, which poorer parents cannot afford. That echoes concerns across the Atlantic about child-rearing becoming a new battleground for class warfare.

It is hard to be categorical about screen use. What is good for one child of a particular age may be bad for another one of a different age. But it is clear that, particularly for younger children, it helps if parents are engaged. Watching a video together or looking something up online and talking about it is not that different from reading a book together. The trouble is that children can find it hard to get any attention from their parents these days because they, too, are always on their smartphones. ■



数字媒体

与生俱来的屏幕

父母可能厌恶它们，但它们会一直存在

“关掉媒体，开启生活。”来自韩国的Nori预防网络成瘾媒体教育中心的宣传视频这样敦促道。这是一家由私人和公共资金混合资助的组织，其主管权正熙（Kwon Jang-hee，音译）热衷于保护儿童免受互联网的不良影响，尤其是智能手机——他认为它无所不在因而最具破坏性。他说，家长们并不了解互联网的危险程度。他引用了首尔国立大学的一项研究，该研究发现了可卡因成瘾者与电脑游戏爱好者的大脑活动有相似之处。如果他的努力能成功，年轻人将不得不等到高中毕业才能拥有自己的智能手机。

韩国是世界上人际联系最紧密的社会之一，他实现自己愿望的希望很渺茫，但很多韩国父母也都认同孩子们看屏幕太多了。最近一项关于智能手机和网络成瘾的政府调查显示，有高成瘾风险的三至九岁儿童的比例达1.2%，而青少年的这一比例为3.5%。这看起来可能不是很多，但一旦成瘾，其影响可能是毁灭性的。这些孩子中的一些人每天至少要玩手机八个小时，对线下生活失去兴趣。在尝试让他们戒断设备未果后，绝望的父母们向政府求助。政府提供各种咨询和治疗，在极端情况下还提供纠正性训练营。

为韩国人口最多的省份京畿道的地区政府开展训练营计划的洪贤珠

（Hong Hyun-joo）表示，接受治疗的孩子通常年龄在14到16岁之间，男孩和女孩人数大致相同。他们在到达训练营时上交手机，在宿舍里生活12天，规律进餐并参加大量体育和团体活动。其目的是让他们提高自尊并结交朋友。他们大多在刚开始时闷闷不乐，但逐渐变得更合作。声称的“治愈”率（意味着恢复较为正常的使用方式）为70%到75%。但这些训练营每年只能接收几百名儿童，远不足以满足需求——那还需要多得多的钱。

韩国被认为是世界上儿童和成人互联网使用问题最高发的国家，但西方世

界对儿童更多使用数字媒体的担忧也在增加，特别是在美国。2015年是有国际可比数据的最近一年，在经合组织国家，15岁的人中有九成可以使用智能手机。他们平均每周在线花费18.5小时，比2012年多出近5个小时，所以这个数字现在可能又更高了。这些孩子中约有16%是“极端用户”，即每天在线时间超过6小时。完全不使用互联网的儿童人数极少。

此外，儿童开始使用数字设备的年龄也越来越小。根据行业协会Bitkom的数据，在德国，10到11岁的人中有67%已拥有自己的智能手机，12至13岁时比例上升到88%。研究机构Childwise表示，英国11至12岁儿童有83%、13至14岁儿童中96%都拥有自己的手机。这些孩子在智能手机上做什么？“做事。”住在伦敦北部的12岁的约翰说。结果发现，这些事包括给朋友发消息和交谈、观看小视频、玩电脑游戏，以及上Snapchat和Instagram。他十岁的妹妹还没有智能手机，但使用支持互联网的iPad。他们的父母规定他们看屏幕的时间额度（绝大多数父母都这样做），但有时还有商量余地。

婴幼儿使用平板电脑等数字设备时几乎还不会说话，更不用说读写了。美国儿科学会过去曾建议父母让两岁以下孩子远离屏幕，但它现在说，即使是很小的孩子，视频聊天是可以接受的。该学会认为，对于2到5岁的孩子来说，一天一小时的高质量节目没问题。一些专家认为这仍然太过保守。

关于儿童使用数字媒体的习惯带来了何种影响，人们的意见两极分化。在一个极端，圣地亚哥州立大学的心理学教授让·特温格（Jean Twenge）在她新书的标题里就说明白了：《iGen：为什么今天的超级网络儿童长大后不那么叛逆、更能容忍、更不快乐——而完全没有准备好进入成年——这对我们其他人意味着什么》（iGen: Why Today's Super-Connected Kids are Growing up Less Rebellious, More Tolerant, Less Happy—and Completely Unprepared for Adulthood—and What That Means for the Rest of Us）。她认为，智能手机彻底改变了1995年至2012年间出生的美国一代儿童的生活，无论他们住在哪里、背景如何。她认为过度使用互联网和社交媒体令他们孤独和沮丧，对他们的身体特别是心理健康构成了严重威胁，有时甚至会到让他们自杀的程度。

其他人则认为，当电视在20世纪下半叶开始普及时，也响起过类似的警告。当时人们普遍认为，如果孩子每天花很长时间看电视，他们会变得愚蠢、肥胖和懒惰。现在一起看电视成了宝贵的亲子活动。当初广播、书面文字或印刷书籍等技术尚属新鲜时，它们也曾被妖魔化。

使用互联网带来的某些风险还不怎么为人所注意。例如，儿童已经在生成大量数据，这从他们还在子宫里的时候就开始了——父母把胎儿的第一次扫描结果放到了网上；之后他们在与各种设备和程序交互时不断被记录，以多种渠道持续产生数据。这些数据永远无法撤回。它们将被提供给第三方，会被如何使用也无从得知。探讨数据密集型技术的社会和文化影响的研究机构“数据与社会”（Data & Society）的莫妮卡·包格尔（Monica Bulger）表示，这些影响可能要到事件发生多年之后才会显现出来。

该机构的创始人达娜·博伊德（Danah Boyd）在名为《一言难尽：网络青少年的社交生活》（It's Complicated: The Social Lives of Networked Teens）的书中承认，在网上花太多时间对青少年来说可能是坏事，就算仅仅是从留给其他活动的时间变少这一层来说。但她也认为，由于现在大多数年轻人出门见朋友的机会和时间都更少了，他们需要另一个可以私下交谈的地方。互联网为他们提供了这样一个论坛。当然，看起来年轻人自己是很认同这个渠道的。在所有经合组织国家中，15岁少年有84%认为在线社交网络非常有用，过半数的人说如果上不了网会感到难过。

联合国儿童基金会（Unicef）下设Innocenti研究办公室的丹尼尔·卡德菲尔特-温泽（Daniel Kardefelt-Winther）研究了他能找到的关于儿童使用数字技术会如何影响其心理健康、社会关系和身体活动的所有证据，发现并没有像通常所说的那么多需要警惕的因素。他看到的大多数研究似乎都表明，技术可以帮助孩子与朋友们保持联系并交上新朋友。在20世纪90年代和21世纪初，互联网还是个比较新的事物，这种好处看起来不太明显，因为它似乎把人隔绝了，但如今几乎每个人都在网上，它已经成为热闹而合群的地方。

花这么多时间看屏幕对孩子的健康造成了什么影响很难估量。虽然它明显减少了身体活动，这可能有损于整体健康并导致体重增加，但谁为因、谁为果尚不清楚。也许是孩子们受到在某些屏幕上看到的广告怂恿，吃了太多不健康食品而导致体重增加，才变得不那么爱活动了。

整体来看，数字技术的使用与儿童的心理健康之间的关系似乎呈U形。研究人员发现适量使用是有益的，而根本不使用或极端使用可能是有害的。但不论哪种情况，其影响都非常小，而儿童通常都对中等甚至很长的屏幕时间表现出惊人的弹性。虽然有明显过度使用的情况，但“成瘾”或“强迫性使用”等术语可能是夸大了。没有真正的证据表明，在网上花费太多时间会在长期严重影响用户的生活，而药物滥用常常会有这样的后果。

这并不是说全无理由担心。心理健康问题是年轻人最大的疾病负担。在经合组织10个国家开展的一项研究发现，四分之一的年轻人患有精神疾病。这个比例哪怕再加上一小点也很麻烦。大量使用社交媒体和玩视频游戏的人经常缺觉，这似乎与焦虑和抑郁有关。但在这里因果关系同样不清楚。

网络欺凌也变得更普遍，虽然它直接影响的儿童比例相对较小，而且专家认为它的伤害通常比线下世界里的欺凌要小。此外，社交媒体上的人们试图让自己的生活看起来比实际更光鲜，这可能会让孩子们感到被排斥。

伦敦经济学院的社会心理学教授索尼娅·利文斯通（Sonia Livingstone）花了几十年时间研究儿童、媒体和互联网之间的关系。她的结论是，人们常常把在高压环境中生活的父母的更普遍的焦虑归咎于屏幕，而没有太多证据证明它们造成了很大的损害。相比而言更让她担心的是，屏幕正在加入中产阶级保持社会优势的军械库，来自富裕家庭的孩子会参加私人课程，学习“如何成为YouTube博主”等技能，而贫穷的父母负担不起。这又应和了大西洋两岸关于育儿成为阶级斗争新战场的担忧。

对使用屏幕的问题很难一概而论。对特定年龄的某个孩子有益的事，可能对另一个不同年龄段的孩子有害。但很明显，特别是对于年幼的孩子，父母与之积极互动会有好处。一起看视频或上网查些什么再讨论一下，这和

一起读书并没有什么不同。问题是孩子们现在很难从父母那里得到任何关注，因为他们自己也总在看手机。 ■



Ageing in Japan

Home help

The government is struggling to curb the rising cost of health care

IN A SUNNY room in a small apartment in the Tokyo satellite town of Kunitachi lies Yasuyuki Ibaraki, eyes closed and breathing laboured. Yukio Miyazaki, his doctor, who visits fortnightly from a local clinic, suspects that he does not have much time left: he has brain damage from a cerebral infarction, a tumour in his digestive system and is unable to swallow or talk. Reiko, his wife, feeds him through a tube to his stomach and clears phlegm from his throat. “He is from a close-knit family and is a quiet man, so I think it is better for him to be here rather than in a hospital,” she says, over green tea and grapes.

Life expectancy in Japan is the highest in the world, at 84. This is good news for its people, but means that an ever-higher share of the population is elderly. Fully 28% of Japanese are older than 65, compared with 15% of Americans and 21% of Germans. More old people, in turn, means higher health-care costs. Last year the government budgeted ¥15trn (\$138bn, or 15% of its total expenditure) for health care and nursing, excluding the charges it levies for the public health-insurance scheme. With public debt at 250% of GDP, and debt service consuming a further 24% of spending, the government is looking desperately for ways to cut costs. It reckons caring for people at home is one of its best options.

All Japanese pay a monthly premium to the public insurance scheme, either through their employer or the local municipality. In return they are entitled to treatment and drugs from public and private doctors and hospitals, although they must also pay a portion of the cost of treatment (a co-payment, in American parlance), subject to a cap. In 2000 Japan introduced

an additional public insurance scheme for long-term care for those over 65, into which people must pay from the age of 40. It works the same way. The premiums and co-payments cover around 60% of the cost of the services provided; the government pays for the rest. And it is the old who cost the most. The government reckons that the average annual cost of health care for someone over 75 is ¥942,000, compared with just ¥221,000 for everyone else.

By the standards of ageing nations, Japan has managed to curb medical costs fairly well, says Naoki Ikegami of St Luke's International University in Tokyo. The government sets fees for services to keep costs down (although that encourages providers to perform unnecessary procedures to make more money: Japan has more CT scanners relative to its population than any other country). It has also promoted the use of generic drugs, which are cheaper.

Nonetheless, the country has crept up to sixth place in the OECD's ranking of the share of GDP spent on health care, behind France and America, but ahead of Italy and South Korea—two other ageing countries (see chart). It is not just that the number of old people is increasing; spending per person is rising, too, as people live longer with diseases like Alzheimer's and diabetes.

Japan has promoted home care for many years, but it is pushing it harder now. The policy is especially beneficial given that the average hospital stay in Japan is three times longer than in the Netherlands, for instance. The health ministry reckons that 1m people will receive care at home in 2025—one-and-a-half times the current total. The number of special nursing units exclusively for home visits has risen from 7,473 in 2014 to 10,418 in 2018.

Last year a government panel suggested raising the amount doctors are

paid for home visits and making consultations conducted via video-conferencing services eligible, too. It also proposed new rules to encourage care at home. Hospitals should be obliged to talk to social services when they discharge a patient, for example.

Some municipalities are already offering good care in the community. Onomichi, a small provincial city that is even older than the country as a whole, is one. Its medical facilities have 15-minute “care conferences” with doctors, nurses, family members and even dentists, to discuss how they will go about looking after people. “It used to be hard for hospitals to tell a patient to return home as there was no system for that; that has changed,” says Hisashi Katayama, a doctor.

Community care for specific diseases is improving, too. Take dementia, which currently affects 5m Japanese (4% of the population), and will afflict 6-7% by 2030. Rather than provide only institutional care and medicine, some towns, such as Matsudo, north-east of Tokyo, have set up cafés to offer advice and companionship to patients and their carers. Day centres that give respite to families tending to elderly relatives are common. Much more could be done: only 13% of Japanese die at home, although most say they want to.

But more widespread home care will not be enough to make Japan’s health care affordable. The government of Shinzo Abe wants to revamp the social-security system, which it reckons will help reduce health-care costs. Raising the retirement age, for example, will keep people active, healthier and paying tax for longer. The government also wants to try to reduce the incidence of diseases that affect older people, but have their origins in behaviour at a younger age. “We have tended to focus on the old, but we need to look at the younger to prevent disease,” says Kazumi Nishikawa of the economy ministry. He is particularly focused on giving people more information on what causes diabetes, which is on the rise in Japan, or

exercises that can stem the progression of dementia.

People are likely to have to pay more for health care, too. Co-payments for many of those over 75 are only 10%, compared with 30% for everyone else. The government should start by doubling that to 20%, says Shigefumi Kawamoto, managing director of Kenporen, the national federation of health-insurance societies. "Some elderly people don't have resources, but many do," he avers. The government could exclude some items from coverage, he says, such as over-the-counter drugs.

Meanwhile, back in Kunitachi, Dr Miyazaki talks to Reiko about her husband's condition. She is worried that her husband is getting worse, she says, and is anxious between visits. The doctor promises to come weekly from now on. ■



日本老龄化

居家照护

日本政府竭力控制医疗支出上涨

在东京卫星城国立市（Kunitachi）一间光照充足的小公寓里，茨木康行闭着眼躺在床上，费力地呼吸着。当地诊所的医生宫崎之男每两周上门探视他一次。他患有脑梗塞引发的脑损伤和消化系统肿瘤，无法吞咽或说话，医生怀疑他将不久于人世。他的妻子玲子通过一根胃管给他喂食，并帮他清除喉咙里的痰。“他来自一个关系紧密的家庭，不爱说话，所以我认为他最好还是待在家里，而不是住进医院。”她边喝着绿茶、吃着葡萄边说道。

日本人的预期寿命是84岁，为世界最高。这对其国民来说是个好消息，但也意味着老年人在总人口中的比重越来越高。日本65岁以上的老年人足足占了总人口的28%，而美国和德国的这一比例分别为15%和21%。老年人越多，相应的医疗保健支出也越高。去年，除去为公共医疗保险计划征收的费用，政府在医疗保健和护理上的预算达15万亿日元（合1380亿美元，占政府总支出的15%）。由于公共债务达到GDP的250%，偿债支出又占了总支出的24%，政府正在想方设法削减成本。政府认为居家照护是最好的选择之一。

所有日本人每个月都通过雇主或市政当局向公共保险计划缴纳保险费。由此他们可以享受公立和私人医疗机构提供的治疗和药物，不过仍须自付一部分治疗费（用美国的说法是共付额），金额有上限。2000年，日本又推出了一项专为65岁以上老年人提供长期照护服务的公共保险计划。该计划要求民众必须从40岁开始缴费。其运作方式与普通公共保险计划相同。大约60%的医疗保健支出由保险费和共付额支付，剩下的由政府承担。而在全部医疗支出上，老年人占了大头。政府估计75岁以上的老年人平均每年的医疗支出是94.2万日元，而其余人群仅为22.1万日元。

东京圣路加国际大学（St Luke's International University）的池上直树表示，按照老龄化国家的标准，日本在设法控制医疗支出方面已经做得不错了。日本政府对各类医疗服务设定价格以降低成本（不过这助长了医疗机构为多赚钱而实施不必要的检查；按人口平均，日本拥有的CT机数量比其他任何国家都多）。政府还提倡民众使用相对便宜的非专利药物。

尽管如此，在经合组织对医疗保健支出占GDP比重的排名中，日本已攀升至第六位，在法国和美国之后，却排在另外两个老龄化国家意大利和韩国的前面（见图表）。这不仅仅是因为老年人的数量在增加，随着老年痴呆症和糖尿病等患者的存活期更长，人均医疗保健支出也在增长。

日本提倡居家照护已有多年，但现在正在加大推动力度。例如，鉴于日本的平均住院时间是荷兰的三倍，居家照护政策尤为有用。厚生省估计，到2025年，在家接受照护者将达到100万，是目前数字的1.5倍。专门提供出诊服务的特殊护理机构的数量已从2014年的7473个增加到2018年的10,418个。

去年，一个政府专家组建议提高医生的出诊费用，以及提供视频问诊服务。另外专家组还提出了一些鼓励在家照护的新规定，例如医院让病人出院时必须与社会福利机构沟通。

一些城市的照护服务已经在社区开展得有声有色，比如历史甚至早于日本建国的小城尾道（Onomichi）。它的医疗服务包含由医生、护士、家属甚至牙医参加的15分钟“照护会议”，讨论如何着手照顾病人。“过去，因为没有这样的系统，医院很难让病人出院回家，现在就不一样了。”医生片山寿表示。

社区对特殊疾病的护理也在改善。以老年痴呆症为例，目前日本有500万患者，占总人口的4%，而到2030年将升至6%至7%。在东京东北部的松户（Matsudo）等城镇，不只有社会公共机构提供照护和医疗服务，还开设了为病人及其照护者提供建议和联谊的咖啡馆。随处可见的日间照料中心可以让那些照顾老人的家属们有一些喘息的机会。尽管大多数人表示希望

自己能在家中辞世，但只有13%的日本人得偿所愿，因此能做的事情还有很多。

但是，居家照护的进一步普及并不足以减轻日本的医疗负担。安倍政府希望改革社会保障体系，认为这将有助于降低医疗保健支出。例如，延迟退休会让人们保持活跃、更健康，纳税的时间也会更长。政府还希望尽力减少那些因年轻时的不良行为所致的中老年疾病的发病率。经济产业省的西川和见表示：“我们向来都更关注老年人，但我们也需要关心年轻人来预防疾病。”他特别强调要向民众普及更多有关糖尿病病因的知识（日本糖尿病发病呈上升趋势），或者是可以防止痴呆症恶化的运动。

民众很可能也得为医疗保健支付更多费用。75岁以上的老年人中，许多人的共付额比例仅为10%，而其余人群为30%。国家医疗保险组织联合会（Kenporen）的常务理事河本滋史表示，政府首先应该将这一比例提高一倍，达到20%。他断言，“有些老年人没有财力，但很多老年人有。”他指出，政府可以将非处方药之类的项目排除在保险范围之外。

回到国立市。宫崎之男与玲子讨论了她丈夫的病情。玲子说自己担心丈夫每况愈下，在没有医生探视的时候自己就很焦虑。医生答应以后他会每周上门一次。 ■



Health reform

No hospital for old men

A new plan to ready the National Health Service for an ageing society

EVERY WEDNESDAY morning a motley group of health and social-care professionals, ranging from a geriatrician to a district nurse to a social worker, get together for a virtual ward meeting in Alderney hospital. The goal is to get to the bottom of the problems facing the ward's patients, who, were it not for the new system, would be in an actual, physical ward, but are instead being treated at home. Does the 85-year-old with a urinary-tract infection just need some antibiotics? Or does he also need someone to come round to fix his heating and check on his wife with dementia? Angie Terry, a community matron, jokes that at times the detective-style hunt for causes becomes like the American crime drama, CSI—only here the goal is to keep people out of a state institution.

Alderney, in Dorset, provides a glimpse of what officials hope the National Health Service will look like in ten years' time. On January 7th Theresa May and Simon Stevens, the head of NHS England, set out a plan for the next decade. This followed Mrs May's promise last summer that the health service would receive £20.5bn (\$26bn) more per year by 2023-24—a welcome rise but still less than economists think the service needs to get back to pre-austerity standards. Having already been promised the cash, NHS England was told to work out how to spend it.

Its plans include headline-grabbing measures like expanding child mental-health provision, doing more consultations by video-link and catching more cancers early. But the priority is dealing with an ageing society. The aim is to save money by preventing illness and keeping people out of hospital. To do this, spending will focus on primary and community

services, creating new multidisciplinary teams of doctors and social services. Success, the plan suggests, will come only if the NHS is radically reshaped.

The idea at the heart of the plan is to roll back competition in favour of co-operation. Since the early 1990s the parts of the NHS that pay for services (typically GPs, or family doctors) have been separated from those that provide them (hospitals, for example), in the hope that an “internal market” will drive up standards. Reforms by the Tory-Lib Dem coalition in 2012 sought to expand this system. But experiments in recent years have seen the NHS move in the opposite direction. As Nigel Edwards of the Nuffield Trust, a think-tank, notes, the long-term plan represents a new stage in the “political falling out of love with the use of market-based mechanisms”.

By 2021 England will be divided into what are known as integrated care systems (ICSs). Already introduced in 14 parts of the country, which range in size from 530,000 to 2.7m people, these bring together payers and providers to collectively plan services and manage resources. In time they will be given more control over spending and held to account for the overall health of their population. The hope is that this will encourage collaboration between different parts of the NHS, and between the NHS and local government.

What this means in practice varies according to an area’s needs. “A lot of it is about putting people in the same room and letting them work it out for themselves,” explains Tim Goodson, head of Dorset’s ICS. In Poole a new team has begun work not just on keeping people out of hospital, but on getting them out once they are in. Having got to know many repeat visitors, they offer advice to accident and emergency wards on whether admission is really necessary. After a person has been in hospital for a few days the team begins to assess whether hospitalisation is in the patient’s interest. Often it is not.

Bringing about this re-organisation of the health service without any new legislation can be tricky. Local NHS officials have had to fight against existing payment mechanisms and legal frameworks to make the ICSs work. Mr Stevens thus hopes Parliament will pass legislation to change the rules to fit the system he is already introducing. Indeed, the NHS's long-term plan ends, ever so humbly, with a "provisional list of potential legislative changes for Parliament's consideration" that would, among other things, loosen current procurement rules.

Even with those legal changes, success is far from guaranteed. There is evidence that integrating services can cut costs and improve outcomes. Some worry, however, that ICSs may turn into local monopolies, responding to the central diktats rather than the needs of local populations. NHS officials argue, in effect, that the efficiencies enabled by integration should outweigh those lost by reduced competition, and that competition will be strengthened in areas where it shows most success, like in patients choosing where to have elective surgery. But Andrew Haldenby of Reform, a think-tank, says that progress in most existing ICSs has been slow. Change is rarely brought about by "bureaucratic exhortation", he notes.

The reforms face strong headwinds. One is staff shortages. The NHS has 100,000 vacancies. As Richard Murray of the King's Fund, another think-tank, points out, having more money is no good if there are no staff to spend it on. Another is the mess in social care. Age Concern, a charity, estimates that 1.4m people do not get the care they need, and the health service often has to deal with the consequences. The NHS is the largest employer in Europe and an enormously complex organisation. Reform is difficult at the best of times. And these are hardly the best of times. ■



医疗改革

不收老人

一项旨在让国民医疗服务体系为老龄化社会做好准备的新计划

每周三上午，一群形形色色的医疗和社会照护专业人士——从老年病医生到社区护理人员再到社工——齐聚奥尔德尼医院（Alderney hospital）参加虚拟病房会议。他们的目标是弄明白病房中的病人面临的问题。如果没有这个新体系，这些病人就得住在现实的病房里，但现在他们可以在家接受治疗。那位尿路感染的85岁老人是不是只给开些抗生素就可以了？还是说还得有人上门给他修修暖气，看看他那个患痴呆症的老伴的情况？社区护工安吉·特里（Angie Terry）开玩笑说，有时候，这种侦探般寻根究底的过程就像美国刑侦剧《犯罪现场调查》（CSI）的剧情一样，只不过这么做的目的是让人们不进公立医院。

从位于多塞特郡（Dorset）的奥尔德尼可以一窥官员们对于英国国民医疗服务体系（National Health Service，简称NHS）在十年后的愿景。1月7日，特雷莎·梅和英格兰NHS负责人西蒙·史蒂文斯（Simon Stevens）制定了一项十年计划。此前，特雷莎·梅在去年夏天承诺，到2023年至2024年，这一医疗服务体系每年将额外获得205亿英镑（合260亿美元）的经费。这样的增长是可喜的，但在经济学家看来仍不足以让该体系恢复到紧缩前的标准。既已获得拨款承诺，英格兰NHS需按要求制定出将如何花这些钱。

其计划包括一些吸引眼球的措施，比如扩大儿童心理健康服务、开展更多视频会诊，以及尽早发现更多癌症病患。但当务之急是应对一个老龄化社会。计划的目标是通过预防疾病和避免人们进医院来节省经费。因此，支出将集中在初级和社区服务上，建立由医生和社会福利部门组成的多学科新团队。该计划表明，只有彻底改革NHS才能成功。

该计划的核心思想是从竞争转向合作。自上世纪90年代初以来，NHS中为

服务付费的部分（通常是全科医生或家庭医生）已经与提供服务的部分（例如医院）分离，希望通过“内部市场”来提高标准。2012年保守党和自由民主党联合政府的改革试图扩大这一体系。但近年来的实验表明，NHS正朝着相反的方向发展。正如智库Nuffield Trust的奈杰尔·爱德华兹（Nigel Edwards）所指出的，这个长期计划代表了一个“政治上不再喜欢利用市场机制”的新阶段。

到2021年，英格兰将采用所谓的整合医疗系统（integrated care systems, ICS），分区管理。ICS已在英格兰14个地区推出，这些地区的人口从53万至270万不等。这一系统将支付方和服务提供方集合在一起，共同规划服务、管理资源。未来系统还将逐步获得更大的支出控制权，也会对所管辖人口的整体健康负责。新系统的设计者希望这将鼓励NHS的不同部门之间以及NHS和地方政府之间的合作。

具体的实施方法因各地区的需求而异。“很大一部分工作是把大家都聚在一起，让他们自己解决问题。”多塞特ICS的负责人蒂姆·古德森（Tim Goodson）解释说。在普尔（Poole），一个新的团队已经开始运作，不仅要让人们远离医院，还要让已在住院的人能尽快出院。在知道有许多反复就诊的人之后，团队还就是否确实有必要让他们入院向急诊病房提供建议。一个人住院几天后，团队就开始评估住院是否符合该患者的利益。很多情况下并不需要住院。

在没有任何新立法的情况下对医疗服务启动这样的重组可能会很棘手。为了让ICS系统运作起来，地方NHS官员不得不对抗现有的支付机制和法律框架。因此，史蒂文斯希望议会能够通过立法修改规则，以适应他已经在推行的体系。事实上，NHS这份长期计划的结尾以极其谦恭的语气写道，“附上可能的立法变更的暂定列表，供议会考虑”，其中包括放宽现行的采购规定。

即使有了这些法律变更，成功也远非十拿九稳。有证据表明整合服务可以降低成本并改善结果。但有人担心ICS可能会变成地方垄断机构，只响应中央指令而不顾当地居民的需要。实际上，NHS官员辩称，整合带来的高

效应该会超过竞争减少造成的低效，而在竞争带来最大成功的领域，如病人选择在哪里进行非紧急的择期手术，竞争会被加强。但是智库Reform的安德鲁·豪登比（Andrew Haldenby）说，现有的ICS大多数都进展缓慢。他指出，“打官腔的劝勉”很少能带来变革。

改革面临强大的阻力。其一是人员短缺。NHS有10万个职位空缺。正如另一家智库国王基金（King's Fund）的理查德·默里（Richard Murray）所指出的那样，如果没人来领薪水，那NHS有再多资金也无益。另一个是社会照护服务的混乱。一家名为“老人关怀”（Age Concern）的慈善机构估计，有140万人得不到他们所需的社会照护，由此造成的后果常常得由医疗机构去应对。NHS是欧洲最大的雇主，也是一个极其复杂的机构。即使是在最好的光景，改革也是困难的，何况现在不是。 ■



Parenting

A never-ending task

Fewer kids can be a lot more work

“WE ARE CREATING a miniature version of our own lives for our kid, wanting him to be productive, keeping him busy all the time.” Abigail is talking about her two-year-old son, Joshua. She has a well-paid job with an investment bank in Dallas, Texas, which she finds stressful but exciting. Now pregnant with another child, she has every intention of resuming work after the second birth. She will keep on her Mexican-American nanny, and her writer husband will help with the child care.

But combining work with a larger family will not be easy, not just because of Abigail’s demanding job but because she and her husband, like many other prosperous parents in America, pursue a form of child-rearing that makes huge demands on their time and resources. It includes filling the child’s day with round-the-clock activities, from music and sports to sleepovers; going to great lengths to get him or her into the right schools; and strictly supervising homework. The parents may not like it, but they feel they have no choice because all their friends are doing the same thing.

This is colloquially known as “helicopter parenting” (because the parents are always hovering), or “concerted cultivation”, a term coined by Annette Lareau, a sociologist at the University of Pennsylvania. In her book “Unequal Childhoods”, based on in-depth studies conducted in the 1990s and early 2000s, she looked at the child-rearing habits of American families from a variety of social and ethnic backgrounds and found a yawning gap. Whereas better-off, better-educated parents (black as well as white) overwhelmingly adopted this intensive method, working-class and poor families followed a different model which she calls “the accomplishment of natural growth”.

They saw their role as providing shelter, food, comfort and other basic support but lacked the time, the money and the nous for such intensive management, so their kids were often left to their own devices, and the extended family played a much greater part in their children's lives than among Ms Lareau's middle-class subjects.

In his book "Our Kids", Robert Putnam, a political scientist at Harvard, used a mixture of interviews and data analysis to argue that different child-raising conventions are reinforcing a growing divide in American society. The privileged top third is pulling ever further ahead of the disadvantaged bottom third, whose families are often fractured and whose lives tend to be precarious. That shows up as a growing divergence in income, education, single- parenthood, friendship networks and other indicators.

Upper-middle-class children are far better placed even before their parents make any special effort, simply because of the sort of homes they are born into. Educated parents tend to respond readily to their children's endless questions, talk to them over the dinner table and take them to new and exciting places. In a famous study in the 1990s, Betty Hart and Todd Risley from the University of Kansas found that in the poorest families children heard about 600 words an hour, whereas in professional families they heard 2,100. By the time they were three, the children from the well-off homes had heard around 30m more words than the poorer ones.

"Parenting", in the sense that it is now understood, is a relatively new term; it first popped up in 1958, according to the Merriam-Webster dictionary, and came into widespread use only in the 1970s. Experts see it as an important factor in successful child-rearing, along with things such as genetic predisposition and external circumstances. To find out how much it mattered, Jane Waldfogel of Columbia University and Liz Washbrook of the University of Bristol separated out the effects of different parenting styles and home learning environments on the cognitive performance of three- to

five-year-olds from different income groups in America and Britain. They found that they accounted for between a third and half of the income-related gap.

Studies show that even poorer and less well-educated parents on both sides of the Atlantic (except, oddly, in France) spent far more time with their children every day in the 2000s than they did in 1965. They also spent more money on them, both in dollars and as a proportion of their income. Sabino Kornrich of Emory University and Frank Furstenberg of the University of Pennsylvania found that between 1972-73 and 2006-07 total spending per child in constant dollars increased somewhat for all income groups (see chart), but far faster for the richest 10% of parents than for the rest. Because incomes in this group had gone up rapidly, their spending as a proportion of income did not rise much. Yet by this measure the poorest 10% of parents vastly increased their spending on their children because their incomes had barely budged.

America is not the only place to practise helicopter parenting. The British do it too, calling it “hothousing”; continental Europe less so, especially in the Nordic countries, where social hierarchies are flatter and parents more relaxed. But globalisation has cranked up competition for the best jobs, and academic standards in different countries have become easier to compare thanks to the OECD’s PISA scores, which measure the reading, maths and science performance of 15-year-olds. Such comparisons have highlighted the effectiveness of a kind of concerted cultivation that is ubiquitous in East Asia. It is somewhat different from the Western sort, being directed more single-mindedly towards academic success, and works particularly well in maths and science. In the PISA rankings for these subjects in 2015 Singapore tops the bill, and Japan, China (currently measured only in Beijing, Shanghai, Jiangsu and Guangdong) and South Korea are all well ahead of America.

Such comparisons have made some Americans wonder whether they are being too soft on their kids. For all the hovering they do, they tend to let them off lightly on things like discipline and helping around the house, preferring to build up their self-esteem and keep them happy. But parents have noticed that some of the country's recent immigrants, particularly those from East Asia, use sterner methods to great effect. In her book "Battle Hymn of the Tiger Mother", Amy Chua, a first-generation Chinese-American married to an American academic, describes the tough love she meted out to her two daughters. She unapologetically made the girls do many hours of homework a day, pushed them into becoming musical prodigies and allowed them next to no time to have fun. Though one of them eventually rebelled, both achieved brilliant academic results and seem to have grown into accomplished adults.

Another Chinese-American mother, Lenora Chu, and her journalist husband tried a different variant of blended cultures. Having moved to Shanghai, the couple decided to send their three-year-old son to a top-notch state-run Chinese kindergarten. Ms Chu's book about their experience is called "Little Soldiers", after a song often recited in the kindergarten that started: "I am a little soldier, I practise every day." It summed up the educational philosophy prevailing there and across China: anyone can succeed at anything if they work at it hard enough, whether or not they have a talent for it. Effort is all.

The Chinese kindergarten, Ms Chu found, had little trouble securing co-operation and compliance from the children and their parents. The authoritarian structure of the education system and powerful administrators keeps parents and students in check. In turn, the kindergarten proved responsive to parental pressure to offer some formal teaching even to these very young children, despite consistent guidance from the ministry of education that this age group should be spending most of the day playing. Even at kindergarten level, the parents are already thinking about getting the child through the *gaokao*, the all-important

university entrance exam. As one mother explains, this is not just about the child itself. The Chinese have long been obsessed with education, and academic success for the child brings honour to the entire family.

If life at school is not much fun for Chinese kids, it is even worse for South Korean ones. Though both countries put much store by rote learning, in South Korea this takes on extreme forms. Jang Hyung-shim, an educational psychologist at Seoul's Hanyang University, likens children's experience at school to military service and says it stifles their creativity.

Song In-soo leads a group that campaigns for educational reform, the No Worry Private Education Association, which has gained a formidable reputation and chalked up a few successes, including a slight relaxation of the high-school entrance exam. He is particularly concerned about the high suicide rate among schoolchildren, partly blaming the ubiquitous *hakwon*, or private crammers, which he says 60% of South Korean students attend. The *hakwon* lessons take place outside school hours and often go on until late at night, turning the children into overworked, sleep-deprived zombies—as well as exacting a heavy financial toll on their parents. Mr Song has assembled lots of evidence against the practice. But as in China, everything hinges on the university entrance exam, so until that is tackled, nothing is likely to change.

In a little forest growing on one of the many rocky outcrops found all over Seoul, groups of tiny children from various local nursery schools are arriving at a “forest experience centre”, one of 50 in this city of about 10m. They come once a week to explore discovery trails on the steep paths, play on various bits of equipment, listen to a guide explaining the wildlife they might see and exclaim at “bug hotels” full of insects. They seem delighted to be there. As wild places go, this is pretty tame; the paths may be steep, but all the play equipment is designed to minimise risk, and the children are carefully supervised. Even so, some parents stop their offspring from taking

part in these excursions for fear that they might get hurt. In South Korea, not having fun starts early. ■



育儿

做不完的任务

孩子少了，活却多多了

“我们正在为孩子打造一个我们自己生活的微缩版，希望他有成就，一直让他有事做。”阿比盖尔说起她两岁的儿子约书亚。她在得克萨斯州达拉斯的一家投行工作，收入很不错，她觉得工作压力大但很有意思。现在她怀了二胎，很想在分娩后回去工作。她会继续雇用她的美籍墨西哥裔保姆，而作家丈夫也会帮助照看孩子。

但要兼顾工作和一个更大的家庭不会是件易事，不仅仅是因为阿比盖尔的工作要求很高，还因为她和她的丈夫与美国许多富裕父母一样，采取了一种对自己的时间和资源都要求苛刻的养育方式。它包括用各式各样的活动填满孩子的一天——从音乐、运动到在同学家聚会过夜；竭尽全力让孩子进好学校；严格监督做作业。父母们可能并不喜欢这么做，但又觉得别无选择，因为他们所有的朋友都在这么做。

这种方式俗称“直升机式育儿”（因为父母们一直在半空盘旋监督），或“协力栽培”。后一个词是由宾夕法尼亚大学的社会学家安妮特·拉罗（Annette Lareau）提出的。在她《不平等的童年》（Unequal Childhoods）一书中，她基于上世纪90年代及本世纪初展开的深入研究，审视了来自一系列不同社会和种族背景的美国家庭养育孩子的习惯，从中发现了一个巨大的差异。富裕的、受过良好教育的父母（包括黑人和白人）绝大多数都采用了这种细致的育儿方式，而劳工阶层和贫困家庭则遵循着另一套模式，她称之为“自然生长的成就”。他们认为自己应该为孩子提供住所、食物、安慰和其他基本支持，但缺乏时间、金钱以及智力、能力来开展如此精细的管理，所以常常任由孩子自行发展，而大家族在这些孩子的生活中发挥的作用要远大于中产阶级的孩子。

在《我们的孩子》（Our Kids）一书中，哈佛大学政治学家罗伯特·帕特南

(Robert Putnam) 引用了各种访谈和数据分析来证明不同的育儿习惯正在让美国社会里的一道鸿沟日益加深。成长背景最为优越的那三分之一的孩子正在进一步拉开和处于最劣势的那三分之一的差距，后者往往生活在破碎的家庭中，生活不大稳定。这体现为收入、受教育程度、单亲育儿、友谊网络和其他指标上的差距不断拉大。

甚至在父母做出任何专门的努力之前，中上层阶级的孩子们就已经遥遥领先了，而这仅仅是因为他们的家庭出身。受过良好教育的父母往往更容易回应孩子没完没了的问题，在餐桌上和他们交谈，并带他们去令人兴奋的新地方。在上世纪90年代一项著名的研究中，来自堪萨斯大学的贝蒂·哈特（Betty Hart）和托德·里斯利（Todd Risley）发现，在最贫困的家庭中，儿童每小时听到600个词汇，而在父母是专业人士的家庭中他们会听到2100个词。到他们三岁时，来自富裕家庭的孩子已经比穷孩子多听了三千多万个词汇。

“育儿”（Parenting）一词就它现在为人们理解的意思而言是一个相对较新的术语：根据韦氏词典，它最早出现在1958年，到了70年代才被广泛使用。专家们视之为成功抚养子女的一个重要因素，其他因素还有遗传特质和外部环境等。为了弄清楚它到底有多重要，哥伦比亚大学的简·沃尔德福格尔（Jane Waldfogel）和布里斯托大学的利兹·沃什布鲁克（Liz Washbrook）分列出不同的育儿风格和家庭学习环境对来自美国和英国不同收入群体的三至五岁儿童的认知表现的影响。他们发现，与收入相关的差距有三分之一到一半是由这些因素造成的。

研究表明，在大西洋两岸（奇怪的是，唯法国除外），即使是较贫穷和受教育程度较低的父母，在21世纪初时每天花在孩子身上的时间都要远多于1965年。他们也在孩子身上花更多的钱，无论是以不变美元计价的绝对值，还是占收入的比例。埃默里大学的萨比诺·科恩里奇（Sabino Kornrich）和宾夕法尼亚大学的弗兰克·弗斯滕伯格（Frank Furstenberg）发现，从1972-1973年到2006-2007年，所有收入群体在每个孩子身上以不变美元计算的总支出都有所增加（见图表），但最富裕的10%的父母的支出增速远高于其余群体。由于这个群体的收入增长迅速，他们的这项支出

占收入的比例并没有太大的增长。然而，从这个意义上说，最贫穷的10%的父母大大增加了在子女身上的开支，因为他们的收入几乎没有变化。

美国不是唯一一个实践直升机式育儿的地方。英国也在这么做，称其为“温室超前教育”（*hothousing*）；欧洲大陆的程度要轻一些，特别是在北欧国家，那里的社会等级更加扁平，父母也更放松。但全球化加剧了对最好的工作的竞争，而经合组织的PISA分数（即“国际学生评估项目”，衡量15岁少年在阅读、数学和科学科目上的表现）使得不同国家的学业标准变得更易比较。这样的比较凸显了在东亚普遍采用的某种协力栽培模式的效力。这种方式与西方的那种有所不同，它更专注于学业上的成功，且在数学和科学方面成效尤佳。在2015年的这两科PISA排名中，新加坡名列榜首，日本、中国（目前仅北京、上海、江苏和广东参与该评估）和韩国都远远领先于美国。

这样的比较让一些美国人怀疑自己对孩子是否太过宽松。尽管他们常常陪伴在侧，但在诸如纪律和帮忙做家务这类事上会睁一只眼闭一只眼，而更注重建立孩子的自尊和让他们快乐。但是，这些父母们已经注意到，近年进入自己国家的一些移民，特别是来自东亚的父母，用更严格的方法取得了很好的效果。与一名美国学者结婚的第一代华裔美国人蔡美儿在她写的《虎妈战歌》（*Battle Hymn of the Tiger Mother*）一书中描述了自己对两个女儿严厉的爱。她让女孩们每天做很多个小时的家庭作业，把她们训练成为音乐天才，让她们几乎没有时间玩耍。虽然其中一个女儿最终反叛，但两人在学业上都取得了亮眼的成绩，似乎也已成长为很有才干的成年人。

另一位美籍华裔母亲朱贵兰和她的记者丈夫尝试了另一种混合文化。搬到上海后，这对夫妇决定将他们三岁的儿子送到国内一家顶尖的公办幼儿园。朱贵兰关于这些经历的书名为《小小士兵》（*Little Soldiers*），书名源自儿子在幼儿园常唱的一首歌。歌的开头唱道：“我是一个小兵。我每天都在练习。”它总结了在当地和中国各地流行的教育理念：只要足够努力，任何人在任何事上都能成功，无论他们在这件事上有没有天赋。努力

就是全部。

朱贲兰发现，中国幼儿园在确保儿童及其父母与园方合作及合规方面没什么困难。教育系统的威权结构和权力强大的管理者管控着父母和学生。反过来，幼儿园也能够响应父母们要求它们为这些年幼孩子提供一些正式教学的压力，尽管教育部的指导一直提倡这个年龄段的孩子大部分时间应该用来玩耍。即便还在幼儿园阶段，父母也已经在考虑如何能让孩子拿下高考这一极其重要的大学入学考试。一位母亲解释说，这不仅仅关乎孩子自身。中国人长久以来都执迷于孩子的教育，而子女的学业成就会为整个家族争光。

如果中国孩子的校园生活没那么有趣，韩国孩子的就更糟了。虽然这两个国家都非常看重死记硬背，但在韩国这已经走到极端。汉阳大学首尔校区的教育心理学家张馨心（Jang Hyung-shim，音译）将儿童在学校的经历比作服兵役，并说这扼杀了他们的创造力。

宋仁秀（Song In-soo，音译）带领的团体“无忧私立教育协会”（No Worry Private Education Association）倡导教育改革，获得了巨大的声誉，并取得了一些成功，包括使得高中入学考试略微放宽。他特别关注学童高自杀率的问题，认为部分原因是无处不在的“学院”（*hakwon*）也就是私立补习班。他说60%的韩国学生都上这种补习班。补习班在放学后上课，常常持续到深夜。这让孩子们变成了疲劳过度、睡眠不足的行尸走肉，同时也给父母们造成了沉重的经济负担。他收集了大量反对这种做法的证据。但就和在中国一样，既然一切都取决于大学入学考试，那么在这一点解决之前，不大会发生什么改变。

在首尔遍布着崎岖不平的岩床露头。在位于其中一片露头之上的小森林中，来自本地各个幼儿园的一群小朋友正在抵达一个“森林体验中心”。在这个人口约一千万的城市里有50个这样的体验中心。他们每周来这里一次，攀爬陡峭的探索小径，玩各种器械，听导游介绍他们可能撞见的野生动物，对着满是昆虫的“人造昆虫窝”惊呼。他们看起来很开心。就野地而言，这里可说平淡无奇。山路可能很陡峭，但所有的游乐设备都意在把风

险降到最低，而且孩子们被非常小心地看护。即便如此，一些父母因为担心孩子受伤，仍然不让他们参加这类远足。在韩国，孩子们早早没了乐趣。 ■



The family

Essential ingredient

Smaller, more heterogeneous, but still indispensable

ON A RAINY Saturday morning, the Museum of Childhood in east London reverberates with the sound of hundreds of small children enjoying themselves. Some are stacking bricks, others are playing in a sandpit as their parents look on. A large Victorian rocking horse attracts a queue of young riders. On a nearby wall a notice outlines a project on which the museum worked with a local school to find out what seven- and eight-year-olds consider important in their lives. The clear winners were the children's families—along with Lego, a construction toy.

The family is still the best place for a child to get the love and security it needs to grow into a well-balanced adult. Child-development experts agree that almost any family, however imperfect, is better than none at all. It does not even have to last for ever, only long enough to provide a safe and warm space for those crucial early years. That is just as well, because today's families are very different from those of a few decades ago.

Most obviously, they are smaller. Across the OECD, the total fertility rate (TFR)—the number of children a woman is likely to have in her lifetime—is now 1.7, against 2.7 in 1970 (see chart). Even America, which until recently used to procreate more than most of the West, is now close to the rich-country average. In South Korea the fall in the TFR has been precipitous, from 4.5 in 1970 to 1.2 now.

Over the same period China's TFR has plummeted from 5.6 to 1.6. That is often attributed to the country's one-child policy, but the ultra-low birth rates of other countries in the region, including Japan, South Korea, Taiwan

and Vietnam, suggest it would have happened anyway, if somewhat later. In 2016 the Chinese government, alarmed by the prospect of a rapid decline in the country's working population, relaxed the rules. That brought a small uptick, but by the following year the numbers were down again. In time the policy is likely be scrapped altogether, but no one expects a baby boom.

Asked what is holding them back from having larger families, Chinese couples often cite the cost of raising children. But the country's increasing urbanisation has also played a part. Many of its modern cities are just as crowded, traffic-ridden, polluted and devoid of green spaces as those in the West, if not more so. They are uninviting places in which to bring up a family.

Both in China and throughout the rich world, couples marry far later than they used to, and have their first child when they are much older. At the start of the 1990s in most OECD countries the mean age of women at first marriage was between 22 and 27, and for men two or three years older; now it is 30 for women and over 32 for men. In Sweden, the place with the oldest brides and grooms, it is 34 and 36 respectively.

And many no longer bother to get married at all. In the past half-century marriage rates in the developed world have roughly halved, though there are big differences between countries, and not necessarily along the lines you might expect. Americans, for example, marry at twice the rate of Italians, French and Spaniards. The Chinese are keenest of all, reflecting a strong aversion to births out of wedlock, for both cultural and practical reasons.

In most rich countries such attitudes are a thing of the past. The average proportion of children born to unmarried parents across the OECD is now around 40%, compared with 7.5% back in 1970 (though numbers in East Asia remain low). In most cases that does not mean they lead chaotic lives. Over 80% of children live in a couple household; the parents may simply have

chosen not to get married, or to leave it until later. Quite a few weddings these days feature the couple's offspring as bridesmaids or pageboys.

Still, a growing share of children in OECD countries are being brought up in single-parent households, usually headed by the mother. As a rule, such households are a lot poorer and often less settled than the two-parent kind. In America they account for more than a quarter of the total, and among African-Americans even more. A new class divide is opening up in which well-educated people continue to have conventional marriages and bring up their children within them, whereas those with less education often have unplanned children who grow up in unstable families.

Parents everywhere split up a lot more often than they used to; divorce rates are typically double those in 1970. Some of them remarry or move in with a new partner, and many children are now part of a patchwork family, perhaps with step-siblings thrown in. Others live with grandparents, other relatives or gay parents. So "home" is different from what it used to be; and with many more mothers going out to work, it may also be empty during the day.

The push of women into the labour force started in America, the Nordics and the Antipodes in the 1960s and gradually spread to other rich countries, with Spain and the Netherlands bringing up the rear. Across the OECD, female labour-force participation has risen from 47.6% in 1970 to 64% now—though in many countries the rise has slowed or even halted as women have found out how hard it can be to combine career and family. In America a big debate was kicked off by an article in the *Atlantic* magazine in 2012 by Anne-Marie Slaughter, an academic and foreign-policy expert who had held down a very senior post in the State Department and was known as a feminist. Entitled "Why women still can't have it all", the article argued that in the face of institutional and cultural barriers, women—and indeed men—still had to make invidious choices between the demands of

work and family. Women continue to be expected to play the main carer role, which helps explain why they typically spend far fewer hours than men in formal employment, but many more hours on unpaid child care and domestic tasks—even in places with enlightened men.

One trigger for getting more women into work has been the expansion of tertiary education. In the past couple of decades more women than men have been gaining higher-level qualifications. The growth in services, too, has created many more jobs that appeal to women. And cultural norms are slowly changing. In Germany a woman who worked outside the home while her children were young used to be branded a *Rabenmutter* (raven mother, an undeserved slur on avian parenting styles). But younger Germans, at least, now think it is fine for mothers to have jobs.

Governments can do a great deal to help parents reconcile work and family commitments. The most obvious way is through paid leave round the birth of a baby, though tax policy and cash support can also play a part. Entitlement to maternity leave in rich countries averages about four months, but with wide variations. America is the only wealthy nation to provide no paid maternity leave at all at federal level, though some states and many employers do. Some countries are moving towards the concept of parental leave, with a minimum period reserved for the mother and the rest divided up among the parents as they wish.

Where fathers have been offered paternity leave, they have been slow to take it up, for fear that having more than a few days off might harm their career. But if parental leave is offered on a use-it-or-lose basis to the parent who is not the main carer, usually the father, uptake increases, as Germany has been finding after a series of recent reforms.

Getting the father more involved has many benefits. It nudges the mother to go back to work sooner, which makes the family better off and boosts the

economy. It is more equitable than to leave all the child care to the mother, and with luck may establish better habits of sharing domestic tasks. And it is good for the psychological well-being of everyone involved. Child and father form a closer relationship, and the mother has a more balanced life if she pursues a career of her own.

Assuming she wants to carry on working, what is top of her wish list? Olivier Thévenon at the OECD studied the effect on female labour-force participation of a range of policies to promote work-life balance, including paid leave, family benefits and tax incentives, and found that one of the most effective ways to get more women to take jobs was to expand child-care provision for the under-threes. That chimes with policymakers' growing focus on the crucial early years of a child's life. ■



家庭

基本要素

更小、更多样化，但仍不可或缺

一个下着雨的周六早晨，成百上千个小孩子欢声笑语响彻伦敦东部的童年博物馆。他们有些在搭积木，有些在沙坑里玩，他们的父母在一旁看着。一匹维多利亚时代的大摇马吸引了年轻的骑手们排队等候。附近的一面墙上贴着一则通知，介绍了博物馆与当地一所学校合作的项目：了解七、八岁的孩子看重什么。在这里，显而易见的赢家是孩子的家庭，还有拼搭玩具乐高。

孩子们要成长为一个平和明智、通情达理的成年人，家庭仍是获得所需的爱和安全感的最好的地方。儿童发展专家一致认为，再不完美的家也几乎总比没有家好。它甚至不需要永远存在，只要能存在足够久，在孩子生命至关重要的头几年里提供安全和温暖的空间就够了。这一点倒不错，因为今天的家庭已和几十年前的家庭截然不同了。

最明显的是，它们变小了。在所有经合组织国家，总生育率（TFR，亦即女性一生中可能生育的子女数量）目前为1.7，而1970年为2.7（见图表）。即便是美国这个直到最近都比大多数西方国家生得更多的地方，现在也已接近富裕国家的平均水平。在韩国，TFR急剧下降——从1970年的4.5跌到现在的1.2。

同一时期，中国的TFR从5.6降到了1.6。这通常都被归因于该国的独生子女政策，但该地区的其他国家（包括日本、韩国、台湾和越南）的超低出生率表明，这无论如何都会发生——或许原本会稍微晚一些。2016年，出于对劳动人口将迅速减少的担忧，中国政府放宽了独生子女政策。这让出生率稍有回升，但翌年再次下降。随着时间推移，这项政策很可能被完全取消，但没人预期这会带来一个婴儿潮。

当被问及为何不生更多孩子时，中国的夫妇常常提到养孩子的成本。但该国不断扩张的城市化也是一个原因。这里的许多现代城市都像西方城市一样拥挤、交通繁忙、污染严重、缺少绿色空间，甚至程度更甚。对于养孩子来说这可不是吸引人的好去处。

无论是在中国还是在整个富裕世界，人们结婚和初育的时间都比以前晚得多。上世纪90年代初，在大多数经合组织国家，女性初婚的平均年龄在22岁至27岁之间，男性要再大两三岁。现在女性的平均婚龄为30岁，男性则在32岁以上。瑞典的新娘、新郎最大龄，分别为34和36岁。

而且许多人根本不再费事去结婚。在过去半个世纪里，发达国家的结婚率大致降低了一半，尽管各国之间存在很大的差异，并且不一定和你想象的一样。例如，美国人的结婚率是意大利人、法国人和西班牙人的两倍。由于文化和一些现实原因，中国人最热衷结婚，反映出对非婚生子女的强烈反感。

在大多数富裕国家，这种态度已成为过去。经合组织国家由未婚父母所生子女所占的比例现在平均为40%左右，而1970年时只有7.5%（尽管东亚的数字仍然很低）。在大多数情况下，这并不意味着这些孩子过着混乱的生活。超过80%的儿童生活在一对伴侣组成的家庭中，他们的父母可能只是选择不结婚，或者暂时不结婚。现在，不少婚礼会让一对新人的孩子做小伴娘或小伴郎。

不过，经合组织国家中确实有越来越多的儿童在单亲家庭中长大，通常是由母亲抚养。一般来说，这些家庭要比双亲家庭贫穷很多，往往也更不稳定。在美国，它们占总数的四分之一以上，在非裔美国人中比例更高。一个新的阶级鸿沟正在显现：受过良好教育的人继续进入传统婚姻并在其中养育子女；受教育程度较低的人则往往会有“计划外”子女，这些孩子在不稳定的家庭中长大。

世界各地的父母离异都比过去多很多：离婚率基本都比1970年时翻了一倍。他们中的一些人会再婚或和新伴侣同居，而许多孩子已是重组家庭的

一份子，可能与继兄弟姐妹生活在一起。其他一些与祖父母、其他亲戚或同性恋父母住在一起。所以“家”已不同以往。而随着更多母亲外出工作，家在白天可能还是空荡荡的。

上世纪60年代，美国、北欧、澳大利亚及新西兰等地开始推动妇女进入劳动力市场，这一趋势逐渐扩散到其他富裕国家，西班牙和荷兰步伐最缓。在经合组织国家中，女性劳动力参与率从1970年的47.6%上升到现在的64%。不过，在许多国家，随着女性发现兼顾事业和家庭有多么困难，这种增长已经放缓甚至停止。2012年，《大西洋》杂志上刊登的一篇文章在美国引发了一场大辩论。作者是学者和外交政策专家安妮·玛丽·斯劳特（Anne-Marie Slaughter），她曾在美国国务院担任要职，被广泛视为一名女权主义者。这篇题为《为何女人仍无法拥有一切》（Why women still can't have it all）的文章认为，面对体制和文化上的障碍，女性——甚至男性也一样——仍然必须在工作和家庭的要求之间做出令人不快的选择。人们仍然预期由女性来担任主要的照顾者，这有助于解释为什么她们在正式岗位上花费的时间远少于男性，而在没有酬劳的育儿和家务劳动上花费的时间要比男性多得多——即使在男性更为开明的地方也是如此。

高等教育普及是推动更多女性进入职场的一个动力。在过去二三十年里，获得高等学历的女性人数超过了男性。服务业的增长也创造了更多吸引女性的职位。而且社会文化规范正在慢慢转变。在德国，一个在孩子尚年幼时外出工作的女人过去被贴上“乌鸦妈妈”的标签（Rabenmutter，这个称呼误解和诋毁了鸟类抚养幼崽的方式）。而现在，至少那些更年轻的德国人认为母亲出去工作并没有问题。

政府可以做很多事来帮助父母们协调工作和家庭任务。最显而易见的方式是在婴儿刚出生的那段时间里提供带薪休假，而税收政策和现金资助也可以发挥作用。富裕国家的民众享有平均四个月的产假，但差异很大。美国是唯一一个在联邦层级不提供带薪产假的富裕国家，尽管一些州和许多雇主会提供。一些国家正在转向“育婴假”的概念，为母亲保留一个最低时限，其余的假期则按父母的意愿在两人之间分配。

在父亲获得“陪产假”的地方，他们并没有很快用掉这些假期，因为他们担心不上班时间长了会有损自己的事业。但是，德国在最近实施一系列改革后发现，如果以“不用就整个作废”的方式把这种育儿假提供给孩子的非主要照顾者（通常是父亲），他们就会更多地使用这些假期。

让父亲更多地参与育儿有很多好处。它促使母亲早点回去工作，这会让家庭经济条件更好，也能促进经济发展。相比把所有育儿任务都留给母亲，这么做也更为公平。而如果幸运的话，还可能建立起更好的分担家务的习惯。而这对所有参与者的心理健康都有益。孩子和父亲建立了更密切的关系，而如果母亲自己有事业追求，她的生活也会更加平衡。

假设她确实想继续工作，那么她愿望清单上头一项是什么？经合组织的奥利维尔·泰弗农（Olivier Thévenon）研究了一系列旨在促进工作与生活平衡的政策对女性劳动参与率的影响，包括带薪休假、家庭福利和税收优惠。结果发现，让更多女性进入职场的最有效方法之一是为三岁以下儿童提供更多的托儿服务。这恰好契合一个趋势：政策制定者愈发关注孩子生命中至关重要的头几年。 ■



Early years

Plastic brains

Catching them young

AT TURNER ELEMENTARY SCHOOL in south-east Washington, DC, about 15 well-turned-out five-year-olds sit on a mat in an immaculate classroom, bellowing out an uplifting song about being ready for school and listening to the teacher. Then they act out little scenes about being good citizens, sharing and helping others. They are having fun, but of a well-controlled sort.

For many of them this may be the calmest and most enjoyable part of their day. The school is in a poor part of America's capital and almost all its students are eligible for free or subsidised meals, which means their parents may struggle to make ends meet. The principal, Eric Bethel, says the school has made a lot of progress and achieves good academic results. It is teaching its preschool kids to read from age three.

The little children at Turner, and many of the District of Columbia's 114 other public schools, are lucky. In 2017 about nine out of ten four-year-olds there, and seven out of ten three-year-olds, were enrolled in publicly funded preschool, the highest rate in America, says Amanda Alexander, the interim chancellor of DC's public-school system. The schools have no trouble recruiting staff for this age group because, unusually, preschool teachers here are paid the same as those for older age groups.

Good preschool education helps get kids from poor families ready for school proper and do better in standardised tests, but it is expensive. In 2017 DC spent about \$17,000 per child on this item, far and away the most of any American state. Average preschool spending across America in 2017 was

about \$5,000, a drop in real terms compared with 2002. Seven states had no programme at all.

Early-childhood education and care is attracting a surge of interest in most rich countries. Increasingly, it is moving out of the home and into institutions, a process experts inelegantly call “defamilisation”. Across the OECD, average enrolment of three- to five-year-olds rose from 75% in 2005 to 85% in 2016.

One reason, as already noted, is to make it easier for women to go out to work, which boosts GDP and saves the state money in family support. In some countries this has been an explicit policy objective. Britain, for example, some years ago introduced free child care for 15 hours a week, and of 30 hours a week provided the parents work, for all three- and four-year-olds, regardless of background. But a paper by the Institute for Fiscal Studies, a think-tank, found that this was likely to have only a slight impact on maternal employment. Even 30 hours a week would not be long enough to squeeze in a full-time job.

Kate Greenaway Nursery School, run by the local authority in Islington, North London, is a confidence-inspiring place full of happy, busy children. It is open weekdays from 8am to 6pm, including holidays, so it provides effective cover for working families. As well as taking three-and-four-year-olds, it offers subsidised places for kids from six months to three years. These cost from £125 to £300 a week, depending on what parents earn. The head, Fiona Godfrey, says the places for younger children are in high demand. Good-quality private nurseries can cost even more and offer less. Child-care costs in Britain as a proportion of average incomes are among the world's highest (see chart).

In France, the ubiquitous, subsidised *écoles maternelles*, which take

children from the age of two, have long been the envy of working mothers elsewhere in Europe; and Germany has recently increased the number of child-care places for younger children, though provision is patchy. Sabine Bermann, head of a heavily oversubscribed *Kita* (Kindertagesstätte, or child day-care centre) in Berlin's rapidly gentrifying Prenzlauer Berg district, explains that parents have a legal right to a place for any child over the age of one. In Berlin they pay only for meals; some other German *Länder* (states) make charges ranging from modest to quite steep. But the promise rings hollow because the better *Kitas* have long waiting lists.

Denmark, along with other Nordics, had the debate about institutional care for young children 30 or 40 years ago and decided to make it universal, says Charlotte Ringsmose, who teaches pedagogy at Aarhus University. Attendance at preschool centres and kindergartens among three- to six-year-olds is around 98%. Danish child-care centres focus on play rather than formal tuition. Children do not learn to read until they start school proper at six, but then catch up fast. And Danes do not shop around for early-years child care because the nearest state-run place is usually just fine. Kids from the least well-off families go free, and even those with richer parents are heavily subsidised. Perhaps not coincidentally, both fertility rates and female labour-market-participation rates in Denmark and other Scandinavian countries—which have similar arrangements—are above the European average.

But Denmark's universal child-care provision also has a more ideological side to it. The idea is to make sure that all children, whatever their background, are steeped in the country's language, culture and values early enough to shape them for life. Last year the (right-wing) government controversially introduced legislation to require children living in designated poor neighbourhoods inhabited mainly by immigrants, which it calls "ghettos", to attend day care for at least 25 hours a week from the age of one.

Recent advances in neurology and child psychology have shown that the period from birth to age five, when the brain is at its most plastic, is the most important in a child's development, and that interventions during that period can be much more effective than later ones. Children from prosperous, educated backgrounds start off with a huge advantage because they already get a lot of stimulation and informal learning at home. But institutional early education and care, if done right, can help level the playing field for those from less privileged backgrounds.

The doyen of this school of thought is James Heckman of the University of Chicago, who has long argued that government investment in early childhood in institutional care pays off both for individuals and for society at large. He calculates the return on investment in high-quality birth-to-five education at between 7% and 13%. In evidence he cites two long-term studies of children from poor homes that began decades ago, the Perry Preschool Project in Michigan and the Abecedarian Project in North Carolina, which suggest that offering extra support for such children pays off not just in academic results but also in social and economic outcomes: better health, less poverty, less crime.

As a follow-up, Mr Heckman and colleagues evaluated a raft of other American early-childhood education programmes. These included Head Start, a long-standing federal preschool programme designed to get poorer kids ready for school, which had been criticised by other scholars because the academic improvements it achieved seemed to fade over time. But Mr Heckman's team reckoned that taking part in the programme did help the children in other ways, fostering social and emotional skills that turned out to be important in later life.

Isabel Sawhill and Quentin Karpilow at the Brookings Institution, a think-tank, studied a representative group of American children, tracking their progress from the earliest years through school and beyond. They, too,

found that well-targeted interventions—such as providing advice for parents and extra support for struggling children—improved the chances of disadvantaged kids becoming middle class when they grow up. Getting in early was crucial, and the best results were achieved by intervening several times from early childhood to early adulthood. The resulting boost to the incomes of those children in later life was about ten times greater than the cost of the programmes.

On the other side of the world, in a suburb of Shanghai, the children on one of the campuses of the Fortune kindergarten are just finishing lunch. The menu alternates daily between Chinese and Western; today it is Chinese food, which seems popular. Later they will take a walk outside and listen to stories, followed by a nap, and then end their school day with games or free play.

Fortune is considered one of the best kindergartens in Shanghai. It is a private establishment with around 3,000 places for children aged from 18 months to six years, scattered among various campuses across the city. Competition to get in is fierce. Local parents are subsidised by the government, but for others, fees for the most expensive package can run to 15,000 yuan (\$2,200, £1,700) a month. That buys you bilingual, bicultural teaching in Mandarin and English and even includes philosophy classes for five- to six-year-olds, explains Stephen Walshe, Fortune's Irish co-principal.

Most important, though, it offers a head start in a highly competitive system leading from kindergarten to primary, middle and senior school and eventually on to university. Better-off mothers often stop work for a while to make sure their child reaches that vital first rung on the educational ladder. For ambitious Chinese parents, formal learning cannot start soon enough. ■



头几年

可塑大脑

趁他们还年轻

在华盛顿特区东南部的特纳小学，窗明几净的教室里，大约15名穿戴整洁的五岁小孩坐在垫子上，高声唱着一首关于为上学做好准备和听老师话的令人振奋的歌曲。然后，他们表演了一些关于成为好公民、分享和帮助他人的小场景。他们玩得很开心，但秩序井然。

对于他们中的许多人来说，这可能是他们一天中最平静、最愉快的时光。学校位于美国首都的一个贫困地区，几乎所有学生都有资格获得免费或补贴午餐，这意味着他们的父母可能在艰难地维持生计。校长埃里克·贝瑟尔（Eric Bethel）表示，学校有了很大的进步，并取得了良好的学业成绩。它正在教学龄前儿童从三岁开始阅读。

特纳小学以及哥伦比亚特区其他114所公立学校的许多幼童都很幸运。2017年，大约有九成四岁儿童和七成三岁儿童入读公费资助的学前班，这一比例为全美最高，哥伦比亚特区公立学校系统的临时主管阿曼达·亚历山大（Amanda Alexander）说。学校在招募针对这个年龄段儿童的员工方面没有任何困难，因为这里有一点不同寻常：学前班教师的薪酬与高年级教师相同。

良好的学前教育有助于贫困家庭的孩子做好上学准备，并在标准化考试中表现更好，但这花费不菲。2017年，哥伦比亚特区在这个项目上的花费约为每个孩子17,000美元，远远超过美国其他州。2017年美国平均学前教育支出约为5,000美元，与2002年相比实值有所下降。有七个州根本没有此类项目。

大多数富裕国家对早期儿童教育和看护的兴趣激增。它正越来越多地走出家庭，进入机构。专家们粗略地称之为“去家庭化”。在所有经合组织国家中，三至五岁儿童的平均入学率从2005年的75%上升到2016年的85%。

正如前文指出的那样，其中一个原因是让女性更容易外出工作，从而提高GDP并节省政府对家庭的资助。这在一些国家是一个明确表述的政策目标。例如，若干年前，无论家庭背景，英国为所有三至四岁儿童提供每周15小时的免费托儿服务，为双职工提供每周30小时的免费托儿服务。但是，智库财政研究所（Institute for Fiscal Studies）的一篇论文发现，这对于推动母亲就业可能只有轻微的作用。哪怕每周空出30个小时也不足以挤进一份全职工作。

凯特·格林纳威托儿所由位于伦敦北部的伊斯灵顿区（Islington）的区政府管理，这里十分鼓舞人心，里面全是快乐而忙碌的孩子。工作日开放时间为上午8点至下午6点，节日也照常开放，为工作家庭提供了有效的保障。除了接收三至四岁的孩子外，它还为六个月到三岁的孩子提供有部分补贴的看护。根据父母收入，费用从每周125英镑到300英镑不等。院长菲奥娜·戈弗雷（Fiona Godfrey）表示，对幼儿看护的需求很大。优质的私营托儿所可能花费更高，服务却更少。英国的托儿费用占平均收入的比例属全球最高之列（见图表）。

在法国，无处不在的受补贴幼儿园（écoles maternelles）接收2岁以上的孩子，长期以来备受欧洲其他地方职场妈妈的艳羡。而德国最近增加了幼儿托儿所的数量，但分布不均。在柏林迅速贵族化的普伦茨劳贝格区（Prenzlauer Berg），一家供不应求的Kita（Kindertagesstätte，儿童日托中心）的负责人萨宾娜·伯尔曼（Sabine Bermann）解释说，父母有法定权利为任何一岁以上儿童获得一个位置。在柏林，他们只需支付餐费；其他一些德国Länder（州）的收费则从适中到非常昂贵不等。但这个承诺只是一句空话，因为进较好的Kita要排队很久。

丹麦和其他北欧国家在三四十年前就低龄儿童的机构看护展开辩论，最后决定普及这种看护，在奥尔胡斯大学（Aarhus University）讲授教育学的夏洛特·瑞恩斯莫司（Charlotte Ringsmose）说。三至六岁儿童的学前班和幼儿园入读率约为98%。丹麦的托儿所专注于游戏而不是正式授课。孩子们在6岁正式上学前不会学阅读，但随后很快会赶上。丹麦人不会为了

托儿所货比三家，因为离家最近的国营机构通常都不错。来自最不富裕家庭的孩子可以免费入读，即使是父母较为富裕的孩子也会获得大量补贴。也许并非巧合的是，丹麦和其他具有类似安排的斯堪的纳维亚国家的生育率和女性劳动力市场参与率均高于欧洲平均水平。

但丹麦为全民提供育儿服务还有更多意识形态方面的因素。那就是为了确保所有的孩子，无论背景如何，都尽早地沉浸在这个国家的语言、文化和价值观中，以塑造他们未来的生活。去年，该国（右翼）政府提出了一项充满争议的立法，要求生活在主要由移民居住的指定贫困社区（他们称之为“贫民窟”）的儿童从一岁开始每周至少入托25小时。

神经学科和儿童心理学的最新进展表明，大脑从出生到五岁处于可塑性最强的时期，也是儿童发展过程中最重要的时期，在此期间的干预可能比后期干预要有效得多。来自富裕的、受过良好教育的家庭的孩子们从一开始就拥有巨大的优势，因为他们已经在家里获得了很多刺激和非正式学习。但是，如果做得好，公共机构的早期教育和看护可以帮助那些来自不那么优越的背景的人公平参与竞争。

芝加哥大学的詹姆斯·赫克曼（James Heckman）是这种观点的资深代表。他长期以来一直认为政府对幼儿机构护理的投资会为个体和整个社会都带来回报。他计算得出，高质量的五岁以下教育投资回报率在7%到13%之间。作为证据，他引用了两项几十年前开始的针对贫困家庭儿童的长期研究：密歇根州的佩里学前教育项目（Perry Preschool Project）和北卡罗来纳州的“ABC启蒙”（Abecedarian）项目。它们表明，为这些儿童提供额外支持不仅提高了学业成绩，还取得了社会和经济回报：健康改善、贫困率降低，犯罪率下跌。

赫克曼和同事进一步评估了美国大量其他幼儿教育计划。其中包括“启蒙计划”（Head Start），这是一个长期的联邦学前教育项目，旨在让贫困的孩子为上学做好准备。该项目受到其他学者的批评，因为它所取得的学业成就似乎随着时间的推移逐渐消失了。但赫克曼的团队认为，参与该项目确实以其他方式帮助了孩子，培养了在日后的生活中发挥重要作用的社交

和情感技能。

智库布鲁金斯学会的伊萨贝尔·索希尔（Isabel Sawhill）和昆汀·卡比洛（Quentin Karpilow）研究了一个具代表性的美国儿童群体，追踪他们从人生头几年到进入学校及之后的进展。他们同样发现，那些针对性很强的干预措施——例如为父母提供建议和为有困难的孩子提供额外支持——提高了弱势儿童长大后成为中产阶级的几率。早期介入至关重要，而从幼儿期到成年初期的多次干预取得了最好的结果。这些孩子日后因此带来的收入提升大约是这些干预项目成本的十倍。

在世界的另一边，在上海的郊区，海富乐园的一个校区的孩子们刚刚吃完午餐。菜单每天在中餐和西餐之间交替。今天是中国菜，看起来很受欢迎。之后他们会在外面散步，听故事，午睡一会儿，然后在游戏或自由活动中结束在学校的一天。

海富乐园被认为是上海最好的幼儿园之一。这是一家私营机构，为18个月至6岁的儿童提供约3000个名额，分布在遍布整个城市的各个校区。入学竞争非常激烈。本地父母有政府补贴，但对于其他人来说，最昂贵的整套服务费用可以达到每月15,000元。海富乐园的爱尔兰联合负责人斯蒂芬·沃尔什（Stephen Walshe）解释说，你因此获得了普通话和英语的双语、双文化教学，甚至还有针对五到六岁儿童的哲学课程。

但最重要的是，它让你在从幼儿园到小学、中学和高中以及最终到大学的激烈竞争的体系中先人一步。富裕的母亲经常会停止工作一段时间，以确保她的孩子到达这个教育阶梯上至关重要的第一级。对于雄心勃勃的中国父母来说，正式学习的启动怎么都不嫌早。 ■



Childhood

The generation game

In just a few decades childhood has changed out of all recognition, says Barbara Beck. What does that mean for children, parents and society at large?

"WHEN I WAS a kid, we were out and about all the time, playing with our friends, in and out of each other's houses, sandwich in pocket, making our own entertainment. Our parents hardly saw us from morning to night. We didn't have much stuff, but we came and went as we liked and had lots of adventures." This is roughly what you will hear if you ask anyone over 30 about their childhood in a rich country. The adventures were usually of a homely kind, more Winnie the Pooh than Star Wars, but the freedom and the companionship were real.

Today such children will spend most of their time indoors, often with adults rather than with siblings or friends, be supervised more closely, be driven everywhere rather than walk or cycle, take part in many more organised activities and, probably for several hours every day, engage with a screen of some kind. All this is done with the best of intentions. Parents want to protect their offspring from traffic, crime and other hazards in what they see as a more dangerous world, and to give them every opportunity to flourish.

And indeed in many ways children are better off than they were a generation or two ago. Child mortality rates even in rich countries are still dropping. Fewer kids suffer neglect or go hungry. They generally get more attention and support from their parents, and many governments are offering extra help to very young children from disadvantaged backgrounds. As adolescents, fewer become delinquents, take up smoking and drinking or become teenage parents. And more of them finish secondary school and go on to higher education.

The children themselves seem fairly happy with their lot. In a survey across the OECD in 2015, 15-year-olds were asked to rate their satisfaction with their life on a scale from zero to ten. The average score was 7.3, with Finnish kids the sunniest, at nearly 7.9, and Turkish ones the gloomiest, at 6.1. Boys were happier than girls, and children from affluent families scored higher than the rest.

That is not surprising. Prosperous parents these days, especially in America, invest an unprecedented amount of time and money in their children to ensure that they will do at least as well as the parents themselves have done, and preferably better. Those endless rounds of extra tutoring, music lessons, sports sessions and educational visits, together with lively discussions at home about every subject under the sun, have proved highly effective at securing the good grades and social graces that will open the doors to top universities and well-paid jobs.

Working-class parents in America, for their part, lack the wherewithal to engage in such intensive parenting. As a result, social divisions from one generation to the next are set to widen. Not so long ago the “American dream” held out the prospect that everyone, however humble their background, could succeed if they tried hard enough. But a recent report by the World Bank showed that intergenerational social mobility (the chance that the next generation will end up in a different social class from the previous one) in the land of dreams is now among the lowest in all rich countries. And that is before many of the social effects of the new parenting gap have had time to show up yet.

This special report will explain what has led to these momentous changes in childhood in America and other rich countries, as well as in middle-income China. They range from broad social and demographic trends such as urbanisation, changes in family structure and the large-scale move of women into the labour force in recent decades to a shifting emphasis in

policy on the early years and the march of digital technology.

Start with the physical environment in which children are growing up. In rich countries the overwhelming majority now lead urban lives. Almost 80% of people live in cities, which have many advantages, including better opportunities for work, education, culture and leisure. But these often come at a cost: expensive housing, overcrowding, lack of green space, heavy traffic, high air pollution and a sense of living among strangers rather than in a close-knit community. This has caused a perception of growing danger, even though crime in Western countries in the past few decades has declined, so statistically the average child is actually safer.

Even more important, the domestic environment for most children has changed profoundly. Families have become smaller, and women bear children far later than they did only a couple of generations ago. In the vast majority of rich countries the average number of children a woman will have is now well below the replacement level of 2.1. Households with just one child have become commonplace in Europe and the more prosperous parts of Asia, including China. That means each child has more time, money and energy invested in it, but misses out on the hustle and bustle of a larger household.

Families have also become far more fluid. Rates of marriage have declined steeply, and divorce has become widespread. Many couples in America and Europe now cohabit rather than marry, and a large and growing proportion of children are born out of wedlock. Far more of them, too, are being brought up by lone parents, overwhelmingly mothers, or end up in patchwork families created by new sets of relationships. Again, this happens far more often at the bottom of the social scale than at the top.

At the same time the number of women going out to work has risen steeply, though in recent years the trend has slowed. The post-second-world-war

model of the nuclear family with a breadwinner husband, a homemaker wife and several children has become atypical. In America the share of women of working age in the labour force has risen from 42% in 1960 to 68% in 2017. To a greater or lesser extent the same has happened in other rich countries. Mothers now mostly return to work within a year or so of giving birth, not five or ten years later. In the absence of a handy grandmother, the child, even at a young age, will probably be looked after outside the home during the working week.

The first few years of a child's life are now receiving more attention as new evidence has emerged about its vital importance in the development of the brain. James Heckman, a Nobel prize-winning American economist, has suggested that early investment in a range of measures from high-quality child care to support programmes for parents offers excellent returns, far better than remedial interventions later in life.

Governments in many countries have started to increase the number of public child-care and kindergarten places to supplement private provision, both to encourage more women to take paid jobs and to promote the development of young children from less privileged backgrounds. This report will look at the wide variety of early-years care on offer in different countries (ranging from plentiful and relatively cheap in the Nordics to scarce and often eye-wateringly expensive in the Anglo-Saxon countries, with most of the rest of Europe somewhere in between), and try to assess what difference it makes. In East Asia this is the first rung of a fiercely competitive educational ladder.

The report will also consider the effect on children of an array of screen-based devices, from televisions to smartphones, offering a feast of passive entertainment, interactive computer games and the opportunity to connect with peers remotely. Not long ago children used to rile their parents by declaring they were bored, but now "being bored is something that never

has to be tolerated for a moment", writes Sherry Turkle of MIT, an expert on digital culture. In rich countries the vast majority of 15-year-olds have their own smartphone and spend several hours a day online. There are growing concerns that overuse might lead to addiction and mental illness, and that spending too much time sitting still in front of a screen will stop them from exercising and make them fat. The digital world also harbours new risks, including cyberbullying and sexting.

But the first thing this report will explore is the new face of the institution still central to any child's life: the family. ■



童年

代际游戏

芭芭拉·贝克说，在短短几十年里，童年已经变化得面目全非。这对儿童、父母和整个社会意味着什么？

“在我小时候，我们一直都在外面，和朋友们一起玩，在每个人家里跑进跑出，口袋里放着三明治，自己找乐子。父母几乎从早到晚都见不着我们。我们没有太多玩意，但可以随心所欲地来来去去，有很多冒险。”在富裕国家，随便找个30岁以上的人来问问他们的童年，听到的回答基本就是这样。这些冒险通常都很普通，更像是小熊维尼而不是星球大战，但自由和友谊是真实的。

今天，孩子们大部分时间都待在室内，通常是和成年人而不是兄弟姐妹或朋友在一起，被更密切地监督，去哪里都有车接送而不是自己走路或骑车，参加多得多的有组织的活动，还很可能每天都要花几个小时在某种屏幕前面。而所有这一切都是出于最好的意图。父母们想要在一个在他们看来更危险的世界里保护自己的后代免于交通事故、犯罪和其他危险，并给予他们一切茁壮成长的机会。

确实，从很多方面来说，孩子们比前一两代人那会儿过得更好了。即使在富裕国家，儿童死亡率仍在下降。得不到照顾或挨饿的孩子更少了。他们通常获得父母更多的关注和支持，还有许多政府为来自弱势背景的幼儿提供额外帮助。在青少年当中，犯罪、吸烟、饮酒或十几岁就做了父母的人更少了。更多人完成了中学学业并继续接受高等教育。

孩子们自己似乎对命运较为满意。2015年经合组织的一项调查让15岁的孩子按0到10分给自己的生活满意度打分。平均得分为7.3分，其中芬兰小孩最阳光，接近7.9分，土耳其小孩最忧愁，为6.1分。男孩比女孩更快乐，富裕家庭的孩子得分高于其他孩子。

这并不奇怪。如今，富裕的父母，特别是在美国，为他们的孩子投入了前

所未有的时间和金钱，以确保孩子们至少能和自己过得一样好，最好是更好。那些无休止的额外辅导、音乐课、体育锻炼和各种教育参观之旅，以及在家里热烈讨论天底下的每个话题，已经证明非常有效地确保了良好的成绩和社交礼节，打开了通向顶尖大学和高薪工作的大门。

美国的工薪阶层父母则缺乏必要的资金来如此细心地养育孩子。其结果是，从一代人到下一代人的社会分裂必将扩大。就在不久之前，“美国梦”还描绘了一幅图景，即每个人，无论背景多么卑微，只要足够努力都会成功。但世界银行最近的一份报告显示，在所有富裕国家中，“梦想之地”的代际社会流动性（即下一代最终处于与上一代不同的社会阶层的可能性）位于最低之列。而此时新的育儿差异带来的诸多社会影响还没来得及显现。

本特别报道将解释是什么导致了在美国和其他富裕国家，以及中等收入的中国，人们的童年时期出现了这些重大变化。它们既有广泛的社会和人口趋势，例如城市化、家庭结构变化以及近几十年来妇女大规模进入劳动力市场，也有育儿政策的重点向婴幼儿期转移和数字技术的进步。

先说孩子成长的物理环境。在富裕国家，绝大多数人如今都过着城市生活。几乎80%的人生活在城市。这带来了许多优势，包括更好的工作、教育、文化和休闲的机会。但这往往需要付出代价：住房昂贵、过度拥挤、缺乏绿地、交通繁忙、空气污染严重，以及生活在陌生人当中而非亲密社区里的感觉。这就给人一种危险越来越大的印象，尽管西方国家的犯罪率在过去几十年间有所下降，因此从统计数字上说，普通儿童的生活实际上更安全了。

更重要的是，大多数儿童的家庭环境发生了深刻的变化。家庭变得越来越小，女性生育的时间远远晚于两三代人之前。在绝大多数富裕国家，女性的平均子女数目现在远低于2.1的更替水平。只有一个孩子的家庭在欧洲以及中国等亚洲较繁荣的地区都已经变得司空见惯。这意味着每个孩子都得到了更多的时间、金钱和精力投入，但却错过了大家庭的热闹。

家庭还比从前不稳定得多。结婚率急剧下降，离婚则非常普遍。美国和欧洲的许多伴侣现在同居而不结婚，而且有大批并且越来越多的孩子是非婚生子女。他们当中由单亲（绝大多数是母亲）抚养长大，或最终生活在因新关系而重组的家庭中的人数也大幅增加。同样，这种情况发生在社会阶梯底层的比例也远高于阶梯顶部。

与此同时，外出工作的妇女人数急剧增加，但近年来这一趋势已经放缓。由养家糊口的丈夫、操持家务的妻子和几个孩子组成的二战后核心家庭模式已经变得不再典型。在美国的劳动力中，劳动年龄妇女的比例从1960年的42%上升到2017年的68%。其他富裕国家也多少地发生了同样的变化。现在大多数母亲会在分娩后一年左右，而不是五年或十年后重返职场。在没有一位能干的祖母帮忙的情况下，孩子哪怕很小，也很可能会在工作日里被放在家庭之外的地方看护。

儿童生命的头几年现在受到更多的关注，因为它对于大脑发育至关重要的新证据已经出现。获得诺贝尔奖的美国经济学家詹姆斯·赫克曼（James Heckman）表示，从高质量的托儿所到父母支持计划，一系列早期投资措施可以提供良好的回报，远远优于后期的补救干预措施。

许多国家的政府已开始增加公共托儿所和幼儿园作为私人机构的补充，以鼓励更多妇女从事有薪工作，同时促进家庭背景欠佳的幼儿的成长发展。本报道将研究不同国家提供的各种早期看护（北欧提供的看护很富足且相对便宜，英美国家稀缺且常常贵得让人瞠目，欧洲其他大部分地区介于两者之间），并尝试评估它产生了何种影响。在东亚，这是竞争激烈的教育阶梯的第一步。

从电视到智能手机，本报道还将考察一系列屏幕设备对儿童的影响。它们提供了一场被动娱乐的盛宴、互动电脑游戏，以及远程与同伴联系的机会。麻省理工学院的数字文化专家雪莉·图克尔（Sherry Turkle）写道，不久前，孩子们还会常常宣称自己感到无聊来气他们的父母，但现在“无聊没有片刻需要被容忍”。在富裕国家，绝大多数15岁的孩子都拥有自己的智能手机，每天在网上消磨数小时。人们越来越担心过度使用会导致成瘾

和精神疾病，并且花太多时间坐在屏幕前会让他们不去锻炼而变胖。数字世界也潜藏着新的风险，包括网络欺凌和色情信息。

但本报道将探讨的第一件事还是所有孩子生活的核心机构——家庭——的新面目。 ■



Demographic change

People power

It is not quite destiny, but demography is too powerful for politicians to control

ONE CLUE to the character of a government comes from listening to what political leaders say about the national birth rate. Authoritarians such as Recep Tayyip Erdogan and Vladimir Putin tend to complain about it, and urge women to have more (or, occasionally, fewer) babies. Outright dictators like Josef Stalin and Nicolae Ceausescu believed they could actually alter it. Grumbling resignation, or silence, is a mark of liberal democracy.

In truth, governments can do little to change people's minds about how many children to have. Even China's one-child policy, introduced in 1979, probably only accelerated a drop in the birth rate that would have happened anyway. Two new books portray demographic change as an inexorable force that, rather than bending to leaders' whims, steamrolls politicians and can change the course of history. They also suggest that what one of them calls "the great fairground ride of world population change" is running out of steam.

Many people have heard of Thomas Malthus, the 18th-century English cleric who predicted that human populations would grow faster than food production, leading to calamity. The American demographer Warren Thompson is less famous. But Thompson's theory of demographic transition, which he outlined in 1929, has held up much better than Malthus's prognostications. To begin with, Thompson observed, a country has a high birth rate and a high death rate. As farming and health care improve, mortality falls. The birth rate stays high for a while, then it begins to drop, too. Countries that have gone through this demographic transition have lower birth rates and lower death rates than they began with—and

many more people.

During the journey, countries acquire and then shed particular strengths and frailties, owing to the changing size and shape of the population. A country in the second stage, with a high birth rate and a low death rate, is young and fast-growing. When the birth rate falls, too, the country enters a wonderful spell. With fewer children relative to the adult population, but still not many retirees to look after, it becomes a nation of able-bodied workers. Then it grows old.

Paul Morland's "The Human Tide" is mostly about how this process has played out in Europe and Asia. Britain went first, to its great advantage. In the late 16th century England had 4m inhabitants—half as many as Spain, which helps explain why the prospect of a Spanish invasion was so terrifying. England's population doubled by the early 19th century, then went bonkers. By 1901 England not only had 30m inhabitants; it had also disgorged many people across North America, Australasia and Africa. The country dominated partly through sheer weight of numbers.

The populations of Germany, Japan and Russia exploded a few decades later, causing others to worry (with some justification) that they too would try to grab more territory. Their swelling, young populations gave them clout at a time when war was largely a matter of flinging bodies at the enemy. The late 19th and early 20th centuries were an era of pro-natalism, and of fear that other countries were reproducing faster than one's own. As a British newspaper put it in 1903: "The full nursery spells national and race dominance."

That was never quite right, and seems even less true in the modern world of cruise missiles, international trade and soft power. But Mr Morland argues that demography continues to shape events. The Middle East, he writes, is unstable partly because it has so many young people. Japan no longer seems

destined to be “number one”, as a book published in 1979 had it, because it has so few. Demography can heighten paranoia and resentment within countries, when one national or ethnic group appears to reproduce faster than another. The former Yugoslavia, where Serbs moved to a low birth rate before Bosnian Muslims or Kosovan Albanians, is “an exemplary case of the destabilising impact of uneven demographic transition”.

In the final stage of that transition, the birth rate falls below the death rate. That leads to population decline unless countries accept lots of immigrants. In “Empty Planet”, Darrell Bricker and John Ibbetson maintain that this is the fate of the entire world. As countries grow richer and more urban, and as more girls go to school, children cease to be economic assets. People begin to have babies not because they need them, or because village elders bully them into parenthood, but because they enjoy bringing them up. That desire can be satisfied with just one or two.

Mr Bricker and Mr Ibbetson regard a sub-replacement fertility rate (in which every woman has fewer than 2.1 children on average) as Europe’s “natural state”. They call the post-war baby boom a blip. Their book argues that even baby-rich sub-Saharan Africa will gravitate towards the one- or two-child norm faster than the sedate expectations of UN demographers. This may be right. The demographic transition seems to be accelerating: Asia and Latin America went through it more quickly than Europe. To mangle a phrase of Francis Fukuyama’s, the world could be heading for the end of demography and (eventually) the last man.

If so, it will reduce pressure on Earth’s resources. But perhaps the cheers should be muted. Shrinking populations are hard to manage: towns must be replanned and pensions trimmed. And many people in the rich world do not actually desire one or two children. Fully 41% of Americans think the ideal number is three or more. Most families fall short because relationships prove too fragile, houses too expensive, bosses too inflexible and

conception too difficult. Behind that supposedly “natural” rate lies much disappointment.

As more and more countries go through the demographic transition, something else is becoming clear. The challenges and pitfalls of population change can be handled more or less adeptly. A bulge of young adults may have been a curse in the Arab world, but it was a blessing in China. Countries can adapt to an ageing population—by welcoming more immigrants and making it easier for mothers to do paid work—or they can stick their collective heads in the sand. Demography is a mighty force. It is not quite destiny. ■



人口结构变化

人的力量

这不完全是宿命。但人口结构的转变太过强大，政客无力控制【《人类的潮汐：人口如何塑造了现代世界》书评】

想了解一个政府的性质，线索之一是听一听政治领导人关于国家出生率的言论。埃尔多安和普京这样的威权主义者往往会抱怨，并敦促女性多生（或者，偶尔是少生）孩子。斯大林和齐奥塞斯库这样彻头彻尾的独裁者竟然相信自己可以扭转乾坤。发着牢骚接受现实或是保持沉默则是自由民主主义者的标志。

实际上，政府在改变人们想生几个孩子方面几乎无能为力。即便是中国于1979年开始实行的独生子女政策可能也只是让原本就会发生的出生率下降加速发生而已。有两本新书将人口结构变化描绘成一种不可阻挡的力量，它不屈从于领导人的一时冲动，而是会碾压政客，并且能改变历史进程。它们还指出，其中一本书所称的“世界人口变化的大游乐场之旅”已经后继乏力。

许多人都听说过托马斯·马尔萨斯（Thomas Malthus）。这位18世纪的英国牧师预言，人口增速将会超过粮食产量的增速，从而导致灾难。美国人口学家沃伦·汤普森（Warren Thompson）没那么出名。但他在1929年提出的人口结构转变理论远比马尔萨斯的预测站得住脚。汤普森观察到，起初，一个国家的出生率和死亡率都很高。随着农业的发展和医疗卫生水平的改善，死亡率下降。出生率在一段时间内保持高位，然后也开始下降。经历了这一人口结构转变的国家的出生率和死亡率都比开始时要低，而人口总数已经多了很多。

在这一过程中，由于人口规模和结构的变化，各国会先获得、继而又再失去一些优势和弱点。处于第二阶段的国家出生率高，死亡率低，人口年轻且增长迅猛。等到出生率也下降，这个国家就进入了一个美妙的时期。相对于成年人口，儿童数量较少，而需要照顾的退休人口也还不多，它成为

了一个劳动力强国。然后这个国家开始变老。

保罗·莫兰德（Paul Morland）的《人类的潮汐》（The Human Tide）一书主要讲述了这个过程在欧洲和亚洲是如何演变的。英国最先经历了这一过程，获得了巨大的优势。在16世纪晚期，英格兰有400万居民，是西班牙的一半，这也解释了为什么一旦西班牙入侵会如此可怕。到19世纪初，英格兰人口翻了一番，然后开始疯涨。到1901年，不仅英格兰本土居民达到3000万，它还向北美洲、澳大拉西亚和非洲输出了很多人口。一定程度上这个国家是靠庞大的人口占据霸主地位的。

几十年后，德国、日本和俄罗斯的人口出现爆炸式增长，其他国家担心它们也会想攫取更多领土（这种担忧有一定道理）。当时的战争胜利很大程度上是靠人命堆出来的，所以这些国家凭借不断膨胀的年轻人口积聚了实力。19世纪末20世纪初是一个鼓励生育的时代，人们担心其他国家的生育速度会超过本国。正如一家英国报纸在1903年所言：“拥挤的托儿所预示着国家和种族的统治地位。”

这种说法不总是正确的，在有着巡航导弹、国际贸易和讲求软实力的现代世界更是如此。但是莫兰德认为人口结构仍然在影响局势。他写道，中东之所以不稳定，部分原因是那里有太多年轻人。日本似乎不再像1979年出版的一本书里说的那样，注定会成为“世界第一”，因为它的年轻人太少了。当一个民族或族裔的繁殖速度看似快过另一个民族或族裔时，人口结构会加剧国家内部的猜疑和怨恨。在前南斯拉夫，塞尔维亚人的出生率比波斯尼亚穆斯林和科索沃阿尔巴尼亚人低，这是“不均衡的人口结构转变造成不稳定的典型例子”。

在转变的最后阶段，出生率低于死亡率。除非各国接受大量移民，否则这将导致人口下降。在《空荡荡的星球》（Empty Planet）一书中，达雷尔·布里克（Darrell Bricker）和约翰·易碧森（John Ibbetson）认为这是全世界的宿命。随着国家变得更加富裕、更加城市化，加上越来越多的女孩接受教育，孩子不再是经济资产。人们开始不再因为需要子女或村里长辈的威逼而生孩子，而是因为他们喜欢养儿育女。而这样的欲望只需要生一两

个孩子就能满足。

布里克和易碧森认为生育率低于人口替代率（平均每个妇女生育少于2.1个孩子）是欧洲的“自然状态”。他们称战后的婴儿潮是暂时现象。他们在书中指出，即使是新生儿很多的撒哈拉以南非洲地区，也会比联合国人口学家四平八稳的预期更快速地迈向只生育一两个孩子的标准状态。这可能是对的。人口结构的转变似乎正在加速：亚洲和拉丁美洲比欧洲的转变速度更快。化用下弗朗西斯·福山（Francis Fukuyama）的一句话，世界可能正走向人口结构的终结，（最终）走向最后一个人。

如果是这样，地球资源的压力会减轻。但也许并不应该为此欢呼。人口萎缩很难处理：城镇必须重新规划，养老金必须削减。而富裕国家的许多人其实并不只想要一两个孩子。足有41%的美国人认为理想的子女数量是三个及以上。大多数家庭没达到这一数量的原因是家庭关系太脆弱、房子太贵、老板太死板，或是受孕太困难。在这个所谓的“自然”比例背后隐藏着太多失望。

随着越来越多的国家经历人口转变，另有一件事也变得日渐清晰。人口变化的挑战和陷阱或多或少可以熟练灵活地应对。年轻人增多在阿拉伯世界可能是一种诅咒，但在中国却是一件幸事。各国可以通过接纳更多移民、让妈妈们更容易从事有偿工作来适应老龄化，或者也可以集体逃避现实。人口结构是一股强大的力量。但它不完全是宿命。 ■



Arms control

Taming terminators

Humans must keep tight control of autonomous weapons

FOR THOUSANDS of years, weapons went where humans thrust, threw or propelled them. In the past century, they have grown cleverer: more able to duck and weave to their targets; more able to select which of many ships, tanks or aircraft to strike; and more able to wait for the right target to turn up. Increasingly, such weapons can be let loose on the battlefield with little or no supervision by humans.

The world has not entered the age of the killer robot, at least not yet. Today's autonomous weapons are mostly static systems to shoot down incoming threats in self-defence, or missiles fired into narrowly defined areas. Almost all still have humans "in the loop" (eg, remotely pulling the trigger for a drone strike) or "on the loop" (ie, able to oversee and countermand an action). But tomorrow's weapons will be able to travel farther from their human operators, move from one place to another and attack a wider range of targets with humans "out of the loop" (see Briefing). Will they make war even more horrible? Will they threaten civilisation itself? It is time for states to think harder about how to control them.

The UN's Convention on Certain Conventional Weapons (CCW) has been discussing autonomous weapons for five years, but there is little agreement. More than two dozen states (including Austria, the Vatican, Brazil and nuclear-armed Pakistan), backed by increasingly vocal activists, support a pre-emptive ban on "fully autonomous weapons". They point to campaigns against anti-personnel landmines, cluster munitions, and biological and chemical weapons as evidence that this can succeed. Most big powers—among them America, Russia and Britain—retort that the laws of

war are already good enough to control autonomous weapons. Some argue that such weapons can be more accurate and humane than today's.

A third group of countries, led by the likes of France and Germany, is urging greater transparency and scrutiny. Autonomous systems make wars more unpredictable and harder to supervise; and they make it harder to assign responsibility for what happens during conflict. This third group is surely right to try to impose at least some controls.

The laws of war are still the right place to start. They do not seek to ban war, but to limit its worst excesses. Among other things, they require that warriors discriminate properly between combatants and civilians, and ensure that collateral damage is proportionate to military gains. Military actions must therefore be judged in their context. But that judgment is hard for machines to form.

In addition, new rules will be difficult to negotiate and monitor. For one thing, it is hard to control what does not yet exist and cannot be precisely defined. How long may a drone hover above the battlefield, empowered to strike, before it has slipped out of the hands of the humans who sent it there? The difference between machines under human control and those beyond it may be a few thousand lines of secret code.

That said, two principles make sense. First, the more a weapon is permitted to roam about over large areas, or for long periods, the more important it is that humans remain "on the loop"—able to supervise its actions and step in if necessary, as circumstances change. That requires robust communication links. If these are lost or jammed, the weapon should hold fire, or return.

A second tenet is that autonomous systems, whether civilian ones like self-driving cars or those that drop bombs, should be "explainable". Humans should be able to understand how a machine took a decision when things

go wrong. On one point, at least, all states agree: that the buck must stop with humans. “Accountability cannot be transferred to machines,” noted a report of the CCW in October. Intelligent or not, weapons are tools used by humans, not moral agents in their own right. Those who introduce a weapon into the battlefield must remain on the hook for its actions.

A good approach is a Franco-German proposal that countries should share more information on how they assess new weapons; allow others to observe demonstrations of new systems; and agree on a code of conduct for their development and use. This will not end the horrors of war, or even halt autonomous weapons. But it is a realistic and sensible way forward. As weapons get cleverer, humans must keep up. ■



军备控制

驯服终结者

人类必须严控自主武器

千万年来，武器按着人类刺、投或推的方向发出攻击。在过去一百年里，武器已变得更聪明——它们愈发能够在攻击过程中闪躲穿行，在众多舰船、坦克或飞机中选择攻击目标，以及等待攻击目标的现身。在战场上，这样的武器可能会越来越多地在少有或完全无人监督的情况下自由发挥。

世界还没有进入杀手机器人的时代，至少现在还没有。当今的自主武器大多是在自卫时击落来袭威胁物体的静态系统，或者攻击狭小指定区域的导弹。几乎所有的自主武器系统仍然有人员“在回路中”（比如远程控制无人机开火）或“在回路之上”（比如能够监视和撤销某个行动）。但未来的武器将能使用人员“在回路外”的系统，行进到离人类操纵员更远之处，从一地移动到另一地，向更大范围的目标发起攻击。这样的武器会不会让战争变得更恐怖？会不会威胁人类文明自身？各国是时候认真思考该如何控制自主武器了。

联合国《特定常规武器公约》（CCW）就自主武器展开讨论已有五年，却没能达成什么共识。在呼声日益强烈的活动人士的支持下，20多个国家（包括奥地利、梵蒂冈、巴西和拥有核武器的巴基斯坦）主张采取先发制人的行动，禁止“全自主武器”。它们以针对杀伤性地雷、集束弹药和生化武器的行动为例证，指出禁止全自主武器是可行的。而美国、俄罗斯和英国等多数强国则反驳称，战争法已经非常完善，足以制约自主武器。一些强国称自主武器可能比现有武器更精准、更人道。

以法国、德国等为首第三类国家则敦促提高透明度和加大审查力度。自主系统让战争更难预测和监督，也让冲突中各类事件的责任界定变得更加困难。这些国家试图至少采取一些管制措施，这显然是正确的。

从战争法入手没有错。战争法并不谋求禁止战争，而是要限制最恶劣的战

争暴行。比如，它要求士兵正确区分作战人员和平民，并确保附带性破坏与军事收益成正比。因而必须根据实际情形来判断采取何种军事行动。但是，机器很难做出这种判断。

此外，要议定和监督实施新的法规存在很大难度。首先，很难对那些尚不存在且不能被精确定义的自主武器实施管控。一架被人类赋予攻击的能力和权力的无人机要在战场上空盘旋多久，才能摆脱人类指挥员的控制？受人类控制的机器与不受人类控制的机器之间的差别可能是几千行秘密代码。

即便如此，仍有两条原则是明智的。第一条是武器被允许的活动范围越广、时间越长，就越有必要保持有人员“在回路之上”，从而能够监督武器的行动，并且根据环境的变化在必要时介入其中。这需要强大而稳定的通信链路。如果通信链路丢失或堵塞，武器应该能停火或返回。

第二个原则是自主系统的行为都应该是“可解释的”，无论是无人驾驶汽车等民用系统，还是投掷炸弹的军用系统。人类应该能够了解机器在出现问题时是如何做决策的。所有国家至少在“责任在于人类”这点上达成了共识。《特定常规武器公约》去年10月的一份报告指出，“不能将责任转嫁到机器上。”武器无论智能与否，都不过是人类的工具，它们本身并不是道德行为体。那些将武器推向战场的人仍然必须为武器造成的后果负责。

法德的提议不失为一种良策：各国应该就如何评估新武器分享更多信息；允许他国观摩新系统的演示；对武器的开发和使用的实施准则达成一致。这并不会终结战争的恐怖，甚至也不会遏阻自主武器的进程。但它却是一条务实而明智的前进道路。随着武器越来越智能，人类也必须与时俱进。





An unfair world

Conkerine inequalities

How to help level the playing field

BRITISH CHILDREN used to play conkers in the autumn when the horse-chestnut trees started to drop their shiny brown nuts. They would select a suitable chestnut, drill a hole in it and thread it onto a string, then swing their conker at that of an opponent until one of them broke. But the game has fallen out of favour. Children spend less time outdoors and rarely have access to chestnut trees. Besides, many schools have banned conkers games, worried that they might cause injuries or trigger nut allergies.

That sort of risk-averseness now pervades every aspect of childhood. Playgrounds have all the excitement designed out of them to make them safe. Many governments, particularly in litigious societies such as America, have tightened up their rules, requiring parents to supervise young children far more closely than in the past. Frank Furedi of the University of Kent, a critical commentator on modern parenting, argues that “allowing children to play unsupervised or leaving them at home alone is increasingly portrayed as a symptom of irresponsible parenting.”

In part, such increased caution is a response to the huge wave of changes outlined in this report. Large-scale urbanisation, smaller and more fluid families, the move of women into the labour market and the digitisation of many aspects of life have inevitably changed the way that people bring up their children. There is little prospect that any of these trends will be reversed, so today’s more intensive parenting style is likely to persist.

But the child-rearing practices now embraced by affluent parents in many parts of the rich world, particularly in America, go far beyond an adjustment

to changes in external conditions. They amount to a strong bid to ensure that the advantages enjoyed by the parents' generation are passed on to their offspring. Since success in life now turns mainly on education, such parents will do their utmost to provide their children with the schooling, the character training and the social skills that will secure access to the best universities and later the most attractive jobs.

To some extent that has always been the case. But there are more such parents now, and they are competing with each other for what economists call "positional goods"—things that are in limited supply and that money cannot always buy, like those places at top universities. This competition starts even before the children are born. The prosperous classes will take their time to select a suitable spouse and get married, and will start a family only when they feel ready for it.

Children from less advantaged backgrounds, by contrast, often appear before their parents are ready for them. In America 60% of births to single women under 30 are unplanned, and over 40% of children are born outside marriage. And even if those children have two resident parents who are doing their best for them, they are still handicapped by a lack of funds, knowledge and connections. The result, certainly in America, has been to widen already massive social inequalities yet further.

What can be done about this? All the evidence suggests that children from poorer backgrounds are at a disadvantage almost as soon as they are born. By the age of five or six they are far less "school-ready" than their better-off peers, so any attempts to help them catch up have to start long before they get to school. America has had some success with various schemes involving regular home visits by nurses or social workers to low-income families with new babies. It also has long experience with programmes for young children from poor families that combine support for parents with good-quality child care. Such programmes do seem to make a difference.

Without extra effort, children from low-income families in most countries are much less likely than their better-off peers to attend preschool education, even though they are more likely to benefit from it. And data from the OECD's PISA programme suggest that children need at least two years of early (preschool) education to perform at their best when they are 15.

So the most promising way to ensure greater equity may be to make early-years education and care far more widely available and more affordable, as it is in the Nordics. Some governments are already rethinking their educational priorities, shifting some of their spending to the early years.

Most rich countries decided more than a century ago that free, compulsory education for all children was a worthwhile investment for society. Since then the school-leaving age has repeatedly been raised. There is now an argument for starting preschool education earlier, as some countries have already done. Before the Industrial Revolution it was the whole village that minded the children, not individual parents. In the face of crushing new inequalities, a modern version of that approach is worth trying. ■



不公平的世界

击碎不平等

如何打造更公平的竞技场

过去，英国的孩子在秋天会玩打马栗（conkers）。当马栗树上开始掉下光亮的棕色坚果时，他们会选一个合适的，在上面打个洞，把它穿到一根绳子上，然后用自己的马栗去击打对手的那个，直到其中一个被击碎。现在这个游戏已经没什么人玩了。孩子们在户外的时间少了，也不太见得到马栗树。而且很多学校还不许玩打马栗，担心有人受伤或坚果过敏。

这样的风险规避现在已经笼罩了童年的方方面面。游乐场的设计移除了所有刺激的部分以确保安全。许多政府——尤其是在美国这样爱诉讼的社会里——已经收紧法规，要求父母用比过去严得多的方式看管幼儿。现代育儿理念的批评家、肯特大学的弗兰克·弗雷迪（Frank Furedi）指出，“让儿童在无人看管的情况下玩耍或把他们单独留在家中被日益描述成不负责任的育儿方式。”

在某种程度上，这种更谨慎的方式是对本报道中概述的巨大变化浪潮做出的应对。大规模城市化、更小而更不稳定的家庭、女性进入劳动市场，以及生活方方面面的数字化，都已不可避免地改变了人们养育子女的方式。这每一个趋势发生逆转的可能性都微乎其微，所以今天这种更加精耕细作的育儿方式应该也会持续下去。

但是，如今在富裕世界的许多地方，尤其在美国，富裕的父母采用的育儿方式远远超出了因外部条件变化而做出的调整。它们实际已经变成一种大力押注，要确保父母一代享有的优势会传递给自己的下一代。由于如今人生的成功主要取决于教育，这些父母会竭尽所能为子女提供一流的学校教育、性格塑造和社交技能训练，以确保他们进入最好的大学，之后又得到最具吸引力的工作。

在某种程度上，情况一直都是如此。但现在这样的父母更多了，而他们正

在彼此竞争，抢夺经济学家称之为“地位性商品”的东西——供应有限，不总能用钱买到，比如顶尖大学的录取名额。这场赛跑甚至在孩子出生之前就已打响。富裕阶层会花时间去挑选合适的配偶并结婚，并且只有在他们感觉已经准备好了的时候才会生孩子。

而背景欠佳的儿童常常是在父母尚未准备好时来到人世。在美国，30岁以下单身女性的生育有60%是计划外，而超过四成孩子是非婚生子女。而即使这些孩子家中有两个正在倾全力养育他们的父母，缺乏资金、知识和人脉依然拖了他们的后腿。结果是业已存在的巨大的社会不平等进一步扩大，这一点在美国毋庸置疑。

对此还能做些什么呢？所有证据都表明，来自较贫困家庭的儿童几乎从一出生就处于劣势。等到他们五六岁时，相比那些更富裕的同龄人，他们远远没能为上学做好准备，所以任何要帮助他们赶上去的努力都必须在他们上学之前很久就启动。美国有各种项目来让护士或社工定期走访有新生儿的低收入家庭，取得了一些成果。它在针对贫困家庭幼儿的项目上也有长期的经验，把对父母的支持和优质的托儿结合起来。这类计划似乎确实起了作用。如果没有额外的帮助，大多数国家低收入家庭的孩子获得学前教育的可能性要远低于富裕家庭的孩子，即便他们更有可能从中受益。而来自经合组织的PISA计划的数据表明，儿童需要至少两年的早期教育（即学前教育）才能在15岁时在学业上有最佳表现。

因此，要确保更公平的成长环境，最有希望的办法可能是大幅增加早期教育和看护的供应，并让价格变得更容易负担，就像在北欧那样。一些政府已经在反思教育上的轻重缓急，将部分开支转移到人生的头几年。

一个多世纪前，大多数富裕国家认定，为所有儿童提供免费的义务教育是一项有意义的社会投资。从那时起，孩子们离校的年龄被一再提高。现在有一种观点是提前启动学前教育，而一些国家已经在这么做了。在工业革命之前，孩子们由整个村庄而不是父母个人照料。面对严峻的新的不平等，这种方式的现代版本值得一试。 ■



Bartleby

Permission to speak

Companies will perform better if employees are not cowed into silence

IN “DAD’S ARMY”, a British sitcom about a home-defence force, Sergeant Wilson would often query his commander’s various orders with the languid phrase “Do you think that’s wise, sir?” His scepticism, although it was often ignored, was usually justified.

Many employees must be tempted to echo Sgt. Wilson on a daily basis when they see their bosses headed down the wrong track. But caution, for fear of appearing insubordinate or foolish and thus possibly at risk of losing their jobs, often leads workers to keep silent.

A culture of silence can be dangerous, argues a new book, “The Fearless Organisation”*, by Amy Edmondson, a professor at Harvard Business School. Some of her examples are from the airline industry. One was its deadliest accident: a crash between Boeing 747s in the Canary Islands in 1977 when a co-pilot felt unable to query his captain’s decision to take off based on a misunderstanding of instructions from air-traffic control. Another case was that of the Columbia space shuttle in 2003; an engineer who may have diagnosed damage to the shuttle’s wing before the flight felt unable to speak as he was “too low down” at NASA.

The stakes may be lower than life or death in most organisations, but companies also suffer when people keep schtum, Ms Edmondson believes. The mis-selling scandal in 2016 at Wells Fargo, an American bank, for example, related to its culture. The lender encouraged staff to persuade clients to buy additional products and for a while achieved levels of “cross-selling” that were twice the industry average rate.

Pressure on employees was intense. At some branches, staff were not allowed to leave until they met their daily target. Bonuses were based on sales figures and people who failed to meet the targets were fired. This was not a place where workers were likely to question the wisdom of the strategy. It is hardly surprising that employees resorted to subterfuge such as opening fake accounts to meet their goals.

Similar problems emerged at Volkswagen, which was caught up in a scandal over diesel emissions from 2015. The engines of its diesel models did not meet American emissions standards and engineers devised a system to fool the regulators. Ms Edmondson says the company's culture had been one based on intimidation and fear; Ferdinand Piëch, its longtime boss, boasted of telling engineers they had six weeks to improve the bodywork fitting on pain of dismissal. In the circumstances, engineers were understandably unwilling to mention the bad news on emissions standards and instead worked around the problem.

In a corporate culture based on fear and intimidation, it may appear that targets are being achieved in the short term. But in the long run the effect is likely to be counterproductive. Studies show that fear inhibits learning. And when confronted with a problem, scared workers find ways of covering it up or getting around it with inefficient practices.

The answer is to create an atmosphere of “psychological safety” whereby workers can speak their minds. In a sense, this is the equivalent of Toyota’s “lean manufacturing” process, which allows any worker who spots a problem to stop the production line.

This does not mean that workers, or their ideas, are immune from criticism, or that they should complain incessantly. The book describes how the success of the second “Toy Story” film was due to a rigorous editing process, in which the early script was revamped. Pixar, the production firm, created

what it called a “Braintrust” to give feedback to film directors. The rules were that feedback should be constructive and about the idea, not the person, and that filmmakers should not be defensive in response.

And psychological safety is not about whistleblowing. Indeed, if an employee feels the need to act as a whistleblower by speaking to external authorities, that suggests managers have not created an environment within the firm where criticism can be aired.

Nor is such a culture only about safety or avoiding mistakes. As mundane tasks are automated, and workers rely on computers for data analysis, the added value of humans will stem from their creativity. But as Ms Edmondson’s book amply demonstrates, it is hard to be either constructive or creative if you are not confident about speaking out.

* Subtitled “Creating Psychological Safety in the Workplace for Learning, Innovation and Growth”. Published by Wiley. ■



巴托比

开口许可

别把员工吓得不敢开口。这样公司业绩会更好

有一部英国情景喜剧叫《老爸上战场》（Dad's Army），讲述一支国防部队的故事。威尔逊中士在接到指挥官各种各样的命令时总会懒洋洋地反问一句：“长官，您觉得这么做明智吗？”他的质疑经常都被无视，但往往是有道理的。

看着自己的老板沿着错误的道路行进，许多员工肯定都恨不得天天都像威尔逊中士那样，给老板提个醒。但他们怕这会显得自己不服管或傻里傻气而丢了工作，所以谨慎起见，往往还是不发一言。

哈佛大学商学院教授艾米·艾德蒙森（Amy Edmondson）在新书《无畏的组织》*（The Fearless Organisation）中指出，这种沉默的文化可能会很危险。她列举的部分事例来自航空业。其中一个是史上最惨重的一场空难：1977年，两架波音747在加纳利群岛（Canary Islands）相撞。一名机长误解了空管指令，决定起飞，而副驾驶员无法开口质疑其决定。另一个例子是2003年的哥伦比亚号航天飞机事故。一名工程师可能在起飞前就已发现机翼有破损，但没办法说出口，因为他在NASA里“级别太低了”。

在多数组织里，沉默带来的风险并不至于闹出人命，但艾德蒙森认为，如果员工都缄口不言，那么企业也会受损。例如，美国的富国银行在2016年爆出的违规销售丑闻就与其文化有关。富国激励员工说服客户购买更多该银行的产品，该行的“交叉销售”率一度达到行业平均水平的两倍。

员工们压力巨大。在有些分行，员工须达到每日的销售目标才能下班。奖金与销售数字挂钩，没达到销售目标的员工会被解雇。在这种地方，员工不大可能去质疑这种策略是否明智。毫不意外，为了达到目标，他们采取了开设虚假账户之类的招数。

自2015年起卷入柴油排放丑闻的大众汽车也出现了类似的问题。该公司柴油车的发动机未能达到美国的排放标准，于是大众的工程师设计了一个系统来欺骗监管部门。艾德蒙森表示，大众的文化是基于恐吓和恐惧。长期担任该公司老板的费迪南德·皮耶希（Ferdinand Piëch）得意洋洋地大谈自己要求工程师在六周之内改进车身装配，否则就开除他们。可想而知，工程师们在这种情况下自然不愿提及有关排放标准的坏消息，而是设法以偏门手段解决这个问题。

在基于恐惧和恐吓的企业文化之下，企业在短期内似乎是有望实现目标，但长期来看效果很可能适得其反。研究表明，恐惧会阻碍学习。每当遇到问题，惶恐不安的员工要么会想办法掩盖问题，要么会用低效的方法去应付或绕过问题。

解决这个问题的办法是创造一种能提供“心理安全感”的氛围，让员工能畅所欲言。从某种意义上说，这相当于丰田的“精益生产法”。根据这种方法，任何发现问题的员工都有权对生产线喊停。

这并不表示员工和他们的想法就会免受批评，也不意味着他们可以抱怨个没完。这本书讲述道，《玩具总动员2》之所以获得成功，原因是它使用了严格而细致的剪辑流程改进早期剧本。皮克斯动画工作室设立了它所谓的“智囊团”（Braintrust），向影片导演提供反馈。根据规则，反馈应该是建设性的，且对事不对人，而影片制作人也不应回以抵触的态度。

增进心理安全感并不是为了鼓励检举揭发。事实上，如果一个员工觉得有必要当一个揭发者而向外部权威告发，只说明管理者没有在公司内创造一个供员工公开表达批评的环境。

这样的文化也不仅仅是为了增强安全性和避免犯错。随着那些乏味的工作任务实现了自动化，员工也依赖计算机来进行数据分析，人类的附加值将源自他们的创造力。但就像艾德蒙森在书中已充分证明的那样，如果一个人不能大胆直言，就别指望他能做到有建设性或创造性了。

* 副标题为：“在工作场所中创造心理安全感，以此促进学习、创新和增

长”。Wiley出版社出版。 ■



Chickenomics

Ruling the roost

How chicken became the rich world's most popular meat

IN A SHED on a poultry farm just outside Colchester, in south-east England, thousands of chickens sit on piles of their own excrement. The facilities will not be cleaned until after the birds are killed, meaning they suffer from ammonia burns and struggle to grow feathers. Ants and maggots crawl over the bodies of those that have not made it to slaughter. The chicken industry is a dirty business, but it is also a profitable one. In the OECD, a club of mostly rich countries, pork and beef consumption has remained unchanged since 1990. Chicken consumption has grown by 70% (see chart).

Humans gobble so many chickens that the birds now count for 23bn of the 30bn land animals living on farms. According to a recent paper by Carys Bennett at the University of Leicester and colleagues, the total mass of farmed chickens exceeds that of all other birds on the planet combined. In London, some 50 miles west of Colchester, fried-chicken shops are ubiquitous. Many are named after American states (including Kansas and Montana, not to mention Kentucky). But schoolchildren and late-night partiers are unfazed by the strange names. Nor do they worry much about where their meal came from.

And why should they? Chicken is cheap and delicious. A pound of poultry in America now costs \$1.92, a fall of \$1.71 since 1960 (after adjusting for inflation). Meanwhile the price of beef has fallen by \$1.17 a pound to \$5.80.

Fans of cheap chicken have selective breeding to thank. In the 1940s America launched a series of "Chicken of Tomorrow" competitions for farmers. The aim, as described by a newspaper at the time, was to produce

"one bird chunky enough for the whole family—a chicken with breast meat so thick you can carve it into steaks, with drumsticks that contain a minimum of bone buried in layers of juicy dark meat, all costing less instead of more." The result was something along the lines of the modern broiler chicken.

Since then chickens have continued to get bigger. A study by Martin Zuidhof of the University of Alberta and colleagues documented this shift by comparing chickens that were selectively bred in 1957, 1978 and 2005. The authors found that at 56 days old the three birds had average weights of 0.9kg, 1.8kg and 4.2kg (see chart). As raising a single big bird is more efficient than raising two smaller ones, it now takes farmers just 1.3kg of grain to produce 1kg of chicken, down from 2.5kg of grain in 1985.

The intense use of antibiotics means that farmers no longer need to spend much time worrying about their chickens' welfare. Before the second world war, most birds were raised on small plots. Farmers kept hens for eggs and sold their meat when they got too old to lay any more. But prophylactics have allowed farmers to pack chickens into conditions that would once have been considered unthinkably cramped and dirty. Birds raised in denser quarters do not move around much, and so require less to eat.

Farmers have also benefited from the healthy reputation of chicken. In the 1980s doctors worried that by eating too much beef and pork people were ingesting lots of saturated fat, which was then thought to increase the risk of heart disease. Those fears have since waned, but new evidence suggests that red meat might increase people's chances of getting colon cancer. In contrast, poultry's image as a healthy meat survives unscathed.

It is not just fussy Western eaters who increasingly favour chicken. Rising incomes mean that demand for the meat is growing even faster in poorer

countries. As a result, chickens are now the world's most widely traded meat. In economic terms they are, in effect, the opposite of cars. They are produced whole. But their value is maximised once they are broken up.

Though Westerners prefer lean, white meat; many in Asia and Africa prefer dark meat, which includes legs and thighs. These preferences are reflected in local prices: in America breasts are 88% more expensive than legs; in Indonesia they are 12% cheaper. Differences in the price of chicken feet are even starker. The thought of eating talons is abhorrent to many Westerners, but they often feature in Cantonese recipes. China now imports 300,000 tonnes of "phoenix claws" every year.

The fact that different countries specialise in different kinds of production also boosts trade. America and Brazil, the world's two biggest chicken exporters, are agricultural powerhouses that grow huge amounts of feed, the main cost in poultry production. Thailand and China, in contrast, dominate the processed-meat market which requires cheap, skilled labour. Russia and Ukraine, once net importers of chicken, have become net exporters as their grain industries have grown.

Producers that sell their meat abroad expose themselves to risks. Chicken has been a flashpoint in trade negotiations. China imposed tariffs on American birds in 2010 and then banned all imports in 2015, shortly after an outbreak of avian flu. Industry observers are pessimistic the ban will be lifted, much to the dismay of American farmers who would love to be paid more for the 20bn chicken feet they produce every year, which currently become animal feed.

Similarly, the European Union banned the import of chlorinated American chicken in 1997, owing to concern that a chlorine wash allows lower hygiene standards in farms. Arguments over chlorinated chickens also proved a big stumbling block in negotiations for the Transatlantic Trade and Investment

Partnership, a now-failed trade deal between America and the EU. Some Britons fear that if they leave the EU any trade deal signed with America would require them to accept imports of such chickens.

Although the chicken boom has been good for consumers, animal-welfare advocates worry that the meat industry's cost-cutting measures have come at the expense of the birds. Vicky Bond of the Humane League, an animal-welfare campaign group, says the size of modern chickens is the cause of the worst problems. Broilers have breast muscles which are too big for their bones to support, leading to lameness. In Colchester the chickens are so unresponsive to humans that they resemble zombies. Indeed, modern chickens have become so big that their muscles prevent them from getting on top of each other to mate (meaning they have to be starved before they are able to consider romance).

Partly because of advocacy by animal-welfare charities, and partly because meat has become so affordable, more consumers are now willing to pay for meat raised in better conditions. Sales of free-range and organic chickens, which—unlike most broilers—have access to the outdoors, are surging. In the Netherlands, a recent public outcry over enormous *plofkip* (which translates as “exploded chicken”) was so intense that retailers switched in droves to breeds that grow more slowly. *Plofkip*'s share of the Dutch market plummeted from around 60% in 2015 to 5% in 2017. In Britain sales of free-range eggs have overtaken those of caged ones.

Concerns about the health of livestock have also led the EU to pass some of the world's strictest animal-welfare laws. Battery cages for egg-laying hens were banned in 2012, for instance. Legislative reforms have been harder to come by in America, especially at the federal level. Animal-welfare advocates lament the country's congressional system, which gives disproportionate clout to rural states. Nevertheless, a rare but significant state-level change came last November when Californians voted to pass

Proposition 12, which will ban the production and sale of pork, veal and eggs from animals kept in cages, bringing the state's laws roughly in line with those in the EU. The change affects all meat producers who want to sell in America's biggest state, putting pressure on them to change their farming practices.

Public companies have been more responsive than lawmakers to animal-welfare concerns. Activists have achieved remarkable success in recent years by threatening companies with the release of unflattering images and videos of how their food is produced. Research by the Open Philanthropy Project, a group which funds animal-welfare activists, finds that such campaigns have prompted more than 200 American companies—including McDonald's, Burger King and Walmart—to stop buying eggs from chicken raised in battery cages since 2015.

Farmers are therefore increasingly interested in improving the lives of their birds. Richard Swartzentruber owns two chicken sheds in Greenwood, a small town in Delaware. The company he supplies, Perdue Farms, has stopped using antibiotics altogether. Mr Swartzentruber's chicken sheds have plenty of windows and doors that open onto a fenced grassy field whenever the weather permits. This comes with trade-offs: chickens might like perching on trees, but so do hawks. Inside the sheds, bales of hay, wooden boxes and plastic platforms are scattered around to entertain his chickens. Such measures have helped him gain a good-farming certificate from the Global Animal Partnership, a charity.

Bruce Stewart-Brown, a food-safety scientist at Perdue Farms, says that his company would love to raise more organic chickens. His ability to provide higher-welfare organic meat is ultimately constrained by market forces, since the feed legally required is pricey. Although larger numbers of people might be willing to pay more for organic or free-range products, most still prefer whatever is cheapest. And, despite growing interest in vegetarianism

and veganism, surveys find little evidence that many people in the rich world are turning into herbivores. People may like flirting with plant-based diets. But what they really love is chicken. ■



鸡肉经济学

当家的鸡

鸡肉如何成为富裕国家里最受欢迎的肉类

英格兰东南部科尔切斯特（Colchester）郊外一个养鸡场的鸡舍里，成千上万只鸡蹲坐在自己拉的粪堆上。在这些鸡被宰杀之前，工人不会清理鸡舍，所以这些鸡会被氨灼伤，很难长出羽毛。有的鸡没能活到宰杀那一刻，蚂蚁和蛆虫就在它们的尸体上爬来爬去。养鸡这行脏是脏，却有利可图。在成员主要为富裕国家的经合组织中，自1990年以来猪肉和牛肉的消费量一直没变，而鸡肉的消费量增长了70%（见图表）。

人类吃那么多鸡，在地球上存活的300亿只养殖禽畜中，鸡占了230亿只。莱斯特大学（University of Leicester）的卡瑞斯·班尼特（Carys Bennett）及其同事最近发表的一篇论文指出，养殖鸡的总重量超过了地球上所有其他鸟类的总和。在科尔切斯特以西大约50英里的伦敦，炸鸡店随处可见。许多店以美国的州名命名（比如堪萨斯、蒙大拿，更别提肯塔基了）。但是小学生和夜店党对这些奇怪的名字并不在意。他们也不太在意吃的鸡从何而来。

是啊，有什么可在意的呢？鸡肉既便宜又好吃。自1960年以来美国每磅鸡肉的价格下跌了1.71美元（经通货膨胀调整后），目前为1.92美元。其间，牛肉价格每磅下跌了1.17美元，目前为5.80美元。

喜爱便宜鸡肉的人们得感谢选择性繁殖。上世纪40年代，美国为养殖户举办了一系列“明日之鸡”大赛。根据当时一家报纸的描述，比赛的目标是培育出“一只足够全家人享用的大肥鸡——鸡脯厚实得可以切成鸡排，多汁的深色鸡腿肉层层包裹在细小的腿骨上。这么大的鸡反而更便宜，而不是更贵。”如此就产生了现代化肉鸡。

从那以后，鸡的块头越来越大。阿尔伯特大学（University of Alberta）的

马丁·祖德霍夫（Martin Zuidhof）及其同事比较了1957、1978和2005三个年份里选择性繁殖的鸡，记录了这种转变。他们发现，这三个年份的56天鸡的平均体重分别为0.9公斤、1.8公斤和4.2公斤（见图表）。由于饲养一只大块头鸡比饲养两只小块头鸡的效益更高，现在养殖户每生产1公斤鸡肉只需要1.3公斤谷物，而1985年时需要2.5公斤。

由于大量使用抗生素，养殖户不再需要太过担心鸡的健康。二战以前，大多数鸡都是在小块土地上散养。养殖户养鸡是为了鸡蛋，等到鸡老得不能下蛋了再卖鸡肉。但是，有了预防性药物，养殖户就可以把鸡塞入以前想都不敢想的狭小、肮脏的环境中。饲养在拥挤笼舍里的鸡很少走动，吃得也就少了。

鸡肉被誉为健康肉，这也让养殖户受益。上世纪80年代，医生担心吃太多牛肉和猪肉会摄入大量饱和脂肪，这在当时被认为会增加患心脏病的风险。之后这些担心已经消减，但新的证据表明，红肉可能增加人们患结肠癌的几率。相比之下，家禽作为健康肉的形象却一直未受影响。

不仅是讲究的西方人越来越青睐鸡肉。在相对贫穷的国家，由于收入的增长，肉类需求的增长甚至还要更快。鸡肉由此成为世界上交易最广泛的肉类。从经济角度看，鸡肉实际上与汽车相反。鸡是整只饲养的，但是将它们分割销售，价值才会最大化。

虽然西方人偏爱瘦的白肉，但是在亚洲和非洲，很多人更喜欢鸡腿之类的深色肉。这些偏好体现在各地的价格差异上。在美国，鸡胸肉比鸡腿贵88%，在印尼却便宜12%。鸡爪的价格差异就更明显了。很多西方人觉得吃鸡爪简直令人发指，但在广东人的食谱里，鸡爪常常占有重要地位。如今中国每年进口30万吨“凤爪”。

各国在生产上的“术业有专攻”也促进了贸易。美国和巴西是世界上最大的两个鸡肉出口国，也是大量生产饲料的农业强国。饲料是家禽养殖最大的成本支出。而泰国和中国则在需要廉价熟练劳动力的加工肉类市场占据主导地位。俄罗斯和乌克兰曾经是鸡肉的净进口国，但随着两国粮食产业的

发展，已经变成了净出口国。

出口鸡肉的生产商要面对风险。鸡肉在贸易谈判中已成为引发纷争的导火索。2010年，中国向美国的家禽征收关税；2015年禽流感爆发后不久，中国随即又禁止了所有的家禽进口。行业观察人士对禁令的解除持悲观态度，这让每年生产200亿只鸡爪的美国养殖户们大为沮丧。他们希望靠鸡爪多挣些钱，而这些鸡爪现在只能沦为动物饲料。

同样，由于担心氯洗会让养殖场采用更低的卫生标准，欧盟也在1997年禁止进口来自美国的氯洗鸡肉。氯洗鸡肉之争也成了《跨大西洋贸易和投资伙伴关系协定》（Transatlantic Trade and Investment Partnership）谈判的一大障碍。美国和欧盟至今未就该协定达成一致。一些英国人担心，如果英国脱欧，那么与美国签订的任何贸易协定都会要求英国接受进口氯洗鸡肉。

尽管养鸡业的繁荣对消费者来说是好事，但动物福利倡导者担心，肉类行业为削减成本牺牲了家禽的利益。动物福利运动团体人道联盟（Humane League）的维基·邦德（Vicky Bond）表示，现代化养殖鸡的块头之大导致了一些最严重的问题。肉鸡的鸡脯大到自己的骨骼都无法支撑，只能跛行。科尔切斯特养鸡场的鸡如同僵尸一般，对人类毫无反应。事实上，现代化养殖鸡已经长得太大了，过多的肉让它们没法跳到其他鸡身上去交配（也就是说必须让它们先挨饿，它们才能考虑交欢的事。）

如今有更多的消费者愿意为出自良好饲养环境的鸡肉买单，这既是动物福利慈善机构倡导的结果，也因为肉价已经很便宜了。散养鸡和有机鸡的销量在飙升。有别于大多数肉鸡，这些鸡能到户外活动。在荷兰，最近公众强烈抗议体型庞大的速成鸡（*plofkip*，直译就是“暴长的鸡”），零售商纷纷转而销售生长周期更长的品种。速成鸡在荷兰的市场份额从2015年的约60%暴跌至2017年的5%。在英国，散养鸡蛋的销量已经超过了笼养鸡蛋。

出于对家畜健康状况的担忧，欧盟通过了一些全球最严格的动物福利法。例如，2012年，养殖蛋鸡的层架式鸡笼被禁止使用。在美国，立法改革相

对难一些，尤其是在联邦层面。动物福利倡导者抱怨美国的国会制度赋予了农业州过多的影响力。然而，去年11月加州民众投票通过了《12号议案》（Proposition 12），将禁止生产和销售笼养猪肉、小牛肉和鸡蛋。这一少有的州级改革意义重大，它让加州的州法律变得与欧盟大体一致。这一改革对所有想在这个美国最大的州销售肉蛋产品的生产商都产生了影响，迫使它们改变惯常的养殖方式。

上市公司对动物福利问题的响应比立法机构更积极。近年来，活动人士以威胁发布养殖过程中令人不快的图片和视频向涉事企业施压，取得了显著的成效。为动物福利活动人士提供资金的组织开放慈善项目（Open Philanthropy Project）的研究发现，自2015年以来，这类运动已经促使包括麦当劳、汉堡王和沃尔玛在内的200多家美国公司停止购买产自层架式鸡笼的鸡蛋。

因此，养殖户对改善鸡的生活越来越感兴趣。理查德·斯瓦兹特鲁伯（Richard Swartzentruber）在特拉华州的小镇格林伍德（Greenwood）拥有两间鸡舍。他为之供货的公司Perdue Farms已经完全禁用抗生素。斯瓦兹特鲁伯的鸡舍有充足的门窗，只要天气允许，朝向一块围着栅栏的草地的门窗都会打开。这种做法也有其弊端：鸡可能喜欢栖息在树上，可老鹰也喜欢。鸡舍里遍布着供鸡嬉戏的干草堆、木箱子和塑料平台。这些措施让他获得了慈善机构全球动物合作组织（Global Animal Partnership）颁发的良好养殖证书。

Perdue Farms的食品安全研究人员布鲁斯·斯图尔特-布朗（Bruce Stewart-Brown）表示，他的公司很愿意饲养更多有机鸡。但由于合乎法规要求的饲料太贵，市场力量最终限制了公司供应高福利动物有机肉的能力。虽然愿意为有机或者散养产品多付账的人可能在增多，但大多数人还是更喜欢最便宜的东西。同时，尽管素食主义和纯素食主义之风渐盛，但调查发现，少有证据表明富有国家的很多人正在变成素食者。人们也许喜欢和素食餐调调情，但鸡肉才是他们的真爱。 ■



The euro zone

Euroboom to eurogloom

So much for the recovery. The currency bloc is losing steam

EVEN AS the European Central Bank (ECB) halts stimulus, it looks as if the economy needs revving up again. In December the bank said it would stop expanding its €2.6trn (\$3trn) bond-buying scheme. But on the same day it trimmed its forecasts of economic growth and warned that “the balance of risks is moving to the downside”. Its warnings have now materialised. Several measures of economic activity in the euro zone have disappointed in recent weeks. The much-touted “euroboom” that began in 2017 has run its course.

The slowdown was first thought to be temporary. At the start of 2018 sluggish growth in Germany, the bloc’s largest economy, was blamed on one-off factors ranging from an outbreak of flu to labour disputes and the timing of national holidays. Weak third-quarter data was chalked up to bottlenecks in the car industry, which had to meet new emissions standards for diesel engines. In the fourth quarter the populist *gilets jaunes* protests in France dealt growth another temporary blow. The demonstrations are expected to have lowered output in the euro zone’s second-largest economy by 0.1%.

But recent figures suggest the economic slowdown is broad-based. “There is more going on than the one-offs that have continually plagued the euro-zone economy,” says Bert Colijn, an economist at ING, a bank. “It’s not country- or sector-specific anymore. The weakness is widespread,” says Felix Huefner of UBS, another bank. On January 4th IHS Markit, a data provider, said that in December its euro-zone purchasing managers’ index (PMI)—a closely watched gauge of economic activity—fell to a four-year

low. PMIs declined in the zone's four largest economies, Germany, France, Italy and Spain. Figures released on January 14th revealed that euro-zone industrial production fell by 3.3% year-on-year in November. That is its largest annual decline in six years.

Early signs suggest GDP too will disappoint. On January 15th Germany's statistics office released figures suggesting that the economy only narrowly avoided a recession last year: after contracting by 0.2% in the third quarter, it barely grew in the fourth. Italy seems likely to have gone into recession in the second half of 2018.

While many have pointed to weak external demand as the primary cause of recent growth woes, domestic demand has also fallen short. Andrew Kenningham of Capital Economics notes that consumption growth slowed significantly in 2018 even as unemployment fell, a worrying sign that "consumers have lost their nerve". Consumer confidence fell over the course of last year.

And there are lurking risks. Mr Colijn reckons the biggest threats to growth in 2019 include a slowdown in China, a disorderly no-deal Brexit, and an escalating trade war with America. Trade is slowing. The World Bank recently lowered its expectations of growth in global trade volumes for this year and the next by around half a per cent.

For now, a full-blown recession across the currency area this year seems unlikely. Economists expect the euro-zone economy to expand by 1.5% in 2019. But if such growth fails to materialise, the ECB will need to consider what tools to use to stimulate it. It could extend its forward guidance—for the moment it expects to keep interest rates at current levels "at least through the summer".

Another option would be to extend its targeted longer-term refinancing

operations, which offer cheap funds to banks that lend to firms and households. As for the bond-buying programme, Mario Draghi, the ECB's president, acknowledged in December that at points it was "the only driver" of recovery in some parts of the euro zone. Disappointing data suggest the central bank might not hold the brakes down for long. ■



欧元区

繁荣无望

经济复苏到此为止。欧元区后继乏力

欧洲央行中止其经济刺激计划之际，欧洲经济却似乎又到了需要重振旗鼓的时候。去年12月，欧洲央行表示将停止扩大其2.6万亿欧元（合3万亿美元）的购债计划。但就在同一天，欧洲央行下调了经济增长预期，并警告称“下行的风险正在加大”。如今警告变成了现实。最近几周，欧元区的多项经济活动指标都令人失望。自2017年起备受吹捧的“欧元区繁荣”已是穷途末路。

起初人们以为欧元区的经济放缓是暂时性的。2018年初，欧元区最大的经济体德国经济增长缓慢，人们将这归咎于流感爆发、劳资纠纷以及法定假日安排等一次性因素；到了第三季度，又将疲软的数据归因于汽车行业的瓶颈，即必须达到柴油发动机的新排放标准。第四季度，法国的“黄马甲”民粹主义抗议活动又给经济增长带来暂时的打击。预计示威活动已经让法国这个欧元区第二大经济体的经济总量下降了0.1%。

但最近的数据表明，这次经济放缓的根基广泛。荷兰银行ING的经济学家伯特·科利恩（Bert Colijn）表示，“持续困扰欧元区经济的不仅仅是一次性因素。”瑞银的费利克斯·赫夫纳（Felix Huefner）指出，“这种疲软不再是哪个国家或行业特有的。它是普遍存在的。”1月4日，数据提供商IHS Markit表示，其欧元区采购经理人指数（PMI）这项备受关注的经济活动指标在去年12月跌至四年来的最低点。欧元区四大经济体德国、法国、意大利和西班牙的PMI数值均出现下降。1月14日公布的数据显示，去年11月欧元区的工业产值同比下降3.3%，创六年来最大的年度降幅。

最新迹象显示GDP也会令人失望。1月15日，德国统计局公布的数据表明，去年德国经济只勉强避免了下滑：继第三季度经济萎缩0.2%之后，第四季度几乎没有增长。意大利经济可能在2018年下半年已经陷入衰退。

尽管很多人认为近期经济增长乏力的主因是境外需求疲软，但是国内需求也不强劲。凯投宏观（Capital Economics）的安德鲁·坎宁安（Andrew Kenningham）指出，2018年，即使失业率有所下降，消费增长还是显著放缓。这一令人担忧的迹象表明“消费者已经不敢花钱了”。去年一整年，消费者信心都在下降。

此外还有潜在的风险。科利恩认为，2019年欧元区经济增长面临的最大威胁有：中国经济放缓、乱象环生的“英国无协议脱欧”，以及与美国不断升级的贸易战。贸易增长正在放缓。世界银行最近将其对今明两年全球贸易量增长的预期下调了0.5%。

就目前而言，欧元区经济今年全面衰退的可能性似乎不大。经济学家预计2019年欧元区经济将增长1.5%。但如果该目标未能实现，欧洲央行将需要考虑采取何种刺激手段。它可能会延长其前瞻性指引——目前它希望“至少到2019年夏天”都把利率维持在当前水平。

另一个选择可能是延长定向长期再融资操作，即为那些向企业和家庭放贷的银行提供廉价资金。至于购债计划，欧洲央行行长马里奥·德拉吉（Mario Draghi）在去年12月承认，有些时候它是欧元区某些国家经济复苏的“唯一驱动因素”。从令人失望的经济数据来看，欧洲央行踩刹车的时间可能不会太久。■



The Canada Pension Plan Investment Board

Moose in the market

A vast pension fund is gaining even more financial clout

TWICE A WEEK the Canada Pension Plan Investment Board (CPPIB), which manages pensions for 20m of Canada's citizens, holds meetings to approve or reject investments above C\$500m (\$375m). Agenda items are plentiful. Since 2017 the board has sanctioned investments in, among other things, toll roads in Mexico and Australia; rental housing in China; shale assets in Ohio; solar and wind assets in India and America; and big chunks of Endeavor, a Beverly Hills talent agency, and Ant Financial, a Chinese financial giant.

The Canada Pension Plan (CPP) is a state-run earnings-related pensions scheme, but its investment board is run as an independent entity. The fund's portfolio size has more than tripled over the past decade, and is going to become only more gigantic. At the end of last year its portfolio was C\$454bn. Investment income, plus an expansion in the scope of the plan last month, which raises contributions in return for higher payouts, means assets may expand at a healthy rate for decades. The CPP receives contributions equivalent to 9.9% of most Canadians' pay (the province of Quebec has its own system), and that share is set to reach 11.9% by 2023. The fund is a particularly mammoth example of a type of state investor that is wielding increasing influence worldwide.

When the CPP was founded in 1965, it had a familiar defect: a mismatch between the benefits promised and the contributions required. By the mid-1990s money was running out. Russia, France and Argentina all faced protests when they tried to stabilise pension funds by squeezing payouts. America's national pension plan, Social Security, is expected to run out of

money by 2034, and the public-sector pensions managed by many states, notably Illinois and New Jersey, face dire shortfalls.

The CPP, by contrast, was overhauled, with contributions raised and its assets separated from the public pot. The investment board was set up in 1997, with a mandate to focus on returns to the exclusion of public policy and a strict transparency requirement. An exemption from public-sector pay caps enables it to hire people from the private sector. Its chief executive, Mark Machin, left Goldman Sachs in 2012 to run the fund's operations in Asia, before he was promoted in 2016.

What was once a single office in Toronto is now a head office with branches in Hong Kong, London, Luxembourg, Mumbai, New York, São Paulo and Sydney. Five departments oversee 25 investment approaches. These include the usual public markets along with direct investments in property, natural resources and infrastructure as well as niche markets such as royalties tied to technology. Outside “partnerships”—with firms through which it invests—have risen from 62 to 254.

Wall Street denizens reckon that its involvement in private equity, which accounts for a fifth of its overall portfolio, places it in the same league as GIC, the entity that manages Singapore’s foreign-exchange reserves. Both have the capability to assess even the most complex potential investments speedily and respond with large amounts of long-term capital. The Cppib has 195 seats on the boards of 77 companies. It plans to allocate up to a third of its portfolio to emerging markets eventually. That would make it one of the most important sources of private capital to many of the world’s fast-growing projects.

Its risk-management approach means evaluating securities according to factors including geography, debt and equity characteristics, climate risk and gender balance in employment. In pursuit of long-term returns, it is

willing to ride out market volatility. In 2018 it expected to have a loss of at least 12.5% at least once a decade. Its actuaries put the annual return needed over the next 75 years to fulfil its obligations at 3.9% above inflation, which it has achieved so far. In order to assess its track record it uses a market benchmark comprised of 85% equity and 15% debt. On average its annual returns have beaten the benchmark over the past ten years, though only modestly.

Inevitably, new risks will emerge. Valuations based on unrealised private-equity positions could be flawed. By taking positions on so many boards the CPPIB is assuming managerial responsibilities for multiple companies; it increasingly resembles a sprawling conglomerate, with the associated organisational challenges. Added to this is the oddity that the entity with a powerful role in private firms itself has state links. Though it is formally separate from Canada's government, it may still be drawn into geopolitical disputes over, say, tariffs and sanctions. And its size, though beneficial in many respects, makes it harder to trade and manage.

Other similar entities have emerged as big players in recent years. A handful, such as the Ontario Teachers' Pension Plan, the Ontario Municipal Employees Retirement System and Quebec's Caisse de Dépôt et Placement, are also Canadian. Whereas Quebec's scheme, for instance, dabbles in local economic development, the CPPIB stands out for its professed independence. Its performance matters beyond Canada not just because of its holdings of global assets, but because many other countries, with their ageing populations and poorly funded pension schemes, might hope to draw lessons from it. ■



加拿大养老金计划投资公司

市场上的驼鹿

一只庞大的养老基金正在获得更大的金融影响力

加拿大养老金计划投资公司（以下简称CPPIB）管理着2000万加拿大公民的养老金，每周举行两次会议，审批5亿加元（3.75亿美元）以上的投资。待审项目类型多种多样。2017年以来，公司批准投资的项目包括墨西哥和澳大利亚的收费公路、中国的出租公寓、俄亥俄州的页岩项目、印度和美国的太阳能和风能项目，以及比弗利山（Beverly Hills）的经纪公司Endeavor和中国金融巨头蚂蚁金服的大笔股份。

加拿大养老金计划（CPP）是一个国营的收入关联养老金计划，但其投资委员会是一个独立运营的实体。该基金的投资组合规模在过去十年中增长了两倍以上，而且只会继续扩大。截至去年年底，其投资组合规模为4540亿加元。CPP上月提高了缴费率及给付水平，基金规模扩大加上投资收入意味着其资产可能会以健康的速度扩张数十年。CPP的缴费率为大多数加拿大人工资的9.9%（魁北克省有自己的养老金体系），到2023年这一比例将达到11.9%。有一类国有投资机构在全世界的影响力与日俱增，CPP是一个规模尤其庞大的例子。

CPP在1965年成立之时存在一个常见的缺陷：承诺的福利与所需缴费不匹配。到上世纪90年代中期，它的资金已快见底。俄罗斯、法国和阿根廷曾试图通过减少养老金发放来稳定养老基金，引发了抗议。预计美国的国家养老金计划社会保障计划（Social Security）到2034年将出现资金枯竭，许多州管理的公共部门养老金（尤其是伊利诺伊州和新泽西州）也面临严重的资金不足。

相比之下，CPP做了大幅调整，提高了缴费率，并把自有资产与公共资金进行了分隔。CPPIB成立于1997年，其任务是关注投资回报，不受公共政策制约，以及满足严格的透明度要求。由于不受公共部门薪资上限的限

制，它可以从私营部门雇用人才。其首席执行官马克·马辛（Mark Machin）于2012年离开高盛前来负责CPPIB的亚洲业务，于2016年获晋升。

CPP过去只在多伦多办公，如今除了在多伦多的总部，还在香港、伦敦、卢森堡、孟买、纽约、圣保罗和悉尼设有办事处。它有五个部门，负责管理25类投资方式。其中包括一般的公开市场投资、对房地产、自然资源和基础设施的直接投资，以及技术使用费等利基市场。它借以开展投资的外部“合作伙伴”已经从62个增加到254个。

CPP的私募股权投资占其整体投资组合的五分之一。华尔街人士认为，CPP对私募股权投资的参与让它成为了和管理新加坡外汇储备的新加坡政府投资公司（GIC）一个量级的投资机构。两者都有能力快速评估最复杂的潜在投资项目，并运用大量的长期投资资本。CPPIB在77家公司的董事会中拥有195个席位。它计划最终将高达三分之一的投资组合分配到新兴市场。这将使其成为世界上许多快速发展的项目最重要的私人资本来源之一。

CPPIB的风险管理方法根据地理、债务水平和股权特征、气候风险以及就业中的性别平衡等因素评估证券。为追求长期回报，它愿意经受市场波动。2018年，CPPIB预计每十年起码会经受一次至少12.5%的损失。其精算师将未来75年为履行义务而需达到的年度回报率定在扣除通胀因素后3.9%。目前为止，它都实现了这个目标。为了评估自己的业绩，它使用了一个由85%的股权和15%的债务组成的市场基准。平均而言，它的年回报率在过去十年中都超过了该基准，尽管超出不多。

新风险将不可避免地显现。基于未兑现的私募股权头寸的估值可能存在缺陷。CPPIB在众多公司的董事会席位，相应地也在多家公司承担了管理职责；它越来越像一个触角众多的庞大的企业集团，也就面临着由此而来的组织挑战。除此之外，这个在很多私营企业中扮演重要角色的实体本身又有政府背景，这也很古怪。虽然它与加拿大政府没有正式关联，但仍可能被卷入涉及关税和制裁等地缘政治争端中。它规模庞大，虽说很多时候

大有大的好处，但也让交易和管理变得更加困难。

其他类似的实体近年来也已成为金融市场上的重要参与者。其中如安大略省教师退休金计划（Ontario Teachers' Pension Plan）、安大略省市政雇员退休体系（Ontario Municipal Employees Retirement System）和魁北克储蓄投资基金（Caisse de Dépôt et Placement）也都是加拿大的机构。魁北克储蓄投资基金涉足地方经济发展，而CPPIB则因其自称的独立性而独树一帜。它的业绩影响超出加拿大之外，这不仅是因为它在全球拥有资产，还因为许多有老龄化和养老金不足问题的国家可能希望借鉴它的经验。 ■



Schumpeter

Is Google an evil genius?

Big Tech does not control its users, however much it may want to

AS A CHILD, Shoshana Zuboff accompanied her grandfather as he walked through his factory, greeting workers. He was an inventor and had made his fortune creating a mechanism to release drinks from vending machines. It was a blissful time, both for her and for American business, she recalls. In the 1950s and 60s, “business had integrity. Those companies barely exist any more.”

That sense of loss clearly lies behind Ms Zuboff’s latest book, “The Age of Surveillance Capitalism”. For the work of a professor emerita at Harvard Business School, it is written with unusual outrage. Its arch-villain is Google, a company as far removed from a blue-collar production line as can be imagined. It sweeps beyond business to society at large, where it warns of an “overthrow of the people’s sovereignty” by the surveillance capitalists. Clearly the halcyon days of her youth, when America’s big business was trusted, are long gone. Her zeal recalls that of another writer yearning for a lost past; Ida Tarbell, whose journalism helped end the monopoly of John Rockefeller, the oil baron who ruined her father. But as muckraking goes, Ms Zuboff lays it on too thick.

To be sure, this is a good time to draw attention to the dark forces at work on-screen. Surveillance capitalism, a phrase Ms Zuboff coined in 2014, is a good way of explaining the Faustian bargain at the heart of the digital economy: the services that users enjoy free of charge are costing them more than they think. It describes the compulsion Silicon Valley’s data-gatherers have to mine ever larger portions of people’s daily existence—how they shop, exercise or socialise—to turn into products that predict and shape

their behaviour.

She argues that users are sleepwalking into this new world of “smart” devices and smart cities, created more for the benefit of those who hoover up their data than for them. In order to get the best use out of their robo-vacuum cleaner, or “sleep-tracking” mattresses, or internet-enabled rectal thermometers, they consent to surrendering their most intimate details, not realising these are put up for sale in “behavioural futures markets”. Beyond the home, little do they know how their phone doubles as a tracking device, enabling firms to geotag them for advertisements. More Americans used apps that required location data in 2015 than those who listened to music or watched videos on their phones, she notes. Because all this is unprecedented, it is ill-defined in law and regulation. Actions against monopoly and privacy do not quite cut it.

In this drama Google makes for a compelling evil genius. It started life as a force for good. In 1998 its founders, Larry Page and Sergey Brin, wrote a landmark paper explicitly warning that advertising-led search engines would be biased against the true needs of consumers. But their idealism was coshed by the dotcom crash of 2000-01, which forced them to turn a profit. Like Tarbell combing through Standard Oil’s court documents, Ms Zuboff picks apart Google’s patent applications to find evidence of its switch to surveillance as the means for its power grab. It was transformed from a “youthful Dr Jekyll into a ruthless, muscular Mr Hyde, determined to hunt his prey anywhere, any time”, she writes.

Several factors need to be taken into account, however, before reaching such a damning verdict on Google, Facebook or any of the tech companies in her sights. First, in her 691-page book she barely mentions the benefits of Google’s products, such as search, maps and Gmail. No company has taken the age-old tools of discovery and communication—quests, voyages and messages—and made them more widely available. It may be true, as Apple’s

Tim Cook has said, that “if the service is ‘free’, you are not the customer but the product”. But arguably, only religions do a better job of providing something for nothing. In a sign that people value “free” stuff despite the surveillance costs, a National Bureau of Economic Research paper has calculated that users of search engines would need to be paid over \$1,000 a month to give up access to the service.

Second, if people become fed up with Google’s tactics, they can always switch. DuckDuckGo, a smaller search engine, assures users that it does not track them. A competitive market for digital privacy is heating up. Amid all the potentially creepy internet-of-things devices at the recent Consumer Electronics Show in Las Vegas, Apple made privacy a marketing pitch with its ad: “What happens on your iPhone, stays on your iPhone.” Ad blockers and subscription services, such as Netflix, are a reminder that advertising’s stranglehold is not invincible. As Tim Wu says in his book “The Attention Merchants”, popular revolt has often been triggered when advertising becomes too intrusive. There is eventually a political reaction, too. Witness the congressional grillings of Facebook when the Cambridge Analytica scandal surfaced. The political furore is one reason why its share price has slumped.

But in a book that calls surveillance capitalism “a threat to human nature in the 21st century”, perhaps the biggest shortcoming is taking the genius of Silicon Valley—evil or not—too seriously. One of Ms Zuboff’s sharpest criticisms is of “inevitability”: the belief, from Karl Marx to the tech giants, that Utopia can be predicted with certainty—in tech’s case, that “*everything* will be connected”.

Others, too, find this unconvincing. In his book “Life After Google”, George Gilder notes that, since Marx, intellectuals have often erred in thinking that their own eras were the final stage of human history, ie, that they had reached the peak of human achievement. The tech titans do too, he

says, not least because this serves to endorse the significance of “their own companies, of their own special philosophies and chimeras—of themselves really”. Ms Zuboff, while highlighting the phenomenon, falls into its trap. Shining a light on the way data can mess with people’s heads is fine. But defining surveillance capitalism as a Big Brother autocracy that threatens human freedom? However dystopian, that has the whiff of inevitablism all over it. ■



熊彼特

谷歌是邪恶天才吗？

科技巨头并不控制用户，无论它多想这么做

孩提时的肖莎娜·朱伯夫（Shoshana Zuboff）曾陪着祖父巡视工厂，向工人们打招呼。她的祖父是一名发明家，因为打造出了一台饮料自动贩卖机而发家致富。她回忆道，那是一段幸福的时光，不论是对她本人还是对美国的企业来说都是如此。在上世纪五六十年代，“商家很诚实。现在基本上没有这样的企业了。”

在朱伯夫的新作《监控资本主义的时代》（The Age of Surveillance Capitalism）背后，显然隐藏着这种失落感。对于哈佛商学院荣休教授这样一个身份而言，此书的笔调可谓异乎寻常的愤慨。书中树立的头号反派是谷歌——一家在人们想象中与蓝领生产线毫不沾边的公司。它的视野从商界扩展至整个社会，警告监控资本家将“颠覆人民主权”。显然，朱伯夫年幼时美国大企业备受信任的静好岁月早已一去不返。其意之切，让人想起另一位同样推崇旧时代的作家艾达·塔贝尔（Ida Tarbell）。塔贝尔的新闻调查导致摧毁了她父亲的石油大亨约翰·洛克菲勒的垄断终结。但就“揭发黑幕”而言，朱伯夫言过其实了。

的确，当前是提醒人们关注屏幕背后黑暗势力的好时机。“监控资本主义”是朱伯夫在2014年提出的新表述，很好地解释了处于数字经济核心的浮士德式交易：用户为享受免费服务付出的代价超出他们的预期。它描述了硅谷的数据收集企业是如何无法抑制地要去挖掘人们更多的日常信息（如何购物、锻炼、社交），将之转化为能预测和塑造人们行为的产品。

她认为，数字产品用户稀里糊涂地走进了这个“智能”设备和智能城市的新世界，而相比于他们的利益，这个世界更多地为那些大量搜集他们数据的公司的利益服务。为充分利用自己买来的扫地机器人、“睡眠追踪”床垫、联网直肠温度计，用户甘愿交出自己最私密的信息，没有意识到这些信息

正被放到“行为期货市场”上出售。走出家门后，他们并不知道手机同时也成了一种跟踪设备，让企业能根据他们所在的位置投放广告。朱伯夫指出，2015年，使用须提供位置数据的应用的美国人超过了在手机上听音乐或看视频的人数。这一切前所未见，所以在法律法规上并无清晰界定。反垄断和保护隐私的行动也只是隔靴搔痒。

在这场大戏中，谷歌成了引人注目的邪恶天才。在诞生之初，它是一股向善的力量。1998年，谷歌创始人拉里·佩奇和谢尔盖·布林写下一篇具里程碑意义的论文，明确警告以广告为导向的搜索引擎会偏离消费者的真正需求。但他们的理想主义受到2000至2001年互联网泡沫破灭的打击，他们被迫转而追求利润。就像塔贝尔详查标准石油公司（Standard Oil）的法庭档案那样，朱伯夫深挖细察谷歌的专利申请文件，希望找到该公司转向以数据监控攫取市场影响力的证据。她写道，谷歌从“年轻的杰基尔博士变身为残忍、强壮的海德先生，随时随地无情捕猎”。

然而，对谷歌、Facebook或任何她论及的科技公司做如此严厉的裁决之前，先要考虑几个因素。首先，在这本691页的书里，几乎没提及谷歌的搜索、地图和Gmail等产品的好处。没有一家公司能像谷歌那样把人类古老的探索和沟通方法（探寻、远征、讯息）推陈出新，并使这些产品大大普及。苹果公司的蒂姆·库克曾说，“如果服务是‘免费的’，你就不是顾客，而是产品”。这可能是对的。但我们可以说明，除了宗教，没有其他更好的免费服务了。美国国家经济研究局的一份报告计算得出，搜索引擎用户要每月收到超过1000美元才愿意放弃使用搜索服务，表明尽管付出了被监控的代价，人们仍看重“免费”服务。

其次，如果大家受够了谷歌的手法，他们总是可以改用别家的产品。规模更小些的搜索引擎公司DuckDuckGo保证不会追踪用户信息。保障数字隐私的市场竞争正在升温。最近在拉斯维加斯举办的消费电子产品展上有大批可能具窥探性的物联网设备亮相，但苹果公司在它的广告宣传中以隐私大做文章：“在你iPhone上发生的，只留在你的iPhone上。”广告拦截器及Netflix等订阅服务也表明广告的束缚并非不可解除。正如吴修铭在《注意力商人》（The Attention Merchants）一书中所说的，当广告变得太过干

扰时，往往会展发人们的普遍反抗。最终还会引发政治反应。剑桥分析的数据泄露丑闻浮出水面后，Facebook面对的国会拷问就是证明。政治公愤是其股价下跌的原因之一。

但是，在这本把监控资本主义称作“21世纪对人性的威胁”的书中，最大的缺点也许是把谷歌这个硅谷的天才太当一回事了——不管它邪恶与否。朱伯夫最尖锐的批判之一针对“必然性”：即从卡尔·马克思到科技巨头都相信乌托邦时代必定会来临——在科技界来说就是认为“万物都将互联”。

其他人也不完全相信这种预测。乔治·吉尔德（George Gilder）在《后谷歌时代》（Life After Google）中指出，自马克思以来，知识分子经常错误地认为自己的时代是人类历史的最后阶段，已达到人类成就的顶峰。他表示，科技巨头也一样，尤其是因为这有助于强化“他们的公司、他们的特殊理念和奇思异想——实际就是他们自己”的重要性。朱伯夫虽然强调了这种现象，但又落入了其陷阱。指出数据可能会迷惑人们的思考，这很好。但把监控资本主义定义为威胁人类自由的老大哥专制统治？虽然这是一种反乌托邦的观点，却通体散发着一股“必然性”的气息。■



Schumpeter

A topsy-turvy world

As retailers abandon the high street, why is IKEA moving in?

TOTTENHAM COURT road is a little-loved street of furniture stores in central London, made even more drab by boarded-up shops and SALE signs plastered across the windows. But since October a new type of outlet has brought in some Lewis Carroll-like magical realism. Through vast glass windows, passers-by gaze in on a kitchen so tall it looks like part of Wonderland. Inside are no tills; indeed nothing is sold there. It belongs to IKEA, a Swedish furniture retailer, which also seems topsy-turvy; IKEA is famously a staple of suburbia.

It may seem as if Alice has stepped through the looking-glass. But there is method in the madness. As other retailers are driven off the high street, partly because of competition from big-box stores like IKEA, the company is heading into the heart of London, Paris and New York as part of an expansion into 30 city centres. It is not only examining where it puts its shops. Though IKEA woke up late to the importance of e-commerce, it is using the shock as an opportunity to rethink its business model; the internet will become more central to its future. Many of its competitors still see digital commerce as just one retail channel among many. They are making a big mistake. Unless they face reality, more will join the ranks of struggling retailers such as Sears, JC Penney and Macy's in America, and Debenhams in Britain—especially if consumer spending turns down.

Retailing is not an industry prone to reinvention. Far from it. As Mark Pilkington, a former lingerie executive, explains in a new book, "Retail Therapy", its two great innovations happened long ago, when shops grew into supermarkets, department stores and malls, and when merchandise

moved out from behind the counter. The big stores became vast distribution systems, benefiting from oodles of capital and high barriers to entry. Meanwhile, customers bought the merchandise and walked out with it; the retailer saw little reason to engage with them beyond advertising and pretending to listen to their complaints.

E-commerce has upended this arrangement. Strip out items that are not widely bought online, such as cars, fuel and meals, and the internet's share of total retail sales last year rose above 17% in Britain, 16% in America and 15% in Germany, according to the Centre for Retail Research, a British consultancy. Above 15%, says Mr Pilkington, is the point at which legacy retailers, with their high cost of stores and staff, struggle to survive, posing huge risks to jobs, the commercial-property business, lenders and investors.

Not bearing such costs or capacity constraints, e-retailers can offer a wider range of goods, at better prices, with a more personalised, data-driven service. E-commerce also changes the distribution system. Retailing used to be cash-and-carry, with shoppers taking their merchandise home with them. Now they often travel by different routes, unencumbered by shopping bags. So in addition to sales, retailers have to factor in delivery. That is where IKEA is devoting lots of attention.

Though Tolga Öncü, IKEA's head of retail, explains this with a wad of Swedish *snus*, or smokeless tobacco, beneath his upper lip, he appears more excited than nervous about the transition. The company's strong brand and balance-sheet give it freedom to have a "test-and-fail" approach, rather than "being in a panic to do something", he says. It has three big tasks ahead: redefining sales measures, logistics and the whole concept of the store.

Start with sales measures in stores. These will remain crucial; online sales make up at most 10% of the total, and stores are still the best way of

attracting customers. But the idea that IKEA's success can be measured only by how much it sells per square foot is outdated. As it ships more of its products to people's homes, it has to bear in mind online purchases, delivery and assembly. In 2017 IKEA bought TaskRabbit, a gig-economy startup that can spare customers the grief of assembling furniture with an Allen key and a wordless instruction manual. Logistics is another factor. As people shop online, they demand speedy delivery. Part of this comes via IKEA's stand-alone warehouses. But Mr Öncü says its large suburban stores, which are within easy reach of densely populated areas, can also "double up" as part of the logistics network, shortening delivery times.

This feeds into the third challenge—changing the purpose of the store. Rather than always stocking the full range of products, the priority in smaller stores is to allow customers to "touch and feel" items they have seen online. That means stores can keep less inventory. Meanwhile, space is freed for displays of kitchens and other rooms, with staff on hand to offer home-furnishing advice.

This switch to more personalised service will be particularly evident in the city centres. In Tottenham Court Road, the outlet is a "planning centre", where no money or goods change hands. This is aimed at online shoppers who need humans to talk to about design without having to travel to suburbia. This spring IKEA will open a different type of store in Paris, selling goods across a fairly small floor space. Its aim will be to attract local visitors more frequently, offering frequent range changes, fresh food and events.

Both store formats respond not just to online pressure, but to generational trends like urbanisation, demand for sustainability and reduced car use. IKEA is lucky. Shoppers already treat going to its stores as an "experience"—albeit not one for all tastes. In an online world, it is vital to build on this to keep customers interested.

IKEA is by no means safe. Its recent results show falling profits as it invests in new formats, but at least it has lots of cash on its balance-sheet. Others have less freedom to experiment, especially retailers who have overexpanded, been leveraged to the hilt by private-equity owners, and paid dividends out of sale-and-leaseback property deals that expose them to rising rents. Many are only just realising that their business model is bust. It may be too late. ■



熊彼特

翻转的世界

零售商纷纷撤离商业街之际，宜家为何反其道而行之？

位于伦敦市中心的托特纳姆法院路（Tottenham Court road）的家具一条街生意本就冷清，封门闭户的店铺和贴满橱窗的减价招牌更是让这里了无生气。但自去年10月以来，一种新型门店给这里带来了几分刘易斯·卡罗尔式的魔幻现实主义色彩。路人透过大片的玻璃橱窗凝视店内的厨房。这厨房的天花板如此之高，宛如爱丽丝仙境的一部分。店内没有收银台，实际上里面什么都不卖。这家店是瑞典家具零售商宜家开的，这一点更让人觉得错乱——众所周知宜家是郊区的标配。

这情境就好像爱丽丝穿过镜子看到的奇境。但在这看似一片荒诞之中实则有战术设计。一定程度上由于宜家等仓储式商店带来的竞争，其他零售商正被迫撤离主要商业街。而与此同时，宜家正在进军伦敦、巴黎和纽约的中心地带，这是它向30个市中心扩张计划的一部分。宜家可不仅仅只在门店选址上做功课。尽管它很晚才意识到电子商务的重要性，但它正把由此带来的冲击变成契机，重新思考自己的商业模式；在它的未来中互联网将变得更加重要。宜家的许多竞争对手仍然仅仅将数字商务视为众多零售渠道中的一个，这可是在犯大错了。如果还不面对现实，它们中就会有更多公司堕入美国的西尔斯、JC彭尼和梅西百货，以及英国的Debenhams等苦苦支撑的零售商之列——尤其是如果消费者支出下跌的话。

零售业不是一个易于发生重塑的行业。甚至是非常不容易。正如女性内衣公司前高管马克·皮尔金顿（Mark Pilkington）在其新书《零售疗法》（Retail Therapy）中所言，零售业的两次重大创新发生在很久以前：商店发展成超市、百货公司和购物中心；商品从柜台后面挪出来。受益于丰厚的资金和高准入壁垒，大型商店变成了巨大的分销系统。而另一方面，顾客买完东西就走人，因此，除了做广告和假装倾听顾客的抱怨之外，零售商认为没什么必要与顾客密切互动。

电子商务颠覆了这一固有模式。根据英国咨询公司零售研究中心（Centre for Retail Research）的数据，除去汽车、燃料和餐点等网购还不普遍的商品，去年英国的网络销售额在零售总额中所占的份额已经上升到17%以上，在美国和德国这一数字分别为16%和15%。皮尔金顿指出，传统零售商的店铺和员工成本高，这一比例一旦超过15%它们就会陷入生存困境，给就业、商业地产行业、贷款机构和投资者带来巨大风险。

电子零售商不受此类成本或服务能力的限制，因而能以更优惠的价格、更个性化、数字驱动的服务来提供更多种类的商品。电子商务还改变了分销系统。过去零售业是一手交钱一手交货，顾客要自己把买到的商品拎回家。现在，顾客有各种不同的购物渠道，也不再需要自己受累拎购物袋。因此，除了销售，零售商还必须考虑送货。而送货正是宜家高度关注的环节。

宜家的零售主管托尔加·恩居（Tolga Öncü）谈及此事时，上嘴唇下塞着一团瑞典湿鼻烟（即无烟烟草）。不过，他对于这一转变更多显现出兴奋而非焦虑。他表示，宜家强大的品牌和资产负债表使它有资本采用“试错法”，而不是“慌不择路”。宜家往后有三大任务：重新定义销售衡量方式、物流，以及门店的整个概念。

先说门店的销售衡量方式。这将一如既往地至关重要。网上销售额最多占总销售额的10%，门店仍然是吸引顾客的最佳手段。但是，那种只通过每平方英尺销售额来衡量宜家成功与否的想法已经过时了。随着宜家将更多商品送至千家万户，它必须时刻考虑到网购、送货和组装。2017年，宜家收购了TaskRabbit，这家零工经济创业公司可以为客户消除使用内六角扳手和参照无文字安装手册来组装家具的烦恼。物流是另一个要考虑的因素。网购顾客要求尽快送货。这些货物一部分通过宜家专门的仓库发出。但是恩居表示，宜家位于郊区的大型门店距离人口密集区很近，也可“兼作”物流网的一部分，从而缩短交货时间。

这就带来了第三个挑战——改变门店的用途。小型门店的首要任务将是让顾客“触摸和感受”他们在网上看到的物品，而不是总要囤积全部品类的产

品。这意味着门店可以减少库存，同时也可以腾出空间来展示厨房和其他功能区，员工可以随时就家居布置提供建议。

这种向更个性化服务的转变将在市中心表现得尤为明显。宜家位于托特纳姆法院路的门店就是一个“规划体验中心”，那里没有钱货交易。该门店就是为了让网购客户不必跑到郊区就能与专业人士面对面地探讨家居设计。今年春天，宜家将在巴黎开设一家与众不同的门店：在一个相当小的营业面积上销售产品。它希望通过频繁更换商品种类、提供新鲜食品，以及组织各种活动来吸引更多本地顾客。

上述两种门店模式都不仅仅是为了应对来自网购的压力，还为顺应城市化、可持续性发展的需要以及少开车等时代的潮流。宜家是幸运的。尽管众口难调，但许多顾客确实已经把去宜家门店当作一种“体验”。在网购的世界中，以此为基础来继续吸引客户至关重要。

但宜家绝非已经安全无虞。它最近的业绩显示，随着它开始投资于新模式，公司的利润下滑，不过至少它的资产负债表上还有大量现金。其他公司可没那么多试错的空间，尤其是那些过度扩张的、被私募股权所有者用以最大限度借贷的，以及通过售后回租的房产交易支付股息而面临不断上涨的租金风险的零售商。许多公司才刚刚意识到自己的商业模式已经崩溃。这可能为时已晚。 ■



The world of work

Nothing to lose but their laptops

The tech industry has ruined office life, according to one veteran

NEWTON'S THIRD law is that every action has an equal and opposite reaction. The titans of technology have amassed great wealth but, like investment bankers before them, they have discovered that this does not bring them popularity. The past few years have witnessed a “techlash” on a wide range of issues, including the way technology invades citizens’ privacy.

Dan Lyons, a journalist who spent time working in the industry, has written an entertaining, if scattergun, attack on one aspect of technology’s influence—the effect it has had on everybody’s working lives. He argues that the industry has reduced real wages, made workers feel dehumanised and less secure, and exposed them to constant, stress-inducing change. Tellingly, the proportion of Americans who are happy with their jobs dropped from 61% in 1987 to 51% in 2016.

A particular target for his ire is the startup technology company. With their sweet-dispensers and ping-pong tables, they may give the appearance of friendliness. But in the author’s experience, such firms are associated with very high staff turnover, especially in sales and marketing. They tend to be marked by a brutal management style; Mr Lyons was told not only that he was failing, but that his fellow workers didn’t like him. “Most startups,” he writes, “are terribly managed, half-assed outfits run by buffoons and bozos and frat boys.” Worse still, they offer little job security because of the way they operate. “All they have is a not-very-innovative business model; they sell dollar bills for 75 cents and take credit for how fast they’re growing.”

Some tech pioneers promote a new compact with workers which holds

that companies owe them neither loyalty nor job security. Workers should expect to move on as frequently as singletons at a speed-dating evening. Patty McCord, director of human resources at Netflix, was astonished when a woman burst into tears when she was fired. She wrote a book saying that employees should no longer expect their company to help them with career development or acquiring new skills. The chapter about sacking workers had the title “People Very Rarely Sue”.

Tech companies cover up their hard edges with a wide range of dubious management techniques. At the start of the book, Mr Lyons attends a Lego Serious Play session where he is asked to build a duck out of bricks. Lego-building is embraced by those who believe in “agile” work, one of the most popular management fads, whereby staff are organised into ad hoc teams to complete a specific task. All this approach produces, the author argues, is another set of meetings for employees to attend. Another fad is for open-plan offices where workers lose all privacy. The main advantage accrues to the management, since the design saves money by cramming workers into a smaller space. (When Apple engineers found out that they were going to be housed in an open-plan set up, they rebelled and were given a separate site.)

In the last section of the book, Mr Lyons cites examples from the alternative school of management that is built around treating people well, and thanking them for their efforts. Nurturing a reputation as a good place to work helps recruit better employees. Instead of obsessing about unicorns (startup companies worth more than \$1bn), the author thinks the world should look for “zebras”, which can turn a profit and improve society at the same time. Many modern workers will agree. ■



职场

损失一台笔记本而已

一位职场资深人士认为，科技行业已经毁掉了职业生活【《实验室老鼠：为什么现代工作让人痛苦?》书评】

牛顿第三定律说每个作用力都有一个大小相等、方向相反的反作用力。科技巨头积累了巨额财富，但就和它们之前的投资银行家一样，巨头们发现这并没有让它们广受欢迎。过去几年里，技术侵犯公民隐私等种种问题都引发了“科技抵制”潮。

曾在科技行业工作过一段时间的记者丹·莱昂斯（Dan Lyons）写了一本读来颇有趣（虽说有些杂乱无章）的书，抨击了科技影响的一个方面：对每个人职业生涯的影响。他认为，科技行业降低了实际工资，让员工感觉被剥夺了人性、安全感下降，并让他们面对永恒的变化而倍感压力。颇能说明问题的是，从1987年到2016年，对自己的工作感到满意的美国人的比例从61%下滑到51%。

莱昂斯特别将怒火撒向了科技创业公司。它们配有糖果机、乒乓球桌，给人一种可亲的感觉。但根据作者的经验，这些公司的员工流动率很高，尤其是销售和市场营销部门。它们往往有着野蛮的管理风格；莱昂斯不仅被告知自己干得很糟，还被告知同事们都不喜欢他。“大多数创业公司，”他写道，“都是管理糟糕，由小丑、笨蛋和大学兄弟会成员经营的半吊子公司。”更糟糕的是，由于其运作方式，这些公司几乎提供不了工作保障。“它们有的只是一种不怎么新鲜的商业模式：1块钱的钞票75美分卖掉，再把公司的快速发展归功于自己。”

有些科技先锋企业提倡和员工达成一种新契约，认为公司既不需要提供归属感，也不需要提供工作保障。职场人士应该像速配之夜的单身人士那样频繁地换工作。看到一位女士被解雇时泪流满面，Netflix的人力资源总监帕蒂·麦考德（Patty McCord）感到很惊讶。她在一本书中写道，员工不应该再指望公司在他们的职业发展或获取新技能方面提供帮助。书中关于解

雇员工那一章的标题是“人们极少起诉”。

科技公司用各种不太靠谱的管理技巧来掩盖自己的硬心肠。在书的开头，莱昂斯讲到自己参加了一期“乐高认真玩”（Lego Serious Play）活动，要求他用积木拼出一只鸭子。拼乐高很受那些相信“敏捷”工作方法的人欢迎。“敏捷”工作是最流行的管理风潮之一，它让员工组成临时团队来完成特定的任务。作者认为，这种方法的唯一结果就是员工需要额外参加一大堆会议。另一个流行趋势是开放式办公室，在这种办公室里员工毫无隐私可言。主要好处归经营者，因为这种设计能把员工塞进更小的空间从而省钱。（当苹果的工程师们发现他们要在开放式办公室工作时，他们做出了反抗，于是得到了一个独立办公空间。）

在本书的最后一部分，莱昂斯引用了另一个管理学派的一些例子。这个学派的理念是善待员工并感谢他们的努力。为自己的公司打造上佳职场环境的声誉有助于招聘更好的员工。作者认为，与其沉迷于独角兽（价值超过10亿美元的创业公司），这个世界更应去寻找“斑马”，即那种能在创造利润的同时改善社会的公司。许多现代员工会同意这一点。■



Global business

Slowbalisation

A new pattern of world commerce is becoming clearer—as are its costs

WHEN AMERICA took a protectionist turn two years ago, it provoked dark warnings about the miseries of the 1930s. Today those ominous predictions look misplaced. Yes, China is slowing. And, yes, Western firms exposed to China, such as Apple, have been clobbered. But in 2018 global growth was decent, unemployment fell and profits rose. In November President Donald Trump signed a trade pact with Mexico and Canada. If talks over this month lead to a deal with Xi Jinping, relieved markets will conclude that the trade war is about political theatre and squeezing a few concessions from China, not detonating global commerce.

Such complacency is mistaken. Today's trade tensions are compounding a shift that has been under way since the financial crisis of 2008-09. Cross-border investment, trade, bank loans and supply chains have all been shrinking or stagnating relative to world GDP (see Briefing). Globalisation has given way to a new era of sluggishness. Adapting a term coined by a Dutch writer, we call it "slowbalisation".

The golden age of globalisation, in 1990-2010, was something to behold. Commerce soared as the cost of shifting goods in ships and planes fell, phone calls got cheaper, tariffs were cut and finance liberalised. Business went gangbusters, as firms set up around the world, investors roamed and consumers shopped in supermarkets with enough choice to impress Phileas Fogg.

Globalisation has slowed from light speed to a snail's pace in the past decade for several reasons. The cost of moving goods has stopped falling.

Multinational firms have found that global sprawl burns money and that local rivals often eat them alive. Activity is shifting towards services, which are harder to sell across borders: scissors can be exported in soft-containers, but hair stylists cannot. And Chinese manufacturing has become more self-reliant, so needs to import fewer parts.

This is the fragile backdrop to Mr Trump's trade war. Tariffs tend to get the most attention. If America ratchets up duties on China in March, as threatened, the average tariff rate on American imports will rise to 3.4%, its highest for 40 years. (Most firms plan to pass the cost on to customers.) Less glaring, but just as pernicious, is that rules of commerce are being rewritten around the world. The principle that investors and firms should be treated equally regardless of their nationality is being ditched.

Evidence for this is everywhere. Geopolitical rivalry is gripping the tech industry, which accounts for about 20% of world stockmarkets. Rules on privacy, data and espionage are splintering. Tax systems are being bent to patriotic ends—in America to prod firms to repatriate capital, in Europe to target Silicon Valley. America and the European Union have new regimes for vetting foreign investment, while China, despite its bluster, has no intention of giving foreign firms a level playing-field. America has weaponised the power it gets from running the world's dollar-payments system, to punish foreigners such as Huawei (see Business section). Even humdrum areas such as accounting and antitrust are fragmenting.

Trade is suffering as firms use up the inventories they had built up in anticipation of higher tariffs. Expect more of this in 2019. But what really matters is firms' long-term investment plans, as they begin to lower their exposure to countries and industries that carry high geopolitical risk or face unstable rules. There are signs that an adjustment is beginning. Chinese investment into Europe and America fell by 73% in 2018. The global value of cross-border investment by multinational companies sank by about 20% in

2018.

The new world will work differently. Slowbalisation will lead to deeper links within regional blocs. Supply chains in North America, Europe and Asia are sourcing more from closer to home. In Asia and Europe most trade is already intra-regional, and the share has risen since 2011. Asian firms made more foreign sales within Asia than in America in 2017. As global rules decay, a fluid patchwork of regional deals and spheres of influence is asserting control over trade and investment. The EU is stamping its authority on banking, tech and foreign investment, for example. China hopes to agree on a regional trade deal this year, even as its tech firms expand across Asia. Companies have \$30trn of cross-border investment in the ground, some of which may need to be shifted, sold or shut.

Fortunately, this need not be a disaster for living standards. Continental-sized markets are large enough to prosper. Some 1.2bn people have lifted themselves out of extreme poverty since 1990, and there is no reason to think that the proportion of paupers will rise again. Western consumers will continue to reap large net benefits from trade. In some cases, deeper integration will take place at a regional level than could have happened at a global one.

Yet slowbalisation has two big disadvantages. First, it creates new difficulties. Between 1990 and 2010 most emerging countries were able to close some of the gap with developed ones. Now more will struggle to trade their way to riches. And there is a tension between a more regional trading pattern and a global financial system in which Wall Street and the Federal Reserve set the pulse for markets everywhere. Most countries' interest rates will still be affected by America's even as their trade patterns become less linked to it, leading to financial turbulence. The Fed is less likely to rescue foreigners by acting as a global lender of last resort, as it did a decade ago.

Second, slowbalisation will not fix the problems that globalisation created. Automation means that there will be no renaissance of blue-collar jobs in the West. Firms will hire unskilled workers in the cheapest places in each region. Climate change, migration and tax-dodging will be even harder to solve without global co-operation. And far from moderating and containing China, slowbalisation will help it win regional hegemony faster.

Globalisation made the world a better place for almost everyone. But too little was done to mitigate its costs. The integrated world's neglected problems have now grown in the eyes of the public to the point where the benefits of the global order are easily forgotten. Yet the solution on offer is not really a fix at all. Slowbalisation will be meaner and less stable than its predecessor. In the end it will only feed the discontent. ■



全球商业

慢球化

一种新的世界贸易模式日渐清晰——其代价也一样

两年前美国政策转向保护主义时，有人发出了上世纪30年代的苦难将要重演的黑暗警告。今天，这些不祥的预测看起来是错的。确实，中国经济正在放缓。也确实，苹果等依赖中国市场的西方企业已受到重挫。但2018年全球经济增长良好，失业率下降，利润增加。11月，特朗普与墨西哥和加拿大签署了贸易协定。如果本月与习近平的谈判能达成一项协议，那么压力得到缓解的市场将得出结论，认为贸易战就是一场政治秀，迫使中国做出一些让步，而不是引爆全球贸易冲突。

这种对现状的心满意足是错误的。今天的贸易紧张局势正在加剧自2008至2009年金融危机以来一直在发生的转变。相对于全球GDP，跨境投资、贸易、银行贷款和供应链都在萎缩或陷入停滞。全球化已让位于一个疲软的新时代。借用一位荷兰作家创造的一个词，我们将这个转变称之为“慢球化”（slowbalisation）。

从1990年持续至2010年的全球化黄金时代有目共睹。海运和空运成本下降，电话费率降低，关税削减，金融自由化，贸易量随之猛增。企业在全球开疆拓土，投资者到处寻找机会，消费者在超市购物，选择之多足以让斐利亚·福克（Phileas Fogg）赞叹，商业由此兴旺发达。

过去十年中，全球化的速度从光速骤减至蜗牛爬行的速度，有多个原因。货运成本已经停止下降。跨国公司发现全球布局很烧钱，而且经常会惨败给本地竞争对手。经济活动的重心已转向服务业，而服务更难开展跨境交易：剪刀可以装在20英尺集装箱里出口，但发型师不能。中国的制造业已变得更加自力更生，因此需要进口的零件也减少了。

这就是特朗普贸易战的脆弱背景。关税往往会得到最多的关注。如果美国在3月如其所威胁的那样进一步对中国提高关税，那么美国的平均关税率

将升至3.4%，为40年来的最高水平。（大多数公司计划将成本转嫁给客户。）而另一件事没那么显眼，却同样有害：商业规则正在全世界范围内被重写。不论国籍平等对待投资者和企业的原则正在被抛弃。

这方面的证据无处不在。地缘政治较量正在强烈影响约占全球股票市场20%的科技产业。隐私、数据和间谍方面的规则正变得支离破碎。税收制度屈从于爱国要求——在美国是为了促使企业将资本调回国内，在欧洲则是用来对付硅谷。美国和欧盟有了新的外资审查制度，而中国尽管在夸口，但也并不打算给予外国企业公平的竞争环境。美国已然将自己对世界美元支付体系的掌控用作武器来惩罚华为等外国企业。即使是会计和反垄断等乏味的领域也在分裂。

先前企业预计关税会进一步提高，因而增加了库存，但随着这些库存耗尽，贸易正在受损。2019年这种情况还会增多。但真正要紧的是企业的长期投资计划——它们开始减少对地缘政治风险高或规则变幻不定的国家和行业的投入。有迹象显示一轮调整正在启动。2018年，中国对欧美的投资下降了73%。跨国公司跨境投资的全球总额在2018年下降了约20%。

新世界的运作模式将有所不同。“慢球化”将令区域内经济体之间的联系加深。北美、欧洲和亚洲的供应链正更多地从更近的地点采购。在亚洲和欧洲，大多数贸易活动都发生在区域内，而且这一占比自2011年以来不断上升。亚洲企业2017年的国外销售额中，亚洲国家的占比比美国更高。随着全球规则失去影响力，各种易变的区域协议和势力范围开始控制贸易和投资。比如欧盟就正在银行业、科技和外国投资领域树立权威。中国希望在今年达成一项区域贸易协议，而此时它的科技企业正在亚洲各地扩张。企业在该区域的跨境投资总计30万亿美元，其中一些可能需要转移、出售或叫停。

幸运的是，这不必定会重创生活水平。规模堪比一个洲的各个市场足以维持繁荣。自1990年以来，约有12亿人摆脱了极端贫困，没有理由认为贫困人口的比例会再次上升。西方消费者将继续从贸易中获得巨大的净利益。在某些情况下，在区域层面将实现比全球层面更深入的一体化。

但“慢球化”有两大缺点。首先，它带来了新的难题。在1990年至2010年期间，大部分新兴国家都在一定程度上缩小了与发达国家之间的差距。今后，会有更多新兴国家难以通过贸易实现富裕。而在更为区域性的贸易模式与由华尔街和美联储为各地市场设定脉搏的全球金融体系之间存在冲突。大多数国家与美国的贸易关联已经减弱，而它们的利率却仍将受到美国利率的影响，这会导致金融动荡。与十年前不同，美联储不太可能再次充当全球的最终贷款人来拯救外国人。

其次，“慢球化”将无法解决全球化造成的问题。自动化意味着西方的蓝领工作不会再复兴。企业将在各个区域中劳动力最廉价的地方雇用非熟练工人。没有了全球合作，气候变化、移民和逃税问题将更难解决。“慢球化”非但远不能让中国的势头放缓及遏制中国，还将有助于它更快地赢得地区霸权。

对几乎所有人来说，全球化都让世界变得更加美好。但为减轻全球化的代价所做的还是太少了。被一体化的世界忽视的那些问题在大众眼中不断膨胀，以至于人们很容易就忘了全球秩序的好处。然而，现在提出的解决方案根本不能解决问题。与全球化相比，“慢球化”的好处将更少也更不稳定。到最后，人们只会愈加不满。 ■



Modern life

A pressing problem

The pros and cons of placebo buttons

SUPPRESSIO VERI, suggestio falsi. Over the course of many years, without making any great fuss about it, the authorities in New York disabled most of the control buttons that once operated pedestrian-crossing lights in the city. Computerised timers, they had decided, almost always worked better. By 2004, fewer than 750 of 3,250 such buttons remained functional. The city government did not, however, take the disabled buttons away—beckoning countless fingers to futile pressing.

Initially, the buttons survived because of the cost of removing them. But it turned out that even inoperative buttons serve a purpose. Pedestrians who press a button are less likely to cross before the green man appears, says Tal Oron-Gilad of Ben-Gurion University of the Negev, in Israel. Having studied behaviour at crossings, she notes that people more readily obey a system which purports to heed their input.

Inoperative buttons produce placebo effects of this sort (the word placebo is Latin for “I shall be pleasing”) because people like an impression of control over systems they are using, says Eytan Adar, an expert on human-computer interaction at the University of Michigan, Ann Arbor. Dr Adar notes that his students commonly design software with a clickable “save” button that has no role other than to reassure those users who are unaware that their keystrokes are saved automatically anyway. Think of it, he says, as a touch of benevolent deception to counter the inherent coldness of the machine world.

That is one view. But, at road crossings at least, placebo buttons may also

have a darker side. Ralf Risser, head of FACTUM, a Viennese institute that studies psychological factors in traffic systems, reckons that pedestrians' awareness of their existence, and consequent resentment at the deception, now outweighs the benefits.

Something which happened in Lebanon supports that view. Crossing buttons introduced in Beirut between 2005 and 2009 proved a flop. Pedestrians wanted them to summon a "walk" signal immediately, rather than at the next appropriate phase in the traffic-light cycle, as is normal. The authorities therefore disabled them, putting walk signals on a preset schedule instead. Word spread that button-pressing had become pointless. The consequent frustration increased the amount of jaywalking, says Zaher Massaad, formerly a senior traffic engineer for the Lebanese government.

Beirut's disabled buttons are, says Mr Massaad, now being removed. They should all be gone within three years. New York has similarly stripped crossings of non-functioning buttons, says Josh Benson, the city's deputy commissioner for traffic operations, though it does retain about 100 working ones. These are in places where pedestrians are sufficiently rare that stopping the traffic automatically is unjustified. However, internet chatter about placebo buttons has become so common that doubt, albeit misguided, seems to be growing about even these functioning buttons' functionality. This suspicion, says Mr Benson, has spread beyond New York, to include places such as Los Angeles, where almost all the crossing buttons have always worked, at least during off-peak hours.

Truth be told, though, the end may be nigh for all road-crossing buttons, placebo or real. At an increasing number of junctions, those waiting to cross can be detected, and even counted, using cameras or infrared and microwave detectors. Dynniq, a Dutch firm, recently equipped an intersection in Tilburg with a system that recognises special apps on the smartphones of the elderly or disabled, and provides those people with 5 to

12 extra seconds to cross. That really will be pleasing. ■



现代生活

按钮难题

安慰剂按钮之利弊

掩盖真相，等于造假。在很多年里，纽约市政部门逐步停用了该市控制人行横道信号灯的大部分按钮，但一直没怎么声张。他们认定，计算机操控的计时器几乎总是更好用。到了2004年，3250个按钮中只剩不到750个还能发挥作用。但是，市政府并没有拆除已经没用的那些按钮，令无数手指白费一番力气。

一开始，按钮被留下来是因为拆除的成本问题。但后来却发现，即使无法控制信号灯的按钮也仍有用处。以色列本·古里安大学（Ben-Gurion University of the Negev）的塔勒·奥龙-吉拉德（Tal Oron-Gilad）表示，按下按钮的行人不太可能在绿色信号灯亮起前就横穿马路。研究过人们在路口的行为后，她注意到大家更倾向于服从一个声称会接收到自己输入的信息的系统。

失效按钮之所以会产生这种安慰剂效应（placebo，出自拉丁语，原意是“我会讨人喜欢”），是因为人们喜欢对自己所使用的系统有掌控感，密歇根大学安娜堡分校的人机交互专家埃坦·埃达（Eytan Adar）表示。他指出，自己的学生在设计软件时经常会加上一个可点击的“保存”按钮，但其实用户的输入都会自动保存，这个“保存”按钮仅仅是为了让对此不知情的用户放心而已。他说，不妨将这视作对抗机器世界里固有的冷漠的一种善意欺骗。

这是一种观点。但是，安慰剂按钮可能也有不利的一面，至少在过马路的问题上是这样。研究交通系统心理因素的维也纳FACTUM研究所的负责人拉尔夫·里瑟尔（Ralf Risser）认为，行人意识到按钮无效进而感到被骗的怨怒，如今已让这种做法弊大于利。

黎巴嫩发生的情况可引为佐证。2005年至2009年间在贝鲁特引入的过街

按钮最后完全失败。行人希望按键后能立刻亮起“步行”信号，而不是像通常那样等待交通灯的周期性转换。因此市政部门停用了这些按钮，按预设的时间启动步行信号。过街按钮无用的消息传开，随之而来的懊恼导致更多人乱穿马路，曾在黎巴嫩政府担任高级交通工程师的查希尔·马萨德（Zaher Massaad）说。

马萨德说，贝鲁特正在拆除无效的过街按钮，三年内应该能全部清理完毕。纽约市交通运营处副处长乔什·本森（Josh Benson）表示，纽约也拆除了无效的过街按钮，但保留了大约100个有效的。这些按钮都设置在行人稀少到已经不适合使用自动交通灯的地方。然而，网上对安慰剂按钮的热议导致人们对有效的按钮也开始怀疑起来，尽管这是受到了误导。本森表示，这种怀疑已蔓延到了纽约以外的地方，包括几乎所有过街按钮都总是有效（至少在非高峰时段是这样）的洛杉矶。

但事实上，无论是安慰剂还是真的过街按钮可能都会很快消亡。越来越多的道路交汇处配备了摄像头或红外和微波探测器，可探测甚至统计等待过马路的行人。荷兰科技公司Dynniq近年在蒂尔堡市（Tilburg）的一个十字路口安装了一套系统，能识别老年人或残疾人智能手机上的专门应用，为他们提供额外5到12秒的过马路时间。这的确会很讨人喜欢。■



Chinese science

The great experiment

China has become a leading scientific power. Can it go on to become a great one?

TO LAND ON the Moon, as China's Chang'e -4 spacecraft did on January 3rd, is not quite the pinnacle of achievement it once was. Both the Indian government and a well-backed Israeli team of enthusiasts will attempt landings there this year; in 2020 various American companies intend to light out for the lunar provinces, too. But all these non-Chinese efforts will land on the Moon's Earth-facing near side, and thus within the solicitous sight of Earthbound controllers—just as all previous lunar landings, whether American, Soviet or, since 2013, Chinese, have been.

Chang'e-4's landing site in Von Kármán crater, though, is on the far side of the Moon, where the spacecraft can no more easily be reached by radio than it can be seen through a telescope. Landing there and getting data back afterwards is possible only with the help of a cunningly pre-positioned relay satellite. Other countries have considered such missions, but none has ever mounted one. China has been carefully building up the capacity to go where they have not; now it has done so.

China is keen on such signals of pre-eminence, and willing to put in the work they require. It wants the world, and its own people, to know that it is a global power—that it boasts not just a titanic economy, but the geopolitical sway and military might to match, soft power of all sorts, a storied past and a glorious future. Science is a big part of this. It is seen in China, as elsewhere, as an ennobling pursuit and a necessary foundation for technological advance. China's leaders see such advances as crucial not just to their economy, but also to expanded military prowess and social progress. They want the sort of science that will help China project its power and respond

to its people's particular problems. They want new clean-energy sources and freedom from resource constraints. And the country's ever greater scientific proficiency makes such ambitions look realisable. It is a long way from landing on the Moon to mining it. But it is not uncommon to hear speculation about such things. As one Weibo user put it after *Chang'e-4*'s landing, "China has made history! Half of the Moon will be ours."

The huge hopes China has for science have prompted huge expenditure. Chinese spending on R&D grew tenfold between 2000 and 2016 (see chart 1). This open chequebook has bought a lot of glitzy kit. Somewhere in the Haidian district of Beijing, which houses the Ministry of Science and Technology as well as Tsinghua and Peking Universities, it seems there is a civil servant quietly ticking things off a list of scientific status symbols. Human space flight? Tick. Vast genome-sequencing facilities? Tick. Fleet of research vessels? Tick. World's largest radio telescope? Tick. Climate researchers drilling cores deep into the Antarctic icecap? Tick. World's most powerful supercomputer? Tick (erased when America regained its lead, but watch this space). Underground neutrino and dark-matter detectors? Tick and tick. World's largest particle accelerator? The pencil is hovering.

The spree is tellingly reminiscent of the golden years of "big science" in post-war America. Between the International Geophysical Year of 1957 and the cancellation of the Superconducting Super Collider (SSC) in 1993, America's government unfailingly invested ever more of the resources of an ever more powerful economy into the things which the leaders of its scientific community most wanted. From the creation of quarks to the cloning of genes to the netting of Nobel prizes, American science came to dominate the world.

Over those 40 years America—and, to a lesser extent, Europe—were doing things that had never been done before. They opened up whole new fields

of knowledge such as high-energy astrophysics and molecular biology. Benefiting from the biggest and best-educated native generations ever produced, they also welcomed in the brightest from around the world. And they did so in a culture dedicated to free inquiry, one keenly differentiated from the communist culture of the Soviet bloc.

Measured against that boom—one of the most impressive periods of scientific achievement in human history—China’s new hardware, grand as it often is, falls a bit short. It has been catching up, not forging ahead. It has not been a beacon for scientists elsewhere. And far from benefiting from a culture of free inquiry, Chinese science takes place under the beady eye of a Communist Party and government which want the fruits of science but are not always comfortable about the untrammelled flow of information and the spirit of doubt and critical scepticism from which they normally grow.

America’s science boom had a firm institutional and ideological foundation. It grew out of the great research universities that came into their own in the first half of the 20th century, and whose intellectual freedom had attracted extraordinary talents threatened by regimes elsewhere, including Albert Einstein, Enrico Fermi and indeed Theodore von Kármán, the Hungarian-born aeronautical engineer in whose honour *Chang'e-4*'s new home is named. China has imported ideas and approaches more than people and ideals. The resultant set-up has the ricketiness often seen in structures ordained from the top down rather than built from the bottom up.

Top-down ambition can mean running before you walk. Take FAST, the Five-hundred-metre Aperture Spherical Telescope, which opened in 2016. Built in a natural basin in Guizhou province, it is more than twice the size of the world’s next-largest radio telescope, in America. But FAST does not have a director. Having leapt from nowhere to the top of the tree in terms of

hardware, the country finds itself in the embarrassing position of having no radio-astronomer to hand who combines the scientific and administrative skills needed to run the thing. Nor, so far, has it been able to recruit a qualified foreigner willing to live in the telescope's remote location.

Self-defeating shortcuts, symbolic and otherwise, are not only the preserve of the government; Chinese scientists are prey to such temptations, too. China is not only recapitulating American science's cold-war national-prestige boom. It is doing so in the context of the subsequent high-technology era in which no American university feels complete without a symbiotic microbiome of venture capitalists pullulating across its skin. The economic benefits of research have increasingly come to be seen as a possible boon to the researcher, as well as to society at large.

For a particularly egregious example, consider the most notable Chinese scientific first of 2018. He Jiankui looked like the model of a modern Chinese scientist. He was educated at the University of Science and Technology of China (USTC) in Hefei. He went on to equally prestigious American universities, Rice and Stanford. He was brought back by the government's "Thousand Talents" programme to a new position at the Southern University of Science and Technology in Shenzhen. Once established there, he took unpaid leave to start an entrepreneurial project.

That project was editing the DNA of embryos that would then grow up into human beings. Its result was two baby girls. They do not, as yet, appear unhealthy. Nor, though, have they been provided with the questionable advantages Dr He says he was trying to provide through his tinkering—tinkering which was unsanctioned, illegal and which, since he went public, has seen opprobrium heaped upon him.

The He affair could have taken place in many places, and it is hardly representative of the broad swathe of China's researchers; 122 of them

signed an open letter denouncing his actions. At the same time it is not at all surprising that the He affair took place in China. It was a perversion of what Chinese scientists are trying to achieve as they seek to establish themselves and their country in the world of elite science. But it was also an illustration of it.

The staggering growth in the number of scientific papers by Chinese researchers needs to be seen in this context. In terms of pure numbers, China overtook America in 2016 (see chart 2). But the quality of some of these papers is very low. In April 2018 Han Xueying and Richard Appelbaum of the University of California, Santa Barbara, reported opinions gathered in a survey of 731 researchers at top-tier Chinese universities. As one from Fudan University put it: “People fabricate or plagiarise papers so that they can pass their annual performance evaluations.”

The Chinese government is aware of the risks of a reputation for poor and even fraudulent research. It is one of the reasons that it is orchestrating the development of a scientific establishment. One of its pillars is a core group of elite universities known as the C9. Fudan is one of them, as are Tsinghua and Peking Universities and Dr He’s alma mater, USTC. The other is the Chinese Academy of Sciences (CAS), an official agency that runs laboratories of its own, which will adhere to prevailing international standards. The government is clamping down on shoddy journals, especially those in which researchers pay to be published. Raising standards in this way will not just improve science; it will also attract the best scientists.

After Deng Xiaoping came to power in 1978 the top tier of Chinese students was encouraged to go abroad for their graduate studies. Many returned, as had been intended, filled with knowledge unavailable at home. Without them the current scientific boom would not have happened, however much the government had spent. But the best often chose to stay abroad. In 2008

the country started the Thousand Talents programme to draw these exiles back with promises of lucre and lab space.

In theory, the programme is open to any top-notch researcher working in an overseas laboratory, regardless of nationality. In practice, few non-Chinese have availed themselves of it. But many Chinese have. Such returners are known as *haigui*, the Chinese for “sea turtle”, since they are thought of as having come back to their natal beach, as turtles do, to lay their eggs.

Talent that has not been abroad is not, however, neglected. A coeval programme, Changjiang Scholars, is aimed at identifying potential top-flight researchers who are languishing in thousands of provincial institutions. Once identified, they, too, are brought into the charmed circle.

This is yielding results at all but the very highest levels. Chinese scientists working in China have as yet earned only one Nobel prize. Other than that work—the discovery of artemisinin, a novel antimalarial drug, by Tu Youyou—there has not yet been any Chinese scientific advance that a fair-minded person would be likely to think Nobel-worthy. No fundamental particle has been discovered there, nor any new class of astronomical object. Chinese scientists have not yet done anything to compare with, say, the development of CRISPR-Cas9 gene editing (America) or the creation of pluripotent stem cells (Japan) or the invention of DNA sequencing itself (Britain).

But a great deal of Chinese science is now very good indeed, particularly in relatively new fields with practical implications. The country has a very large and ever growing workforce (see chart 3) that is both enjoined and keen to tackle juicy topics. A study published by Elsevier, a scientific publisher, and Nikkei, a Japanese news business, on January 6th found that China published more high-impact research papers than America did in 23 out of 30 hot research fields with clear technological applications. Chinese science

is a nimble giant, capable of piling in on any new field of promise with enormous, often centrally encouraged, force.

Developments in fields such as double-layer capacitors and biochar, two of those 23, may be important but are unlikely to be much noticed, either by Nobel committees, the public or foreigners who need impressing. For visible signals of its national prowess, China is following the well-trodden path of big science in America, Europe and Japan: building large physics experiments and putting things—especially people—into space.

The China National Space Administration has sent several “taikonauts” into orbit and provided them with some small space labs to hang around in while they are there. Its plans include, in the near term, a bigger space station, assembled in orbit from modules launched separately, and in the longer term crewed missions to the Moon enabled by a new booster more powerful than any of today’s, the Long March 9.

The National Space Science Centre, part of CAS, is busy putting up scientific satellites; in April 2018 it announced six new ones that should be launched by 2020 or soon after. Most of China’s launches, though, are not scientific; they are for communications, Earth observation—and military intelligence. China’s space programme began in the bosom of the People’s Liberation Army (PLA), and though it is no longer directly run by the armed forces, they are still keenly involved with the development of the country’s orbital abilities. In 2007 China tested an anti-satellite weapon; its “Strategic Support Force” is thought to co-ordinate its military space-, electronic- and cyber-warfare capabilities. All China’s taikonauts are PLA officers. Other physics facilities have obvious military applications, too, such as wind tunnels designed for research into forms of hypersonic flight that are really relevant only to the armed forces.

Beyond rocketry, China's most ambitious big-science plan is to build the largest particle accelerator ever. Since their development in the 1930s, circular particle accelerators have grown from the size of a room to the size of the Large Hadron Collider (LHC), which occupies a 27km loop of tunnel beneath the Franco-Swiss border at CERN, Europe's particle-physics laboratory. The bigger the accelerator, the more energy it can pump into its particles. The LHC packs its protons with more than a million times more energy than the original machines did in 1930s Berkeley.

The Chinese plan foresees a loop of tunnel as much as 100km long. Even China will not be able to foot the bill for such a beast alone. In the 2000s the LHC cost CERN over SFr4bn (\$5bn); contributions to its experiments from other countries, including China and America, significantly increased the total. Making use of it has cost billions more. Nor would China be able to supply all the physicists needed to make use of such a facility. Like the LHC, the next accelerator will be a single lab for the world, wherever it is: these toys are one-per-planet affairs. But the Chinese seem more serious than anyone else about hosting and building the thing. Just as it meant something beyond the world of particle physics when America cancelled its proposed giant SSC and CERN's LHC became the biggest game in town, so it would mean something if China took CERN's crown.

Particle physics enjoys a particular prestige in part because of its early (and now dissolved) association with the development of nuclear weapons, in part because of the conceptual depths it plumbs, in part because of the sheer size and expense of its tools. But there are other parts of physics with more of the cutting edge about them. These include applications of the more abstruse aspects of quantum mechanics to computation and cryptography, an area where China is a world leader: it was the first country to send a quantum-encrypted message via a satellite. In computer science, too, it has few peers. Though it does not yet have a semiconductor industry that quite matches those elsewhere, it is world class in many applications, especially

in artificial intelligence.

The same applies in trendy bits of biology. Dr He was not the first person to edit the DNA of a human embryo. That honour belongs to Huang Junjiu, a researcher at Sun Yat-sen University, in Guangzhou, whose research was blameless and above-board. Like Dr He, Dr Huang was making use of the capabilities of CRISPR-Cas9. Since 2012 this form of gene editing has become one of the hottest fields in biology, and China is very well represented in it (see chart 4); according to the study by Elsevier and Nikkei, it is publishing 22.6% of the world's most highly cited papers in gene editing, slightly more than half the amount that comes from America, and far more than from any other country.

Dr Huang wants to apply CRISPR-Cas9 to the treatment of beta thalassemia, a hereditary blood disease. To this end, in 2015 he successfully edited the DNA of several fertilised human eggs left over from IVF treatment. He had no intention of implanting the results in anybody's womb; he used embryos which, due to other abnormalities, were not able to develop. What he learned about gene editing in those experiments will, if all goes well, be used to edit stem-cells extracted from the bone marrow of people suffering from the disease, allowing them to make better red blood cells.

Stem-cell research is another hot topic to which China is adding its heft. Zuo Wei of Tongji University in Shanghai is trying to use stem cells to repair lungs damaged by emphysema, a big problem in China, where smoking is still common and the air often dense with smog. Last year he conducted a trial in which four patients had some lung tissue removed. The most healthy-looking stem cells in that tissue were isolated and encouraged to multiply, and the revved-up results then sprayed back into the lung. The procedure apparently repaired the lungs of two of the patients; the other two showed neither benefits nor harm. Dr Zuo has since organised a second trial

of 100 patients. He is working on a similar approach to kidney disease, but so far only in mice.

Dr Zuo's work demonstrates another feature of Chinese bioscience: keeping its application clearly in mind. In the West there has been an increasing concern over the past couple of decades that basic biology led by independent academic researchers has drifted too far from potential medical application. In America, in particular, biomedical-research prowess and the health of the population are increasingly poorly correlated.

This concern has led to a new emphasis on building up "translational-medicine" research capacities to bridge the gap—an idea the Chinese are already integrating into their work. The government has opened a translational-medicine centre in Shanghai, where laboratory researchers, clinicians and patients will all be under the same roof and biotech companies encouraged to set up shop next door. Others may follow in Beijing, Chengdu and Xi'an.

Genetic research is a field where China has both made big investments and sees a big future. In the BGI, as what was once the Beijing Genomics Institute is now known, China has by some measures the largest genome-sequencing centre in the world. Once an arm of CAS, it declared independence as a "citizen-managed, non-profit research institution" and has now become a semi-commercial chimera, with one of its divisions listed as a company on the Shenzhen stock exchange.

The BGI's corporate arm is also taking an interest in beta thalassemia; it has developed a DNA blood test for it, one of an increasing range it is making available across China. The tests use DNA-sequencing machines the BGI developed with technology which it acquired when it bought Complete Genomics, an American firm, in 2013.

That battalion of machines has a lot of other work to do. Non-commercial bits of the BGI use them for pure research. The outfit is also home to the China National GeneBank, the intended repository for several hundred million samples taken from living creatures of all sorts, human and non-human. It already holds the genomes of 140,000 Chinese people, part of a wider desire by the government to be at the forefront of the field of precision medicine, in which diagnoses, and eventually treatments, are personalised with particular emphasis on understanding a patient's genetic make-up.

The BGI is one example of China's ability to bring big-science approaches to new areas of research. For another you should look inside a low building in Zhuanghe, Liaoning province, where the world's largest battery is taking shape. It is to have six times the storage capacity of the system supplied by Elon Musk, an American entrepreneur, to South Australia in 2017, which lashed together thousands of lithium-ion battery cells to make the world's then-largest battery. It can do so because it uses a completely different approach based on a flow of vanadium-salt solutions.

China's near-insatiable demand for energy has led to investments in wind and solar power that dwarf those in other parts of the world, and is now leading to research into better ways of handling the energy they produce. Vanadium-flow batteries are of interest because, unlike most batteries, in which a single electrolyte is built into the cell, a flow battery has two electrolytes and an open cell through which they pass. This means its storage capacity is governed solely by the size of the tanks that store the electrolytes. That makes it possible, in theory, to build batteries big enough to store energy on a scale useful to large grids. The theory has been developed by Zhang Huamin, a researcher at the Dalian Institute of Chemical Physics, a local arm of CAS. The factory in Zhuanghe, owned by Dalian Rongke Power, a local electricity company, is trying to turn theory into practice. If it works, it could revolutionise grid-scale electricity storage.

The Dalian Institute's researchers are also looking into perovskites, materials with applications both in batteries and in solar cells. Their aim—also being pursued elsewhere in China and abroad—is to apply perovskite solutions to everyday solar cells so that the resultant layers will absorb wavelengths of light that the normal cells cannot absorb. This could produce much more efficient solar panels for relatively little extra cost. To the extent that academic publications are a good measure of technologies quite close to the market, perovskites are an area where China has a substantial lead over America, with 41.4% of the highest impact publications, compared with 21.5% from America.

China's energy research also extends to areas that the rest of the world is avoiding. China is building 13 new nuclear reactors to add to its fleet of 45; it has 43 more planned. If they are all built China will become the world's biggest generator of nuclear electricity. Those reactors are of similar design to the plants already in operation around the world. But China is also exploring new reactor technologies—or rather, technologies abandoned elsewhere. These include reactors in which the core is filled not with fuel rods but with little ceramic pebbles—or, in the case of thorium reactors, with molten metal.

The lack of progress such reactors have enjoyed in the West reflects a lack of appetite for new sorts of nuclear power much more than a lack of scientific plausibility. If China's appetite is sharp and its researchers imaginative, progress may come swiftly. The development of mass-produced, compact, cheap and safe nuclear reactors would be a Chinese first that a world in the throes of climate change would have real cause to celebrate—and start importing.

That possibility, though, brings to the fore a shadow over the future of Chinese science. Making novel nuclear reactors extremely safe requires critical thinking and obstinate truth-telling; so does convincing others that

you have done so. A culture that provides the results the boss wants, or does not investigate inconvenient anomalies, or withholds data from nosy outsiders is not good enough.

Those requirements are very like the norms that are seen as basic to doing good science in the West. Testing hypotheses, finding the flaws in the work on which your teacher's reputation rests, questioning your own assumptions, following the data wherever they lead, sharing data openly with your rivals-sorry-colleagues: this is how science is meant to work, even if in real life the ideal can be a bit tarnished. In some labs and institutions in China things doubtless do work that way. But the authoritarian system in which they are embedded makes it hard for Chinese science to speak truth to power, or escape challenges to its integrity. This gnaws at the scientific body politic, and saps resources, both financial and moral.

In their survey of Chinese researchers Dr Han and Dr Appelbaum heard many complaints about excessive government interference. A respondent from Sun Yat-sen University told them "There is still not enough academic freedom in higher education. If the central government makes one statement, even if it is not fair, all of the universities have to follow suit."

In matters of promotion, job interviews and grant-giving, the question of who you know seems much more important in China than in the West (and even there, it is not negligible). For the past decade the National Natural Science Foundation of China (NNSFC), one of the country's main funding bodies, has been running a campaign against such misconduct. Wei Yang, until recently the NNSFC's boss, describes a situation in which, to stop interference from outside, the composition of interview panels is kept secret until the last minute. Panellists are not told in advance who candidates are, and both panellists and candidates have their mobile phones confiscated in order to avoid anyone being nobbled—which used to

happen even while interviews were being conducted.

Some Chinese scientists fear that the corruptions and silences endemic in authoritarian states will hold them back from the breakthrough-making Nobel-winning heights. Others may doubt this. China has been playing in science's premier league for only a decade or so. Its investments are not at an end. China's R&D was 2.07% of GDP in 2015, up from 0.89% in 2000 (see chart 5). That is higher than the average for European states, but lower than France, Germany or America. It is much lower than in the Asian catch-up states that might be the most natural comparators, Japan and South Korea. A China spending as much of its GDP on research as South Korea does would have an R&D budget twice today's. With resources on that scale and a scientific workforce in the many millions, the hobbling effect of corrupt institutions might be overcome by brute force.

Others might argue that big breakthroughs are not the only measure of good science. Incremental work that solves practical problems is not to be sniffed at. Scientific research directed from the top down can serve national goals, and a one-party system may give particularly consistent support to such programmes. China's lunar programme has built up its capabilities steadily in a way no Western space-science programme has since Apollo, the achievements of which it may yet match.

This is the sort of methodical science that typically appeals to engineers oriented towards results—and from Jiang Zemin onwards all China's presidents, as well as almost all its other leading politicians, have had engineering degrees. Xi Jinping, today's president, studied chemical engineering at Tsinghua.

But the idea that you can get either truly reliable science or truly great science in a political system that depends on a culture of unappealable

authority is, as yet, unproven. Perhaps you can. Perhaps you cannot. And perhaps, in trying to do so, you will discover new ways of thinking as well as fruitful knowledge. ■



中国科研

伟大的实验

中国已成为领先的科研大国。但能成为伟大的吗？

中国的嫦娥四号探测器上月3日登陆月球，不过如今登月已经算不上什么顶尖的成就了。印度政府和以色列一个获得大笔资助的爱好者团队今年都将尝试登月；多家美国公司也打算在2020年奔赴月球。但在所有这些中国以外的登月计划中，飞行器都将降落在月球朝向地球这一面，因而能从地球上的控制中心密切观测。以前的登月项目都是如此，无论是美国的、前苏联的，还是中国在2013年启动的探月工程。

然而，嫦娥四号在冯·卡门撞击坑内的着陆点却是在月球的背面，望远镜无法观测到，也无法直接接收来自地球的无线电信号。只有在预先精心部署的中继卫星的帮助下，探测器才能在那里着陆并发回数据。其他国家也考虑过这样的做法，但从未实施过。中国一直在认真积聚实力以求探索尚未涉足之地，现在它做到了。

中国热衷于这种标志性的卓越成就，愿意为之付出努力。它希望全世界——还有它自己的人民——知道它是一个世界强国，不仅拥有庞大的经济体量，同时还拥有与之相匹配的地缘政治影响力和军事力量、各种各样的软实力、传奇的过去、荣耀的未来。科学在其中的角色举足轻重。与其他国家一样，科研在中国被视为一项崇高的事业，以及技术进步不可或缺的基础。中国领导人认为技术进步不仅对本国经济至关重要，对业已增强的军事实力和社会发展也同样重要。他们想要那种有助于中国投射影响力，并能解决其人民特有的问题的科学。他们需要新型清洁能源以摆脱贫穷的制约。而中国不断增强的科研实力让这些宏图大志似乎都变得可实现。从登月到在月球采矿还有很长的路要走，但在这类事物上常常可以听到各种推断。正如一位微博用户在嫦娥四号着陆后所言：“中国创造了历史！半个月球都将是我们的。”

中国对科学发展寄予的厚望促使它在这方面大力投入。2000年至2016年，中国的研发支出增长了十倍（见图表1）。这本敞开的支票簿买回了大量炫目的装备。在科技部以及清华、北大所在的北京海淀区某处，似乎有一位公务员默默地在象征科学地位的成就清单上打勾。载人航天？有了。庞大的基因组测序设施？有了。科考船队？有了。世界上最大的射电望远镜？有了。气候研究人员将钻芯钻入南极冰盖深处？有了。世界上最强大的超级计算机？有了（美国重新获得领先后这个勾擦掉了，但敬请关注后续）。地下中微子和暗物质探测器？都有了。世界上最大的粒子加速器？这个还下不了笔。

这个“采购狂潮”很容易让人回想起战后美国“大科学”的黄金岁月。从1957年国际地球物理年到1993年超导超级对撞机（SSC）项目取消的这段日子里，美国经济日益强大，政府不断加力，将资源投向本国科学领袖最希望发展的领域。从夸克的发现到基因克隆，再到垄断诺贝尔奖，美国科学开始称霸世界。

在那40年里，美国做了各种人类前所未有的科学尝试。欧洲也一样，但规模相对较小。欧美开辟了高能天体物理学和分子生物学等全新的知识领域。它们受益于有史以来最庞大、受到最好教育的几代国民。除此之外它们还敞开怀抱，吸纳来自世界各地的精英。而这一切发生在一个尊崇自由探索的文化中，与前苏联阵营的共产主义文化截然不同。

就科学成就而言，那是人类历史上最令人瞩目的时期之一。与那时的繁荣相比，中国新添置的硬件虽然通常都很宏伟，但仍有所不及。中国一直在奋力追赶，而不是冲在前头。它也没有成为指引他国科学家的灯塔。中国的科学研究并非受益于自由探索的文化，而是在共产党和政府的密切注视下进行的。党和政府一方面希望取得科学成果，但对于不受约束的信息流动、质疑的精神和批判性的怀疑主义往往又难以放心，而这些通常都是科学成果生长的土壤。

美国的科学繁荣扎根于一个坚实的制度和意识形态基础之上。这个基础源

于自20世纪上半叶开始显现非凡价值的优秀的研究型大学，它们给予的智力自由吸引了受到其他政权威胁的杰出人才，包括爱因斯坦、恩里科·费米和冯·卡门（Theodore von Kármán）——嫦娥四号的新家正是以这位匈牙利出生的航天工程学家的名字命名。中国引进的想法和方法多于人才和理想，由此产生的架构并不稳定。这种脆弱性常见于自上而下的指令性机制，而非自下而上建立起的体系。

自上而下的雄心壮志可能导致“还不会走就先跑”。以2016年启用的500米口径球面射电望远镜（FAST）为例，它建于贵州省的一个天然盆地，口径超过美国那台全球第二大射电望远镜两倍。但是FAST没有主管科学家。中国在硬件方面一跃到顶，却发现自己处于一个尴尬的境地：手边并没有兼具运行这套设备所需的科学和管理技能的射电天文学家。而且，直到现在它也没能招募到一个愿意到望远镜所在的偏远地区工作的合格的外国专家。

不只是政府容易去走弄巧成拙的捷径（无论是有象征意义的项目还是别的），中国的科学家也会堕入这种诱惑的陷阱。中国不仅仅是在重现美国科学在冷战时期实现的国家声誉大涨，它还是在冷战后的高科技时代里做这件事。在这个时代，任何一所美国大学若没有一个大量风险资本家组成的微生物群落与自己共生，都会觉得自身不完整。研究的经济效益越来越被认为可能是科研人员乃至整个社会的福音。

有一个特别恶劣的例子，那就是2018年最出名的中国科学创举。贺建奎看起来像是个典型的现代中国科学家。他曾就读于合肥的中科大，后来去往美国，到同样享有盛誉的莱斯大学和斯坦福大学继续深造。中国政府的“千人计划”将他作为人才引进回国，到位于深圳的南方科技大学的一个新岗位上任职。在那儿立住脚后，他就停薪留职，开始创业。

他创建的项目是编辑人类胚胎的基因，结果诞生了一对双胞胎女婴。到目前为止，她们看起来没什么不健康。但她们也没有得到贺建奎宣称他的基因编辑所能带来的好处，这种好处本身也值得怀疑。这种编辑未经批准，也不合法。贺建奎一对外公布此事就广受抨击。

贺建奎事件可能会发生在许多地方，也不能代表广大中国科研人员——他们当中有122人共同签署了一封公开信，谴责他的做法。不过，此事件发生在中国也不足为奇。中国科学家为让自己和自己的国家在精英科学界中立足而努力，此事件是这种追求中的一种扭曲的行为。但它又是一个非常能说明问题的例证。

我们需要在这种背景下来看待中国科研论文数量的惊人增长。单看发表数量，2016年中国超过了美国（见图表2）。但有些论文的质量低劣。2018年4月，加州大学圣塔芭芭拉分校的韩雪英（Han Xueying，音译）和理查德·阿佩尔鲍姆（Richard Appelbaum）公布了他们从中国一流大学的731名研究人员那里征集到的意见。正如复旦大学的一位研究人员所说：“很多人论文造假或抄袭，都是为了通过年度绩效考核。”

中国政府明白，质量低下甚至是欺诈性的研究是对声誉的威胁。这是它正在精心打造一个科研架构的原因之一。该体系的一个支柱是被称为九校联盟的精英大学核心组织。复旦就是其中之一，清华和北大以及贺建奎的母校中科大也是其成员。另一个支柱是中国科学院，一个拥有自己的实验室的官方机构，这些实验室将遵循通行的国际标准。政府正在打击劣质期刊，尤其是那些供研究人员付费出版的期刊。以这种方式提高标准不仅会改善科研的质量，还将吸引到最优秀的科学家。

1978年邓小平上台后，鼓励中国的尖子生到国外深造。许多人按政府预期的那样，满载着在国内无法获得的知识回国。没有他们，政府投再多的钱也无法实现如今的科学繁荣。但顶尖人才经常选择留在国外。2008年，中国启动“千人计划”，用金钱和实验室空间吸引这些留在国外的人才回国。

该计划理论上是面向所有在海外实验室工作的一流研究人员，无论国籍。而在实际上，很少有非中国人会利用这个计划。但很多中国人会。他们回国后被称为“海龟”，因为人们认为他们就像海龟一样回到自己出生的海滩来产卵。

然而，没出过国的人才也不会被忽视。与“千人计划”并举的还有“长江学

者奖励计划”，目标是在数千个省级机构中发掘被埋没但有可能成为一流研究者的人员。一旦得到了长江学者的身份，他们也就会被带进一个有特别影响力的小圈子。

这样的政策在各个层级都取得了成果，最高层级除外。至今为止，在中国工作的中国科学家只获得过一项诺贝尔奖。除了屠呦呦发现青蒿素（一种新型抗疟药物）的研究之外，尚未有任何中国的科学进步在一个公正开明的人眼里可能够得上诺贝尔奖。中国没有发现任何基本粒子，也没有发现任何新一类的天体。中国科学家还没有任何极其重要的科学发现能媲美CRISPR-Cas9基因编辑技术的发展（美国）、多能干细胞的创造（日本）、DNA测序技术的发明（英国）等成果。

但是，中国现在确实有大量优质的科研成果，特别是在那些有实用前景的较新领域。中国的科研人数众多且不断增长（见图表3），这些人被吩咐去解决有趣的问题，他们本身对此也有强烈的兴趣。科学出版商爱思唯尔（Elsevier）与日经新闻1月6日发表的一项研究发现，在30个具有明确技术应用前景的热门研究领域中，中国在23个领域里发表的高影响力论文多于美国。中国的科学就像一个灵活的巨人，可以在任何有前景的新领域中密集投入大量通常受到中央鼓励的科研力量。

双层电容和生物炭（23个领域中的两个）等领域的发展可能很重要，但不太可能引起太多注意，不管是诺贝尔奖委员会、公众，还是外国人的注目。为了能清晰地展示国家实力，中国正沿着美国、欧洲和日本走过的大科学路径前进：发展大型物理实验，把东西尤其是人送入太空。

中国国家航天局已将几名“中国太空人”送入太空轨道，并提供了小型太空实验室，让他们在天上也有地方活动活动。航天局的短期计划是建立一个更大的空间站，由分开发射的模块在轨道上组装而成；长期目标则是完成载人登月，这要借助比如今所有火箭都更强大的全新运载火箭——长征9号。

隶属中科院的国家空间科学中心正忙着发射科学卫星；2018年4月，它宣

布争取在2020年前或随后不久发射六颗新的科学卫星。不过，中国发射的大多数卫星都不是科学卫星，而是用于通讯、地球观测和搜集军事情报的卫星。中国的太空计划始于军用目的，虽然已不再由军方直接管理，但军队仍然密切参与中国轨道能力的发展。2007年，中国测试了一种反卫星武器；外界认为是解放军的“战略支援部队”在负责协调中国的空间战、电子战和网络战能力。中国的太空人全都是解放军军官。其他物理实验设施也有明显的军事用途，例如用于研究高超音速飞行方式的风洞，这种研究其实仅与军队有关。

除了火箭，中国最雄心勃勃的大科学计划就是建造有史以来最大的粒子加速器。自上世纪30年代开始发展以来，环形粒子加速器已经从一个房间大小发展到了大型强子对撞机的规模。这个对撞机位于法国-瑞士边界地区的欧洲核子研究中心（CERN），占据了一条长达27公里的地下环形隧道。加速器越大，向粒子注入的能量就越高。大型强子对撞机质子对撞产生的能量比上世纪30年代在伯克利研发的原始加速器高出一百多万倍。

中国计划修建的加速器预计将占据一条长达100公里的环形隧道。即便是中国也无法独自为这样的“巨兽”买单。在本世纪头十年，CERN为大型强子对撞机花费了超过40亿瑞士法郎（50亿美元），而其他国家（包括中国和美国）对其实验的贡献大大增加了总花费。为了把该设施利用起来，又另外花费了几十亿。中国物理学家的数量又不足以让这种设施利用起来。和大型强子对撞机一样，下一个加速器无论建在哪里，都将成为一个自成一体的世界性实验室：这样的大玩具地球有一个就够了。但是中国似乎比任何国家都更重视在本国建造加速器。当年美国取消了建造巨型超导超级对撞机的计划，CERN的大型强子对撞机遂成为世界上最大的加速器，这带来的影响不仅局限于粒子物理学界。如果中国摘走了CERN的皇冠，也会有同样的效应。

粒子物理学享有特别的声望，这既是因为它早期曾与核武器的发展有关（现在已经没有关联），也是因为它所探究的概念很深奥，此外还因为它所使用的工具的规模和费用巨大。但是物理学的其他一些领域有更多前沿性的发展。其中包括将量子力学更深奥的方面应用于计算和密码学，中国

在这一领域领跑全世界：它是第一个通过卫星发送量子加密信息的国家。中国在计算机科学领域也罕有对手。虽然它还没有能与其他国家相比的半导体产业，但它在许多应用领域都处在世界领先水平，特别是人工智能。

中国在生物学的热门领域同样领先。贺建奎不是第一个编辑人类胚胎基因的人。这一殊荣属于位于广州的中山大学的研究员黄军就，他的研究无可指摘，且光明正大。和贺建奎一样，黄军就也是利用了CRISPR-Cas9技术。2012年以来，这种形式的基因编辑已成为生物学中最热门的领域之一，中国在该领域成就显著（见图表4）；根据爱思唯尔和日经新闻的研究，世界上引用率最高的基因编辑论文中，由中国发表的论文占总数的22.6%，是美国发表数量的一半略多，远超其他任何国家。

黄军就希望将CRISPR-Cas9应用于治疗遗传性血液病 β 型地中海贫血。为此，他于2015年成功编辑了试管婴儿手术中遗留下来的几个受精卵的DNA。但他无意将编辑后的受精卵植入任何人的子宫；他用的是因其他异常而无法发育的胚胎。如果一切顺利，他在这些实验中得到的有关基因编辑的知识将用于编辑从 β 型地中海贫血患者的骨髓中提取的干细胞，让它们能够制造更好的红细胞。

干细胞研究是另一个中国正在发力的热门领域。上海同济大学的左为正尝试利用干细胞来修复肺气肿导致的肺部损伤。肺气肿在中国是个严重的问题，因为吸烟在中国仍很普遍，而雾霾又常见。去年，左为进行了一项试验，在四名患者身上取出了少量肺部组织，分离出这部分组织中最健康的干细胞促使其扩增，之后将这些更活跃的干细胞输送回患者肺部。该疗法似乎修复了两名患者的肺部；另外两名患者既无好转也无损伤。后来，左为进行了有100名患者参与的第二次实验。他正在研究用类似的方法治疗肾脏疾病，但到目前为止只在小鼠身上进行了试验。

左为的研究展示了中国生物科学的另一个特点：应用目的十分明确。过去二三十年里，西方人越来越担心，认为独立学术研究人员领导下的基础生物学已与潜在的医学应用偏离太远。特别是在美国，生物医学研究的实力

和人口健康的相关性越来越弱。

这种担心催生了一个新的重点：打造“转化医学”的研究能力以弥合差距。中国人已将这一理念融入到自己的研究工作中。政府在上海设立了一个转化医学中心，让实验室研究人员、临床医生和患者聚集在同一屋檐下，并且鼓励生物技术公司就近开店。北京、成都和西安可能也将开设这样的中心。

基因研究是中国既投入大量资金又看到广阔未来的领域。在前身为北京基因组研究所的华大集团，中国拥有以某些标准衡量堪称世界最大的基因组测序中心。华大集团曾隶属中科院，后来宣布成立公司，变成“民办非营利性研究机构”，现在已成为半商业化的嵌合体，有一家下属企业在深圳证券交易所上市。

华大集团的下属公司也对β型地中海贫血感兴趣，已经为这种疾病开发了基因血液测试，并正在中国各地普及这种检测范围不断扩大的测试。测试所使用的基因测序仪是用华大集团在2013年收购美国公司Complete Genomics时获得的技术开发的。

华大集团的众多仪器还有其他很多用途。其下属的非商业机构将这些仪器用于纯粹的研究。这些机构包括中国国家基因库，该基因库计划存放从人类和其他各种生物中采集的数亿个基因样本。那里已经拥有14万名中国人的基因组样本，属于政府希望发展的尖端精准医学的一部分。精准医学将诊断乃至治疗方案个性化，特别强了调解患者的基因组成。

华大集团的例子显示了中国将大科学方法引入新研究领域的能力。而在辽宁省庄河市的一幢低层建筑里能找到另一个例子，这里正在研发世界上容量最大的电池，其存储容量将是美国企业家伊隆·马斯克在2017年向南澳大利亚提供的电池系统的六倍。马斯克的系统将数千个锂离子电池捆绑在一起，制造出了当时世界上最大的电池。庄河之所以可以生产容量更大的电池，是因为它使用了基于钒盐液流的截然不同的方法。

中国对能源的需求几乎是无止境的，为此它大力投资风能和太阳能，让世界其他地区相形见绌。如今它还要研究如何更好地存储这两种能源产生的电能。中国对钒液流电池很感兴趣，因为它与大多数电池不同：一般电池内部包含一种电解质，而液流电池使用两种电解质，以及电解质可以通过的开放电池单元。这意味着其容量仅由存储电解质的存储罐的大小决定。这在理论上可以制造出足够大的电池，以大型电网所需的规模来蓄电。该理论由中科院大连化学物理研究所研究员张化民开发，地方电力企业大连融科储能公司下属的位于庄河的工厂正试图将理论付诸实践。如果成功，就可能彻底改变电网级电力的储存方式。

大连化学物理研究所的研究人员也在研究钙钛矿，这种材料在电池和太阳能电池上都可以应用。他们的目标是将钙钛矿溶液应用于日常所用的太阳能电池，让其中各层都能吸收普通太阳能电池无法吸收的波长范围的光。中国其他地方以及其他国家也在做这样的尝试。这就能以相对而言极小的额外成本生产出效率高得多的太阳能电池板。如果说学术出版物可以很好地衡量技术接近市场化的程度，那么中国在钙钛矿领域明显领先美国：中国在这一领域的高影响力论文数占41.4%，美国为21.5%。

中国的能源研究还延伸到了其他国家回避的领域。中国已建成45座核反应堆，还有13座在建和43座计划建设的新反应堆。如果全部建成，中国将成为世界上核电发电量最大的国家。这些反应堆的设计与世界各地已经在运行的核电站类似。但中国也正在探索新的反应堆技术，或者更确切地说是已经被其他地方放弃的技术。有的反应堆的堆芯用的不是燃料棒，而是小小的陶瓷卵石；如果是钍反应堆，用的就是熔融金属。

核反应堆在西方国家进展不足，主要是因为对新型核电的需求不足，而不是缺乏科学上的合理性。如果中国的胃口够大，研究人员又富有想象力，那么可能很快就会实现进步。中国将可能捷足先登，开发出可量产、廉价又安全的小型核反应堆。面临气候变化困境的世界将真正有理由去庆贺这一成就，并开始从中国进口核反应堆。

然而，这种可能性突显了笼罩在中国未来科学发展上的一层阴影。要保证

全新类型的核反应堆极为安全，需要批判性思维和坚持坦承真相。而在说服别人相信你建成的核反应堆具备高度安全性时，同样需要这两点。如果一种文化只要求提供领导想要的结果，或者对一些麻烦的异常问题不予深究，又或者对好奇的外人隐瞒数据，是不足以做好这件事的。

这些要求非常类似于西方对从事好的科研的基本规范。检验假设、在关系你老师的声誉的研究工作中寻找缺陷、质疑自己的假设、遵循数据所指的任何方向、与对手——哦，应该是同事——坦诚分享数据，这才是从事科研的正确方式，即使在现实中这些理想可能会有点折损。中国的一些实验室和研究机构确实是这样运作的。但它们身在其中的威权体制让中国科学难以对权威说真话或逃脱那些对其诚信的挑战。这侵蚀了它的整个科研群体，也消耗了财政和道德两方面的资源。

在面向中国研究人员的调查中，韩雪英和阿佩尔鲍姆听到了许多关于政府过度干预的抱怨。中山大学的一位受访者告诉他们：“高等教育机构中仍然没有足够的学术自由。中央一发话，即使不公平，所有大学也只能照做。”

在职称晋升、求职面试和经费发放等问题上，人脉在中国要比在西方重要得多（即使在西方人脉也不可忽视）。过去十年中，中国主要的项目资金资助机构之一国家自然科学基金委员会一直在开展行动打击不正之风。刚刚卸任该委员会主任的杨卫讲到，为了防堵来自外界的干扰，评审小组的成员名单直到最后一刻才会揭晓。小组成员事先不知道候选项目的负责人是谁，并且评审过程中他们以及候选项目负责人的手机都会被没收，以杜绝走后门现象——过去这种情况甚至在评审进行的过程中都会发生。

一些中国科学家担心，威权国家中常见的腐败和沉默会让他们难以实现诺贝尔奖级别的突破性进展。其他人可能对此表示怀疑。中国进入科学界的顶级联赛才十年左右，投资还没有结束。中国的研发支出占GDP的比重从2000年的0.89%上升到了2015年的2.07%（见图表5），高于欧洲各国的平均水平，但低于法国、德国或美国。把日本、韩国这样奋起直追的亚洲国

家拿来比较可能最自然不过，而中国的这一比重远低于这两个国家。如果中国的这一比重达到韩国的水平，那它的研发预算将会是现在的两倍。凭借这种规模的资源和数百万的科研人员，腐败机构的拖累可能会被蛮力压倒。

也许还有人认为重大突破不是衡量良好科学发展的唯一标准。能解决实际问题的渐进性工作不应被嗤之以鼻。从上至下的科学研究可以为国家目标服务，而一党制可以为这些项目提供持续的支持。中国探月计划的成就可能还赶不上阿波罗计划，但已经稳定地建立了自己的能力，这是西方太空科学计划自阿波罗以来所未有的。

这种有条不紊的科学发展方式通常是以结果为导向的工程师们喜欢的。而从江泽民开始，所有中国国家主席以及几乎所有其他重要领导人都是工科出身。如今的主席习近平就曾在清华学习化学工程。

有观点认为，在一个建立于权威不可被上诉的文化之上的政治体系中，要么能获得真正可靠的科学，要么能获得真正伟大的科学，但这种观点尚未得到证实。也许能，也许不能。也许，在尝试这么做的过程中，你会发现新的思路和丰硕的知识。 ■



British universities

Money and meaning

Studying a “useless” field at Oxbridge costs a mint in forgone earnings

SCEPTICS OF HIGHER education often complain that universities offer too many frivolous degrees with little value in the workplace. Since elite universities tend to produce higher-earning graduates than less selective institutions do, you might expect them to teach more practical courses. Yet data from Britain's department for education show the opposite. Undergraduate students at prestigious universities are more likely to study purely academic fields such as philosophy and classics, whereas those at less choosy ones tend to pick vocational topics such as business or nursing.

What could explain this seeming contradiction? One reason is that employers treat a degree from a top university as a proxy for intelligence. This means that students at elite institutions can study bookish subjects and still squeak by financially. The median Cambridge graduate in a creative-arts subject—the university's least lucrative group of courses, including fields such as music—earns around £25,000 (\$32,400) at age 26. Economics students from less exalted universities, such as Hull, make a similar amount.

Yet even though Oxbridge students can pretend to read “Ulysses” for years and still expect a decent salary, they end up paying a large opportunity cost by pursuing the arts. That is because employers reserve the highest starting wages for students who both attended a leading university and also studied a marketable subject. Cambridge creative-arts graduates earn £11,000 more at age 26 than do those from Wrexham Glyndwr University, whose arts alumni are the lowest-earning in Britain. In contrast, Cambridge economics graduates make £44,000 more than do those from the University

of Salford, where the economics course is the country's least remunerative.

Many gifted arts students would struggle to crunch numbers. But for those who can excel at both, the cost of sticking with the arts, in terms of forgone wages, is steep. Cambridge creative-arts students have A-level scores close to those of economics students at Warwick, but earn about half as much. That is tantamount to giving up an annuity worth £500,000.

Who can afford such indulgence? The answer is Oxbridge students, who often have rich parents. At most universities, students in courses that lead to high-paying jobs, such as economics and medicine, tend to come from wealthier families, partly because such applicants are more likely to have the examination scores necessary to be accepted. At Oxbridge, however, no such correlation exists. History and philosophy students there come from richer parts of Britain, on average, than their peers studying medicine do. ■



英国大学

金钱与思想

在牛津、剑桥学习“无用”专业，收入损失惨重

高等教育怀疑论者常抱怨大学提供了太多在职场上无甚价值的无用学位。相比招生标准较低的大学，名牌大学的毕业生一般收入更高，因此人们可能会以为名校开设的课程更实用。然而，英国教育部的数据显示出相反的情况。名校的本科生更有可能学习哲学和古典文学等纯学术性专业，而在招生标准更宽松的大学，学生则倾向选择商科或护理等职业性专业。

这看似矛盾的现象该如何解释？原因之一是雇主认为顶尖大学的学位是一个衡量智力的指标。这意味着在名牌大学攻读学术性专业的学生仍能“钱”途光明。剑桥大学创意艺术类专业（该校毕业生收入前景最低的专业，包括音乐等）的毕业生在26岁时的收入中位数约为25,000英镑（32,400美元），跟赫尔大学（Hull）等不太知名大学的经济学专业毕业生的收入相仿。

然而，尽管牛津和剑桥的学生可以自称研读《尤利西斯》多年而仍可预期高薪，但攻读人文学科的他们最终要付出相当大的机会成本。这是因为雇主把最高起薪留给了既出身名校、所学专业又符合市场需求的毕业生。剑桥创意艺术类专业的毕业生26岁时的收入比雷克瑟姆格林多大学

（Wrexham Glyndwr University）的同龄同专业毕业生高出11,000英镑，后者的收入为英国同专业最低。相比之下，剑桥大学经济学专业的毕业生收入比索尔福德大学（University of Salford）的高44,000英镑，后者是英国经济学毕业生中赚得最少的。

许多有天赋的人文艺术学科的学生都不擅长和数字打交道。但对于那些两方面都擅长的人来说，坚守人文艺术领域代价不菲（就放弃掉的工资而言）。剑桥创意艺术类专业学生的A-level课程成绩与华威大学（Warwick）经济学专业学生的相近，但收入只有后者的一半左右。这相

当于放弃了价值50万英镑的年金。

谁能有本钱如此任性？答案是家境一般都比较富裕的“牛剑”学生。在大多数大学，通往高薪工作的专业（如经济学和医学）的学生往往来自较富裕的家庭，部分原因是这些申请人更可能取得入学必需的考试成绩。然而在牛剑却不存在这样的关联。在这两所学校，平均而言，历史和哲学专业学生的家境比医学专业的学生更加富裕。■



Drones

Hovering saviour or menace?

Regulators need to encourage drones, but also to protect people from them

WHILE TESTING a drone to detect sharks off a beach in New South Wales last year, Australian lifeguards spotted two young men struggling to swim in the violent surf. The drone was dispatched to drop an inflatable pod, which the men used to reach the shore safely. Such civilian drones are saviours that have helped rescue mountain-climbers and people trapped by natural disasters. They carry emergency medical supplies and organs for transplant. Apart from saving souls, civilian drones are becoming a good business. Goldman Sachs, a bank, reckons that the market will be worth \$100bn by 2020 in areas such as surveying, security and delivery.

The trouble is that drones also endanger life and cause disruption, as they did on January 22nd when Newark airport near New York closed briefly after a drone was seen nearby. Drone sightings at Gatwick airport near London forced it to shut for 36 hours just before Christmas. Three weeks later a drone closed Heathrow, the world's third-busiest airport, for an hour. These were hardly the first such incidents. Stockholm's Arlanda Airport suspended flights in 2017 after spotting a drone. Pilots frequently report near-misses. Because they contain metal parts and potentially explosive lithium-ion batteries, drones can badly damage an aircraft in a collision. They are also used to smuggle contraband across borders and into prisons. In Yemen Houthi rebels recently used a drone to attack the VIP podium of a military parade-ground, reportedly killing six soldiers.

As with other dual-use technologies, the task for regulators is to encourage the good uses of drones while preventing the bad. The tension between those aims can lead to contradictory impulses. The FBI warned recently that

the threat to America from attacks by rogue drones is steadily increasing. The Federal Aviation Administration, meanwhile, is starting to allow some drones to be flown beyond the sight of their operators, which would greatly boost their commercial use. But some in the aviation industry worry that until drones can be incorporated into the air-traffic-control system, the relaxation of safety restrictions could make accidents more likely.

Rules are needed to ensure that drones are safe, and many countries now have such laws. By and large, professional operators and keen hobbyists will respect them, because they will not want to have their flying permits revoked or their equipment confiscated. Stiff penalties and better information can keep irresponsible users in check. Manufacturers can put safeguards in their drones' digital-navigation systems to prevent them being flown too high or too close to sensitive sites such as airports.

But it would be a mistake to pile rules on the industry in order to tackle malicious users, who will simply ignore them. Trouble-makers will not register their drones. They will overcome countermeasures by tampering with safety systems or building their own machines from readily available parts.

Rather than wrap the drone industry in red tape, the security forces need to take on the rogue operators directly (see Science section). The first trick is to identify threats quickly. The best hope, already used by some airports, is three-dimensional radar, which, unlike standard airfield radar, can track a drone flying several kilometres away. This can help airports detect if they have a problem, identify the source of the threat and, most important, rapidly determine when it is safe for flights to resume.

Once a rogue drone has been spotted, it has to be disabled and safely forced down. This comes with risks. Military systems may not be suitable for protecting a big public event or a busy airport surrounded by residential

areas. Firing bullets, missiles or lasers risks sending an out-of-control drone crashing into a public place. A better approach is therefore to attempt a “soft kill”, using signal-jamming, which can force a drone to land or seize remote control of it. Signal-jamming has to be careful, though, to ensure that aircraft instruments and airfield-navigation and radio systems are not also affected.

Investment in counter-drone systems is helping overcome some of these shortcomings. Other countermeasures can be added as better ones come along. But a technological race between malevolent drone operators and the forces of law and order is inevitable. As the countermeasures advance, regulators need to remember that their job is to hobble the bad guys without undermining the many beneficial uses of drones. ■



无人机

空中救星还是威胁？

监管机构需要鼓励无人机的发展，但也要保护人们不受其伤害

去年在新南威尔士州的一个海滩上，澳大利亚的救生员测试用无人机探测鲨鱼时发现两个年轻人正在汹涌的浪涛中挣扎。他们操控无人机投放了一个充气艇，两个年轻人靠它安全地回到了岸边。这样的民用无人机仿佛救星，它们协助救援登山者和被天灾所困的人们，运送紧急医疗用品和待移植的器官。除了拯救生命，无人机也日渐成为一门好生意。投行高盛估计，到2020年，勘察、安保和快递等领域无人机市场的价值将达到1000亿美元。

可问题是无人机也会危及生命，造成破坏。上月22日纽约附近的纽瓦克机场（Newark）周围发现一架无人机后，机场短暂关闭。去年圣诞节前夕，伦敦附近的盖特威克机场（Gatwick）出现无人机，机场被迫关闭36小时。三周后，世界上第三繁忙的机场希思罗机场发现无人机后关闭一小时。这些干扰事件都不是新鲜事了。2017年，斯德哥尔摩的阿兰达机场（Arlanda Airport）在发现一架无人机后暂停了所有航班。飞行员们经常上报差点与无人机相撞的险情。因为无人机含有金属部件和有爆炸危险的锂离子电池，所以一旦碰撞，飞机会严重受损。无人机还被用来在边境走私和向监狱运送违禁品。在也门，胡塞叛军最近使用一架无人机攻击了一个军事阅兵场的贵宾台，据称导致6名军人死亡。

像对待其他军民两用技术一样，监管机构的任务是鼓励人们对无人机加以善用，同时防范他们用它来做坏事。这两个目标之间的对立可能导致相互矛盾的倾向。FBI近期警告说，流氓无人机对美国的威胁正持续增大。与此同时，联邦航空管理局（FAA）开始允许一些无人机飞出操作员的视线范围，这将极大地促进其商业用途。但是，一些航空业人士担心，在无人机可被纳入空中交通管制系统之前，放宽安全限制可能会使事故更容易发生。

要确保无人机的安全使用就需要制定规则，许多国家现在都有此类法规。总的来说，专业无人机操作员和业余发烧友都会遵守这些法规，因为他们不想被吊销执照或被没收设备。严厉的处罚和更好的情报可以约束不负责任的无人机用户。制造商可以在无人机的数字导航系统中设置安全措施，以防它们飞得太高或离机场等敏感地点太近。

但是，为了对付恶意用户而一味对行业施加规则也是不对的，因为那些人对规则只会视若无睹。麻烦制造者不会登记他们的无人机，还会篡改安全系统或用很容易买到的零件自己制造无人机来对付管控措施。

安全机构需要直接对付流氓操作员，而不是用繁琐的规章去约束无人机行业。第一个难题是快速识别威胁。对此最大的希望在于三维雷达，一些机场已经在用它了。与普通机场雷达不同，三维雷达可以在几公里外发现无人机。这可以帮助机场发现问题，确定威胁的来源，最重要的是可以快速确定何时可以安全地恢复航班。

一旦发现流氓无人机，就必须令其瘫痪并安全迫降。这也伴随着风险。要保护大型公共活动或周边居住区密集的繁忙机场可能不适合动用军事系统。发射子弹、导弹或激光可能会让失控的无人机坠毁在公共场所。因此，更好的方法是用信号干扰来尝试“软杀伤”，迫使无人机降落或者夺取其遥控权。但是，信号干扰要谨慎操作，以确保飞机仪表和机场导航及无线电系统不受影响。

投资反无人机系统有助于克服这些缺点。随着更好的应对手段不断出现，也可以引入其他对策。然而，恶意无人机操作员和安全机构之间的一场技术竞赛将不可避免。在反制措施不断进步之时，监管机构需要记住，它们的工作是在不损害无人机的众多有益应用的情况下遏制坏人。■



The elite that failed

The Davos delusion

Down with philanthrocapitalism, says an entertaining polemic

IT IS MORE than 20 years since Samuel Huntington introduced the concept of Davos Man in his great book “The Clash of Civilisations”. Now Anand Giridharadas has gone one better and taken his reader deep inside the mind of that peculiar creature. Everybody knows the basics: Davos Man believes that markets are more efficient than governments and that globalism is preferable to nationalism or localism. Mr Giridharadas’s trick is to focus on the more intriguing parts of the Davos world-view: that businesses can “do well by doing good”; that philanthropy needs to be “reinvented” for the age of the internet and the T-shirt-wearing billionaire; and that one of the greatest problems facing the world, even as some inner-cities are ravaged by drugs and violence, is that there aren’t enough Davos Women to join the Davos Men in this win-win nirvana.

A few years ago Mr Giridharadas, who works as a political analyst for MSNBC and teaches journalism at New York University, stumbled across a big problem—that the rise of the win-win mantra had coincided with one of the longest periods of wage stagnation in American history. Davos Man’s smiley-faced faith in business-led solutions (green bonds, impact investing, social innovation and the rest) concealed a harsher reality. Businesses were relentlessly pursuing efficiency and cutting costs—shifting jobs to cheaper places or forcing people to work longer hours—and then recycling a fraction of the profits they made into Davos-style consolations.

All this recycling is wonderful for the billionaires who derive a warm feeling from spending their money on helping the poor. It is wonderful for CEOs who can burnish their brands by embracing the latest fashionable good

cause. It is particularly wonderful for the “thought-leaders” who can spend their lives hanging out with Sergei and Mark and suggesting clever ways for their philanthrocapitalist masters to cure the world’s ills. But it does little to make up for the winner-takes-all philosophy that is driving companies to hold down wages and transfer the burden of risk onto their employees. And it does little to solve the problems of “the unexotic underclass”—white ex-working-class men in particular—who have been deemed too boring and reactionary for the Davos crowd to bother about.

It is easy to raise objections to Mr Giridharadas’s argument. He ignores the fact that figures like Bill Gates have done a great deal of good. He doesn’t mention that, even though incomes in the West have stagnated in recent decades, hundreds of millions of people in the emerging world have been lifted out of poverty. His anti-business animus is blunt-edged: he would have been better off focusing on genuine scandals such as tax-dodging rather than railing against efficiency-seeking in general. Yet in some ways these objections miss the point. “Winners Take All” is a splendid polemic that is all the better for simplifying and exaggerating.

Mr Giridharadas writes brilliantly on the parasitic philanthropy industry that somehow manages to hold its meetings in desirable resorts (Davos in the ski season, Bellagio in the summer) rather than in Detroit or Lagos. In one particularly stomach-turning section he reports on a luxury cruise, Summit at Sea, where various bigwigs discuss ways to improve the world while sitting in the well of the Bliss Ultra Lounge. “The boat’s not about getting drunk and getting naked,” a motivational speaker intones. “Well, it’s sort of about that. But it’s also about social justice.”

He produces worrying case studies that illustrate his theme of companies creating big social problems and then offering sticking-plaster solutions in the form of philanthropy. For example, Purdue Pharma has an impressive record of providing grants that “encourage the healthy development of

youth by reducing high-risk behaviours such as substance abuse". But one reason that the company can afford such largesse is that it has made a fortune from marketing OxyContin, a drug that, thanks to over-prescription, is at the heart of America's opioid epidemic.

The only genuine failure of this otherwise excellent screed is that Mr Giridharadas does not push his argument further. He rightly goes beyond inequality of wealth to address inequality of power: how win-win fixes invariably take problems out of the political realm and sub-contract them to unaccountable global elites. But he says nothing about the fascinating issue of inequality of esteem.

The Davos elite is not content with hoarding an inflated proportion of the world's wealth and power. It is trying to appropriate an outsize share of the world's esteem by reinventing philanthropy in its own techy and globe-trotting image. It is not just Davos Man's vices that are fuelling the populist fire. It is his virtues too. ■



失败的精英 达沃斯幻象

打倒慈善资本主义，一本引人入胜的抨击之作如此说道【《赢家通吃：改变世界的戏精精英》书评】

二十多年前，塞缪尔·亨廷顿（Samuel Huntington）在其伟大著作《文明的冲突》（The Clash of Civilisations）中提出了“达沃斯人”这个概念。如今，阿南德·格里哈拉达斯（Anand Giridharadas）更进一步，带领读者走入了这类奇特生物的内心深处。有些基本点人人皆知：达沃斯人相信市场比政府更有效率，全球主义比民族主义或地方主义更可取。格里哈拉达斯的妙招在于他聚焦于达沃斯世界观中更有趣的部分：企业可以“靠做善事兴旺发达”；在互联网兴起和亿万富翁都穿着T恤的时代，慈善事业需要“重塑”；当一些旧城区被毒品和暴力蹂躏时，世界面临的最大问题之一是没有足够的达沃斯女性加入到达沃斯男性的双赢天堂。

格里哈拉达斯是微软全国广播公司（MSNBC）的政治分析师，在纽约大学教授新闻学。几年前，他无意中发现了一个大问题：双赢口号的兴起恰巧与美国历史上最长的工资停滞期之一重合。达沃斯人对由企业主导的解决方案（绿色债券、影响力投资、社会创新等）笑脸相迎的信念掩盖了一个更加严酷的现实。企业一直不懈地追求效率和削减成本，将工作岗位转移到成本更低的地方，或是迫使人们工作更长时间，然后再将所获利润中的一小部分循环利用，变成达沃斯式的安慰。

有些亿万富翁因为能花钱帮助穷人而感到暖心，对他们来说，所有这些循环利用都妙得很。有些CEO能够通过积极投身最新潮的公益事业为自己的品牌增色，对他们来说，这也妙得很。对于那些可以跟谢尔盖和小扎厮混一生、给他们的慈善资本家主公建议治愈世界弊病之良方的“思想领袖”来说，这更是妙不可言。但这无助于弥补“赢家通吃”的理念，正是这种理念推动企业压低工资，将风险负担转嫁给员工。此外，它也无助于解决“平平无奇的下层阶级”（尤其是原为工人阶级的白人男性）的问题。这一阶

层被认为既乏味又保守，达沃斯人根本懒得去理会。

对格里哈拉达斯的论点提出异议很容易。他忽略了这样一个事实：像比尔·盖茨这样的人物做了很多好事。他没有提到，尽管近几十年来西方的工资收入停滞不前，但新兴世界已有数亿人摆脱了贫困。他对商业的敌意不够尖锐：他本应把注意力集中在逃税之类的真正的丑闻上，而不是对追求效率的行为一概加以痛斥。不过在某些方面，对他的这些意见没有切中要害。正是由于作者这种简化和夸大，《赢家通吃》更加成为一本精彩的抨击之作。

格里哈拉达斯对寄生性的慈善行业做了精彩的描绘。这一行想方设法在理想的度假胜地（滑雪季在达沃斯，夏天在贝拉吉奥）举办会议，而不是在底特律或拉各斯。有个章节特别让人反胃，作者描述了一艘豪华游轮“海洋巅峰”（Summit at Sea）上的情形，各色大人物坐在极乐酒廊（Bliss Ultra Lounge）里讨论着如何改善世界。“来这艘船上可不是为了喝醉酒脱光光的，”一位励志演说家慢条斯理地说，“嗯，其实差不多就是为了这个。不过也是为了社会正义。”

作者给出的案例研究令人忧心，以此阐明自己的主题：企业造成严重的社会问题，然后再以慈善的形式提供治标不治本的解决方案。例如，普渡制药（Purdue Pharma）的捐款记录令人刮目相看，这些捐款“通过减少药物滥用等高风险行为促进青少年的健康发展”。但该公司之所以能够如此慷慨，原因之一是靠销售奥施康定（OxyContin）赚了大钱。拜乱开处方药的风气所赐，奥施康定已成为美国阿片类药物滥用的主要药品。

这部精彩之作唯一的失败之处是，作者没有更深入地推进自己的论点。他迈出了正确的一步，在财富不平等之外论述了权力的不平等：双赢的修补方案总是把问题带出政治领域，再把它们转包给不负责任的全球精英。但他没有提到“尊重的不平等”这一引人入胜的问题。

达沃斯的精英们并不满足于积聚超高的全球财富和影响力。他们正试图以自己的科技范儿和奔走全球的形象重塑慈善事业，以期收获全人类更多的

敬重。助长民粹主义之火的不只有达沃斯人的恶行，还有他们的美德。 ■



COFCO International

Feeding the dragon

China's efforts to build a massive global food trader are not entirely reassuring

The world of grain trading is a gerontocracy. The four giant firms that dominate global agricultural flows—ADM, Bunge, Cargill and Louis Dreyfus, collectively known as the ABCDs—were all founded over a century ago. Their age is an edge: their unique networks of silos, ports, ships and farmer relationships, built over decades, make them indispensable middlemen. But a toddler from China is threatening to put a pitchfork in the works. COFCO International (CIL), the overseas trading arm of China's state-owned food and oil giant, wants to "become a true global agribusiness", says Chi Jingtao, its chairman. It is barely four years old.

Mr Chi's aims are not only commercial but strategic. China does not have enough arable land to feed its 1.4bn people. As a rising middle class consumes more meat, that gap worsens, for animal feed is mostly made of grain. One solution from the government has been to buy farmland abroad. Chinese firms have done so in more than 30 countries—China is the largest foreign owner of agricultural land in Australia, for example. But the government soon realised that export bans could render its acquisitions useless, and host countries tightened rules on foreign investment.

Instead, China's leadership is seeking to establish a position in global trading of foodstuffs by building China's own champion, CIL, founded in 2014 as an offshoot of state-owned COFCO Group. In that same year China abandoned its official goal of being self-sufficient in soyabeans, indicating that it was prepared to rely on global suppliers for some staples. CIL's main task is to help China source crops directly from overseas farmers. COFCO had done that as the main Chinese importer of global foodstuffs. But

managing the domestic market was its focus, whereas CIL's remit is global. There are profits to be made, too, from taking a margin on food imports that have soared 12-fold since 2000, to \$117bn in 2017.

CIL's first steps were awkward; it began by buying Nidera of the Netherlands and Hong Kong-based Noble Agri, two traders with a strong presence in South America, for inflated prices. It then neglected to integrate them, and both kept undercutting each other. Then a \$200m unauthorised trading loss was found on Nidera's biofuel desk, followed by a \$150m hole in the accounts of its Latin American division. Rivals "thought it hilarious" that the Chinese newbie seemed so clueless, says Jonathan Kingsman, a commodities expert and former Cargill employee.

No one is laughing now. CIL already earns \$34bn in revenue—four-fifths that of Louis Dreyfus, the smallest ABCD. It shifts 105m tons of grain, oilseeds and sugar a year, a volume roughly equal to America's entire production of soyabeans. CIL wants to be far more than China's procurement platform. Already China accounts for less than half of its sales.

CIL is selling to more than 50 countries, focusing on Europe, the Black Sea and Latin America. Like the ABCDs, it has invested in massive silos, transport links and processing facilities. It is the fourth-largest soya exporter in Brazil. Latin America remains its most important region for sourcing, but it is also creating export routes from North America and the Black Sea.

The speed of its turnaround has caught the industry off guard. In the first half of 2018, CIL reportedly made trading losses of \$122m because of wrong-way bets on agricultural markets. It also went through painful staff cuts and a long shutdown at a key port and processing plant. But "the company is probably in much better shape than it seems from the outside", says Sönke

Lorenz of BCG, a consultancy. The trade war has further convinced China of the merchant's vital role. Last July, China responded to American tariffs on its goods by slapping high duties on American soyabean, making it too expensive to buy them. This forced China to find a new source for one-third of its \$40bn yearly needs—totalling 33m tonnes or four times what all of Southeast Asia consumes. CIL did much of the work by finding new suppliers in Brazil.

Mr Chi claims that 2019 should be a pivotal year. Last year, after integrating Noble and Nidera in 2017, CIL also had to deal with operational problems from the mergers, fallout from the trade war between America and China and severe droughts in Argentina. But the firm is at last in a position “to embrace growth and development”, the chairman argues. He notes that CIL achieved profitability last year “for the first time in history” (it does not disclose figures). It will invest in sourcing more grain directly from the world’s breadbaskets, including Russia, Argentina and North America, and it will search for new customers in Europe, the Middle East and South-East Asia, including state-owned entities such as wheat boards, local traders and food processors. CIL’s strategy, summarises Mr Chi, “is to leverage our strong presence in China to grow our global business”.

The first element is already under way. In December the firm appointed Dong Wei, a 25-year veteran of COFCO Group, as chief executive. Mr Dong is an expert in the procurement and processing of soyabean—a good fit for CIL. “His arrival will facilitate the integration of our domestic and international business,” explains Mr Chi.

What worries CIL’s big rivals is that the firm’s efforts to dominate direct access to China’s vast market of consumers for grain—both for strategic and business reasons—could have the side-effect of locking them out. For now, they have a prized direct relationship with COFCO Group and with other Chinese food manufacturers. “CIL could become an unavoidable

middleman,” says Jean-François Lambert, a consultant and former head of commodity finance at HSBC, a bank.

The ABCDs can take comfort that their position is still robust. In the markets that count, such as America and Russia, much of the infrastructure used to store, process and ship grain belongs to the established firms. “It’s very difficult, if not impossible, to become an ABCD without purchasing an ABCD,” argues Jay O’Neil of Kansas State University. That may be true in the short term. Two members of the club are private, and ADM, the largest of their two listed peers, is nearly twice as big as CIL, so would be hard to swallow. Bunge, an American firm that is the weakest of the bunch, may be a good target, but America’s Committee on Foreign Investment in the United States would probably block a Chinese bid.

Still, CIL could seek to form alliances with peers to penetrate specific markets. Mr Lambert also suspects the firm could seek to buy a chunk of Louis Dreyfus. (Its owner took a large loan to buy out other shareholders late last year).

CIL must also contend with the fact that its entry into the bulk-commodity trade comes when the activity is hardly profitable. Digitalisation and competition have destroyed margins. The savviest traders are shifting towards value-added products: Cargill makes most of its money from making animal feed and proteins; ADM has carved a niche in food ingredients such as sweeteners and colouring. CIL needs to master the basic activities first. “This is a young company”, Valmor Schaffer, CIL’s Brazil chief, said in November. “At this moment we have other priorities.”

That highlights a dilemma for the firm. CIL’s primary objective remains “feeding the dragon”, as Mr Lorenz puts it, so it may be ready to accept far lower profits than peers. If the going gets tough, it could also tap the government for cheap back-up capital, insiders suspect.

But the company cannot entirely disregard its bottom line. While state-owned entities own most of CIL, minority shareholders include Singapore's Temasek, the World Bank's private investment arm and Standard Chartered, a British bank. These took a stake in 2014, when the trader bought Nidera, and all expect a good return. Such pressure is unlikely to abate. Mr Chi says CIL could seek to raise more capital to fund its expansion: "Going public is a direction CIL is going to take." When that might happen is a decision for shareholders to make, but an IPO would entail more scrutiny of the company's results.

CIL's game may be a longer one. Trading is an information war: superior insights on global production, prices, inventories and shipping capacity are the sinews of merchants' profit. Incumbents know this. Cargill in 2017 invested in a startup that analyses satellite images to forecast crop yields. As CIL tightens its grip over China's food market, the world's largest, its edge could become unmatchable. "Everything starts and ends with Chinese demand," says a former ABCD executive. "Understand what the biggest national buyer is doing, and you control the trading game." ■



中粮国际

喂养巨龙

中国倾力打造一家全球超级粮商，让人有些担心

粮食贸易是老牌公司的天下。主宰全球农产品流通的四大巨头——被统称为ABCD的ADM、邦吉（Bunge）、嘉吉（Cargill）以及路易达孚（Louis Dreyfus）——都创立于一百多年前。年龄是它们的一大优势：它们用几十年时间建立起无与伦比的网络，包括筒仓、港口、船舶以及与粮食生产者的关系，借此成为不可或缺的中间商。但如今却从中国杀出了一个乳臭未干的小子。中国国有粮油巨头的海外贸易部门中粮国际的董事长迟京涛表示，中粮国际想要“成为真正的全球农业综合企业”。这家公司成立不过四年。

迟京涛所说的目标不仅具有商业意义，更具有战略意义。要养活14亿人口，中国的耕地本已不足。中产阶级的壮大带动了肉类消费的增长，而动物饲料主要由谷物制成，导致缺口进一步扩大。在海外购买农田成为政府的一个解决办法。中国企业已在30多个国家购买了农田，例如在澳大利亚，中国是该国农业用地最大的外国所有者。但政府很快意识到，出口禁令可能会使其购置的土地失去意义，而土地出售国也加强了对外国投资的控制。

因此，中国领导层正在打造自己的王牌企业中粮国际，力图在全球粮食贸易中占得一席之地。成立于2014年的中粮国际是国有公司中粮集团的下属机构。同年，中国放弃了实现大豆自给自足的官方目标，这表明中国有意依靠全球供应商购买部分主要粮食。中粮国际的主要任务是帮助中国直接从海外粮食生产商那里购买农作物。而此前一直是由中粮集团作为中国主要的全球食品进口商来承担这一任务。但中粮集团过去的重点是经营国内市场，而中粮国际现在瞄准全球市场。另外还可从粮食进口中赚取差价获利，自2000年以来中国的粮食进口额飙升了12倍，2017年达到1170亿美元。

中粮国际一开始笨手笨脚。它先是以虚高的价格收购了荷兰的尼德拉（Nidera）和总部位于香港的来宝农业（Noble Agri）这两家在南美表现出色的贸易商。然而之后它疏于将两家整合，而这两家公司之间继续削价竞争。随后，尼德拉相继爆出其生物燃料部门有2亿美元未经授权的交易亏损，以及其拉美部门账户上有1.5亿美元的亏空。大宗商品专家、嘉吉前雇员乔纳森·金斯曼（Jonathan Kingsman）表示，中国新手表现出如此的无知让其竞争对手“觉得太好笑了”。

现在没人再嘲笑了。中粮国际已经实现了340亿美元的收入，是ABCD中最小的路易达孚收入的五分之四。它每年销售1.05亿吨谷物、油籽和糖，大约相当于美国大豆的总产量。中粮国际的目标远不止成为中国的采购平台。它在中国的销售额已经不到其总销售额的一半。

中粮国际的产品销往50多个国家，主要集中在欧洲、黑海和拉美地区。与ABCD一样，它还投资超大型筒仓、运输枢纽和加工设施。它是巴西第四大大豆出口商。拉美仍然是中粮国际最重要的货源地，但它也在开辟北美和黑海的出口路线。

中粮国际逆袭的速度之快令整个行业措手不及。据说2018年上半年，由于押错了农产品市场形势，中粮国际的交易亏损达1.22亿美元。它还经历了艰难的裁员、一个关键港口和一家加工厂的长期关闭。但波士顿咨询公司的桑克·洛伦茨（Sönke Lorenz）表示：“这家公司的状况可能要比外界看起来好得多。”贸易战更是让中国确信这家贸易商的重要作用。去年7月，美国对中国商品征收关税，中国予以反击，对美国大豆征收高额关税，使其价格高得无法负担。这迫使中国要为每年400亿美元（共3300万吨，是整个东南亚消费量的四倍）的大豆需求中的三分之一另寻货源。中粮国际在巴西寻找新供应商，解决了大部分问题。

迟京涛声称2019应该是关键的一年。在2017年完成来宝和尼德拉的整合之后，过去一年里中粮国际还必须应对合并带来的运营问题、中美贸易战的影响，以及阿根廷的严重干旱。但这位董事长认为，公司最终“迎来了增

长和发展”。他指出，中粮国际去年“自成立以来第一次”实现了盈利（该公司未披露数据）。中粮国际将开展投资，直接从俄罗斯、阿根廷和北美等世界粮仓寻找更多货源，并将在欧洲、中东和东南亚寻找新客户，包括小麦委员会等国有机构、当地贸易商和食品加工企业。迟京涛总结，中粮国际的策略是“充分利用我们在中国的强大影响，开拓全球业务”。

第一步工作已经展开。去年12月，公司任命有着25年中粮集团工作经验的老将董巍为中粮国际首席执行官。董巍是大豆采购和加工方面的专家，与中粮国际很契合。迟京涛解释说：“他的到任将有利于我们国内和国际业务的整合。”

让中粮国际的主要竞争对手担心的是，出于战略和商业上的原因，中粮国际试图主导直接进入中国庞大的粮食消费市场的路径，这可能会连带着把它们挡在门外。目前，这些对手与中粮集团以及其他中国食品制造商有着宝贵的直接关系。咨询顾问、汇丰银行前大宗商品融资主管让-弗兰索瓦·兰伯特（Jean-François Lambert）表示：“中粮国际可能会成为其对手绕不开的中间商。”

ABCD可以感到欣慰的是自己的地位仍然稳固。在美国和俄罗斯等重要市场，用于储存、加工和运送谷物的大部分基础设施属于老牌公司。堪萨斯州立大学的杰伊·奥尼尔（Jay O'Neil）认为：“要成为ABCD那样的企业而不收购其中之一，就算不是完全不可能，也是非常艰难的。”这一论断在短期内可能是正确的。四巨头中有两家未上市，另外两家上市公司中较大的ADM的规模几乎是中粮国际的两倍，所以很难吞并。ABCD中实力最弱的美国公司邦吉可能是个不错的目，但美国的外国投资委员会可能会阻挠中国的收购。

尽管如此，中粮国际仍然可能寻求与同行结盟，以打入特定市场。兰伯特还猜测中粮国际可能会寻求收购路易达孚的大量资产。（去年年底，其母公司中粮集团获得大笔贷款来买断其他股东的股份。）

中粮国际还必须应对的是，它是在行业很难盈利的情况下进军大宗商品贸

易的。数字化和竞争已经让利润变得微乎其微。最精明的贸易商已在转向增值产品：嘉吉的大部分利润来自动物饲料和动物蛋白生产；ADM在甜味剂和着色剂等食品配料方面觅得了一个商机。中粮国际首先得掌握基本业务。“这是家年轻的公司，”中粮国际的巴西业务负责人瓦尔莫尔·谢弗（Valmor Schaffer）去年11月表示，“目前我们还有其他要紧事。”

这凸显了中粮国际面临的两难境地。正如洛伦茨所言，中粮国际的首要目标仍然是“喂养巨龙”，因此它可能愿意接受远低于同行的利润。知情者猜测，如果形势艰难，中粮国际还可能向政府请求低息援助资金。

但中粮国际不能完全无视自己的盈亏。虽然中粮国际的大部分股份由国有实体持有，但它还有新加坡淡马锡、世界银行的私人投资部门以及英国渣打银行等少数股东。这些股东在2014年中粮国际收购尼德拉时获得了股份，它们都期望得到良好回报。这种压力不太可能减轻。迟京涛表示，中粮国际可能寻求筹集更多资金用于扩张：“上市会是中粮国际选择的方向。”何时可能上市要由股东们决定，但IPO势必意味着公司业绩面临更多审查。

中粮国际可能采取的是长久之计。贸易是一场信息战：对全球产量、价格、库存和运输能力的敏锐洞察是商家利润的来源。老牌公司深谙这一点。嘉吉就在2017年投资了一家通过分析卫星图像来预测农作物产量的创业公司。随着中粮国际对中国这个世界最大食品市场的掌控不断加强，它的优势可能变得无可比拟。“一切始于且终于中国的需求，”一位ABCD前高管表示，“了解了这个最大的进口国正在发生什么，你就能控制贸易游戏。”■



The China-US trade dispute

An ocean apart

Although hopes of a deal buoy up stockmarkets, a chasm remains

Last year, when American officials visited Beijing for trade negotiations, they spent more time fighting among themselves than against China. They could not agree on who should lead the talks or what their goal should be. Seeing such amateurism, their Chinese interlocutors reckoned that they had little to worry about.

Many of the same Americans have been back in Beijing for more talks in recent days. But this time they had an undisputed leader—Robert Lighthizer, the hard-nosed United States Trade Representative—and a clear set of demands. Their Chinese counterparts, having seen President Donald Trump's zeal for tariffs, knew that they had something to worry about after all.

America has set a deadline of March 1st for an agreement. If it is missed, tariffs on \$200bn-worth of imports from China are due to rise from 10% to 25%, inflicting more pain on a slowing Chinese economy. That would invite a sharper backlash from China. Its ability to direct firms to shift purchases to other countries has already hurt American exporters (see chart). Chinese officials resent the deadline but it has focused minds. The latest talks, which began on February 11th and were due to end on February 15th, are the third round this year.

All this has fed expectations that the two sides could soon make peace—or at least extend their truce. Mr Trump told reporters that he might let the deadline slide if a good deal is within reach. Another meeting between Mr Trump and Xi Jinping, China's president, is under discussion. Investors

have taken heart. American and Chinese stockmarkets have both risen by about 10% this year.

The outlines of a deal have been in view for a while. China would probably promise to buy lots of goods from America, from soyabeans to natural gas, and allow foreign companies more access to its economy. America would cut tariffs and perhaps promise to remain open to Chinese investors, as long as they are not part of a state-backed assault on sensitive technology.

Yet when negotiators get into the details, problems surface. After many frustrating years waiting for China to open its markets, the Americans suspect that its pledges will be empty. The Chinese suspect that America is motivated by a desire not for fair trade but for thwarting a new rival.

Two key outstanding questions are thus how to measure whether China lives up to its word, and what America can do if it fails. Scott Kennedy of the Centre for Strategic and International Studies in Washington says changes should be measured by China's economic outcomes, not by its stated policies. The government has, for instance, agreed to scrap rules that foreign firms must find local partners to make cars in China. The test, says Mr Kennedy, ought to be whether foreign carmakers actually do set up wholly owned firms in China and operate them successfully.

And if it is judged that China is not keeping its promises? One option is to submit disputes to neutral arbitration. Mr Lighthizer is said to dislike this idea. Another is to give America the right to slap tariffs unilaterally on Chinese goods—which China is understandably loth to accept. Even as the trade war seems to be cooling, a chasm still lies between the combatants. ■



中美贸易纷争

隔洋相对

尽管达成协议的希望推高了股市，但分歧依然深刻

去年，美国官员到访北京进行贸易谈判时，他们花在内部争论上的时间比和中国官员谈判还要多。他们无法就谁应该领导谈判和谈判的目标是什么达成一致。看到这样业余的表现，他们的中国谈判对手认为自己没有什么好担忧的。

近日，这些美国官员中的很多人重返北京，展开更多磋商。但这一次他们有了一位无可争议的领导——固执的美国贸易代表罗伯特·莱特希泽（Robert Lighthizer），也有了一系列清晰的诉求。他们的中国谈判对手见识到了特朗普对关税的狂热，明白自己终究还是要有所担忧。

美国把3月1日定为达成协议的最后期限。如果不能如期达成，便将把价值2000亿美元的中国商品的关税从10%提升至25%，这会让已经放缓的中国经济雪上加霜。而这将促使中国发起更激烈的反击。它可以直接指挥企业转向其他国家采购，美国的出口商已经因此受损（见图表）。中国官员对这一期限心怀不满，但明确的期限也让双方集中了注意力。最近一次谈判从2月11日持续到15日，是今年的第三轮谈判。

所有这些都让人预期双方可能很快会达成和解，或者至少会延长休战期。特朗普对记者说，如果令人满意的协议近在咫尺，他可能不会死盯着最后期限。双方正在讨论特朗普和习近平再进行一次会谈。投资者已受到鼓舞。今年美国和中国股市都上涨了10%左右。

协议生成雏形已有一段时日。中国可能将承诺购买从大豆到天然气的大量美国产品，并允许外国公司更多地参与本国经济。美国将削减关税，并可能承诺对中国投资者保持开放，只要他们不会在政府的支持下对敏感技术出手。

但当谈判双方深入细节时，问题就会出现。经过多年空等中国开放市场，美方怀疑中国的承诺只是空话。中方则怀疑美国的目的并非公平贸易，而是要打压一个新对手。

因此，两个有待解决的关键问题就是如何衡量中国是否兑现了承诺，以及若未兑现美国能怎么做。华盛顿战略与国际研究中心的斯科特·肯尼迪（Scott Kennedy）说，应该用中国的经济成果而不是它提出了怎样的政策来衡量改变。例如，中国政府已经同意废除外国公司必须和本地企业合资才能在中国制造汽车的规定。那么，肯尼迪说，衡量方法就是看外国汽车公司是否确实在中国建立了全资公司并成功经营。

而如果认定中国没有遵守承诺呢？一种方法是将争端提交中立机构仲裁。据说莱特希泽不喜欢这种做法。另一个方法是让美国有权单方面对中国商品征收关税——中国自然不乐意接受。就在贸易战看似降温之际，交战双方之间仍然横亘着一道鸿沟。 ■



Schumpeter

Good copy, bad copy

Believe it or not, Chinese firms are not all serial intellectual-property thieves

Wars sometimes have moments of cultural levity—even trade wars. Last summer, as America and China were bombarding each other with tariffs, a quaint exhibition opened at the National Museum of China on Tiananmen Square paying tribute to, of all things, American intellectual-property (ip) protection.

It was a surprise hit. More than 1m visitors filed past 60 beautifully crafted models of inventions, such as an ice-cream maker, submitted to the United States Patent Office between 1836 and 1890 (all property of the Hagley Museum in Delaware). No doubt some visitors were arm-twisted to go, because it coincided with the start of an innovation drive by President Xi Jinping. But many were simply in thrall to American inventiveness. One remarkable visitor, says David Cole, the Hagley Museum's boss, was an elderly man, Hu Guohua, who was granted the first-ever patent in Communist China, in 1985. It was a reminder of how young IP protection is in China; in America the first patent dates back to 1790 and was signed by George Washington.

IP is one of the main fronts in President Donald Trump's trade war against China. It is also the crux of an indictment in America against Huawei, a Chinese tech giant. In both cases, the government seeks to give the impression that stealing from the West is part of the modus operandi of Chinese firms, something a *Wall Street Journal* columnist described recently as a practice they regard as a “patriotic duty”.

But that is lazy thinking. The Chinese state may encourage philandering of

ideas, and foreign firms in China doubtless face pressure to surrender their secrets. Yet IP protection in China, for all its flaws, has improved at rocket speed of late. As Chinese firms issue more patents, the keener they are to protect them. Some executives even tacitly support American pressure, hoping it will strengthen the rule of law. In an echo of the fawning nickname “Xi Dada”, some have whispered “Trump Dada”, or Daddy Trump.

The litany of complaints about piracy in China, to be sure, goes back decades: copyright infringement in the case of software, and trademark violation against firms such as Disney. Michael Jordan, a basketball legend, spent years trying to stop a sportswear firm using his name, which read as Qiaodan in Chinese, until he was partially successful in 2016. Today, local trademarks of Peppa Pig, a cartoon character, are being sought by scores of patent “squatters”, using a rule that lets them get in ahead of its British owners. Two American tech firms, Qualcomm and InterDigital, have been mauled in Chinese courts in royalty-related antitrust cases. China is a long way from living up to the IP commitments it made on entering the World Trade Organisation in 2001. It still forces firms in joint ventures with state-owned enterprises to surrender IP, and pursues a Communist Party-first industrial policy far removed from the free-for-all of 19th-century American entrepreneurship.

Yet among Chinese firms, the mindset is starting to change—as it eventually did among Japanese firms after they robbed America blind in the 1970s and 1980s. From humble beginnings (Mr Hu applied for his first patent in a half-built bungalow), China accounted for 44% of the world’s patent filings in 2017, submitting twice as many applications as America, according to the World Intellectual Property Organisation. Companies, mostly Chinese ones, sue each other over patents in China more than in any other country.

When foreigners do litigate in China, Rouse, a law firm, says they have a higher win rate in patent cases than domestic ones, and are awarded

more damages overall. Such fines are low by international standards, but are improving: Alfred Dunhill, a British luxury brand, won a \$1.4m payout in October over trademark infringement by a Chinese menswear brand called Danhuoli. In January, the IP court system was bolstered by the establishment of an appeals tribunal at the Supreme People's Court in Beijing.

The more inventive it is, the more protection benefits China. Huawei was the world's biggest filer of international patents in 2017; whatever misgivings there are about its loyalties to the Chinese state, it is hard to doubt its commitment to innovation. An executive at Alibaba notes that as Chinese firms expand globally, particularly in South-East Asia, they, too, suffer from having their ideas ripped off, making them keener to protect them. As China's economy weakens, says an executive of Beiqi Foton Motor, a vehicle manufacturer, his firm will need to protect its patents from rivals even more, to guard its share of a shrinking market.

Executives admit to gaping holes in the IP system, particularly in inland regions where local tribunals are subject to heavy-handed interference by provincial governments keen to shield local copycats. That is why some IP executives in China accept the rationale behind American arm-twisting. After all, they admit, if it were not for American pressure on intellectual property, China would not have come half as far. That is not to say they approve of Mr Trump's bombastic approach, which adds to the sense that America is trying to stifle China's rise. But the desire for change is both internally and externally driven. As one executive puts it, "No one likes to be called a thief—not even kids."

It is also worth recalling how much of a cultural wrench the Anglo-Saxon IP system is for China. The country that invented printing had no Western concept of copyright. There is even a Chinese saying that "to steal a book is an elegant offence". When inventions were flourishing in 19th-century

America, the West tried to impose IP codes on a humbled China that simply could not square them with its Confucian traditions. Yet America was no saint either. As the Hagley Museum's Mr Cole points out, its patent office in the early days charged more to foreigners for patents than it did to Americans, especially the British, with whom America was engaged in an earlier version of "strategic competition". That point was not emphasised at the exhibition in Tiananmen Square. ■



熊彼特

会抄不会抄

信不信由你，中国企业并非都是知识产权惯偷

战争有时会有文化上轻松幽默的时刻——即便贸易战也一样。去年夏天，正当中美两国用高关税相互轰炸之时，天安门广场上的中国国家博物馆里举行了一场奇异古雅的展览，竟是向美国的知识产权保护文化致敬。

展览意外地大受欢迎。一百多万名观众参观了60件制作精美的发明模型，包括一台冰淇淋机。它们在1836年至1890年间提交给美国专利局，目前均为特拉华州哈格利博物馆（Hagley Museum）藏品。有些参观者无疑是不得不来，因为此次展览恰与国家主席习近平开始强调创新相呼应。但很多人仅仅是着迷于美国人的发明精神。哈格利博物馆馆长大卫·科尔（David Cole）说，参观者中有位名叫胡国华的老人特别值得注意，他在1985年获得了中华人民共和国成立以来的第一项专利。这提醒人们知识产权保护在中国还是多么年轻。在美国，第一项专利要追溯到1790年，由乔治·华盛顿签署。

知识产权是美国总统特朗普对华贸易战的主战场之一，也是美国对中国科技巨头华为提起诉讼的关键所在。在这两起事件里，美国政府都想要给人留下这样一种印象，即从西方窃取知识产权是中国企业的惯用伎俩。近日《华尔街日报》的一位专栏作家称，中国企业把这视为“爱国义务”。

但这种思维方式太过简单粗暴。中国政府可能会鼓励以非正规方式“拿来”创意，在华外国企业也确实面临交出秘方的压力。不过，尽管存在种种缺陷，中国的知识产权保护近来却在飞速改善。随着中国公司获得越来越多的专利，它们也更热衷于保护这些专利。一些高管甚至私下里支持美国施压，希望能由此加强法治。有些人暗地里喊着“川大大”，与吹捧习近平的昵称“习大大”对应。

对中国侵权行为的冗长控诉无疑可以追溯到几十年前：软件盗版、侵犯迪

士尼等公司的商标权。篮坛传奇人物迈克尔·乔丹多年来一直想要阻止一家运动服饰公司使用他的中文名字“乔丹”，直到2016年才取得部分成功。如今，卡通人物“小猪佩奇”的本地商标正受到众多专利抢注者的追逐，一项法规让他们能抢在该商标的英国持有者之前注册。高通和InterDigital这两家美国科技公司在中国法院因专利费相关反垄断案而遭受重创。中国距离兑现2001年加入世贸组织时所作出的知识产权承诺还有很长的路要走。它仍然在强迫与国有企业合资的公司放弃知识产权，并奉行共产党优先的产业政策，这与19世纪美国人自由放任的企业家精神相去甚远。

然而，在中国企业中，观念正在改变，就像日本企业在上世纪七八十年代洗劫美国之后最终做出的改变一样。在不起眼的起步之后（胡国华在一间还没建好的平房里提交了第一件专利），根据世界知识产权组织的数据，中国在2017年申请的专利占全球专利申请量的44%，是美国的两倍。在中国，企业间专利诉讼数量比在其他任何国家都多，其中又以本地公司居多。

罗思律师事务所（Rouse）称，一旦外国人在中国提起专利诉讼，他们胜诉的几率比中国人更高，而且总体上获得的赔偿金也更高。以国际标准衡量，这类罚款还很少，但正在改善：英国奢侈品牌登喜路去年10月因中国男装品牌Danhuoli商标侵权获得140万美元赔偿。今年1月，最高人民法院在北京成立了知识产权法庭，加强了知识产权审判体系。

中国的创造力越强，保护措施对中国就越有利。2017年，华为是全球最大的国际专利申请方；无论人们对于它效忠中国政府有何疑虑，都很难质疑它对创新的执着。阿里巴巴的一位高管指出，随着中国企业在全球尤其是东南亚扩张，它们的创意也会被剽窃，这让它们更渴望保护自己的创意。北汽福田汽车的一位高管表示，随着中国经济放缓，他所在的公司更需要保护自己的专利不被竞争对手侵犯，以求在不断萎缩的市场中保住自己的份额。

企业高管们承认知识产权体系存在巨大的漏洞，尤其是在内陆地区，地方法院受到省级政府的强力干预，因为政府积极保护本地山寨企业。这就是

中国一些知识产权方面的高管对美国施压的理由表示认同的原因。毕竟，他们承认，如果没有美国在知识产权方面施压，中国不会有现在一半的进步。这并不表示他们赞同特朗普夸张的做法——这种做法更让人觉得美国试图遏制中国的崛起。但是，变革的愿望是内部和外部共同驱动的。正如一位高管所说：“没人喜欢被人骂‘小偷’，连小孩都不愿意。”

同样值得回顾的是，盎格鲁-撒克逊知识产权体系给中国带来了巨大的文化冲击。这个发明了印刷术的国家并没有西方的版权概念。中国甚至有一个流传很广的说法：“窃书不算偷”。19世纪，当发明在美国蓬勃发展时，西方试图将知识产权法规强加给当时饱受屈辱的中国，而这个国家全然无法将之与自身的儒家传统相洽。而美国自己也非圣人。正如哈格利博物馆的科尔馆长所指出的那样，在早期，美国专利局向外国人收取的专利费用要高于对美国人的收费，尤其是对英国人，而当时美国正在和英国开展“战略竞争”的早期版本。天安门广场的展览里并没有强调这一点。■



Scientific ethics

No dumping, please

Recent events have highlighted an unpleasant scientific practice: ethics dumping

The announcement in November of the editing of the genomes of two embryos that are now baby girls, by He Jiankui, a Chinese DNA-sequencing expert—brought much righteous, and rightful, condemnation. But it also brought a lot of tut-tutting from the outside world about how this sort of thing was to be expected in a place like China, where regulations, whatever they may say on paper, are laxly enforced. Dig deeper, though, and what happened starts to look more intriguing than just the story of a lone maverick having gone off the rails in a place with lax regulation. It may instead be an example of a phenomenon called ethics dumping.

Ethics dumping is the carrying out by researchers from one country (usually rich, and with strict regulations) in another (usually less well off, and with laxer laws) of an experiment that would not be permitted at home, or of one that might be permitted, but in a way that would be frowned on. The most worrisome cases involve medical research, in which health, and possibly lives, are at stake. But other investigations—anthropological ones, for example—may also be carried out in a more cavalier fashion abroad. As science becomes more international the risk of ethics dumping, both intentional and unintentional, has risen. The suggestion in this case is that Dr He was encouraged and assisted in his project by a researcher at an American university.

The scientist in question is Michael Deem of Rice University in Houston, Texas. Dr Deem was Dr He's PhD supervisor between 2007 and 2010, and has continued to collaborate with him. The two are co-authors of at least eight published papers and several as-yet-unpublished manuscripts. Dr Deem

also appears (along with nine others, all Chinese, including Dr He) on the author list of a paper, “Birth of twins after genome editing for HIV resistance”, which Dr He submitted to *Nature* before his announcement of his work at a meeting in Hong Kong. *Nature*’s editors rejected the paper (and will not, as is normal procedure in the case of rejection, confirm that they actually received it).

According to a Chinese scientist involved in the genetically modified embryo project, which used a technique known as CRISPR-Cas9 to disable the gene for CCR5, a protein that HIV attaches itself to when entering a cell, Dr Deem participated as a member of the project team in the procedures in which potential volunteers gave their consent. Dr Deem will not comment. But a statement from his lawyers said, “Michael Deem has done theoretical work on CRISPR in bacteria in the past, and he wrote a review article on the physics of CRISPR-Cas. But Dr Deem has not designed, carried out, or executed studies or experiments related to CRISPR-Cas9 gene editing—something very different. He did not authorise submission of manuscripts related to CCR5 or PCSK9 [an unrelated protein involved in cholesterol transport] with any journal, and he was not the lead, last, or corresponding author on any such manuscript. And Dr Deem was not in China, and he did not otherwise participate, when the parents of the reported CCR5-edited children provided informed consent.”

In America, in effect, the implantation of genetically modified embryos into a woman’s womb is forbidden. Such an experimental medical procedure would require permission from the country’s Food and Drug Administration, and such permission would not be forthcoming. Carrying on regardless would be a federal crime and one that, according to Hank Greely, a lawyer and bioethicist at Stanford University, might attract a fine of as much as \$100,000, and a year in jail.

For an American to support the execution of such work in another country

is, though, a different matter. That would not be illegal under American law—though it would still violate federal rules if Dr Deem participated in the project without the approval of his university, which is investigating his role in the affair. Rice says it “had no knowledge of the work”, and, to its best knowledge, “none of the clinical work was performed in the United States.” It would not comment on the ongoing investigation. Neither Dr Deem nor his lawyers would comment on the specific suggestion that he had committed ethics dumping.

Across the Atlantic from America, the Commission of the European Union (EU) has sponsored a three-year, €2.7m investigation into ethics dumping. TRUST, as it is called, has been a collaboration between researchers from Europe, Africa and Asia, which came to an end last year. It scrutinised past examples of ethics dumping and sought ways of stopping similar things happening in the future. As Doris Schroeder of the University of Central Lancashire, in England, who led the TRUST project, observes, “sometimes it’s because of the lack of awareness [of the laws in other nations]. Sometimes it’s about having double standards. We’ve certainly seen cases where there was a definite attempt to avoid legislation in European countries.”

Zhai Xiaomei, the executive director of the Centre for Bioethics at the Chinese Academy of Medical Sciences, in Beijing, who is also deputy director of the health ministry’s ethics committee, welcomes what TRUST has done. “China’s weak ethics governance has made it an attractive destination for the export of unethical practices from the developed world,” she says. One high-profile case in China concerns Sergio Canavero, an Italian neurosurgeon who resigned from the University of Turin in 2015 because of fierce opposition to his plan to perform head transplants on human beings. Knowing that no country in Europe or North America would approve such procedures, Dr Canavero went to China, which he says “is quite different from the West” and “has a different ethics”.

There, he collaborated with Ren Xiaoping, an orthopaedic surgeon at Harbin Medical University, on dogs, monkeys and human cadavers, and planned, last year, to graft the head of a patient paralysed from the neck down onto the body of a deceased donor—only to be stopped by China's health ministry at the last minute. “The proposed procedure is based on astonishingly thin scientific evidence,” says Dr Zhai. “It's not only ethically indefensible but against the Chinese law.” For his part Dr Canavero says, “we shouldn't have announced the plan before the two papers [on dogs and on human cadavers] came out.”

A dozen similar cases in Asia and Africa fill “Ethics Dumping: Case Studies from North-South Research Collaboration”, a book published by TRUST. Three notable examples are American-financed clinical trials that happened in India between 1998 and 2015. These were testing the efficacy of cheap cervical-screening methods. Such trials require control groups, which, in America, would be composed of women undergoing an established screening procedure. In the Indian trials, however, the controls—a total of 141,000 women—were not offered the pap smears that were supposed (though they were in practice often unavailable) to be the standard for screening in India at the time.

Nor need behaving badly abroad as a researcher be life-threatening to be unacceptable. Another case highlighted by TRUST involved the San, a group of people in southern Africa well known to (and well studied by) the outside world because of their hunter-gatherer way of life, click-laden languages and ancient rock art. In 2010 a paper published in *Nature* on the first San genome to be sequenced caused an outcry among some San. According to Roger Chennells, a human-rights lawyer at Stellenbosch University, in South Africa, they found the consent procedures inappropriate and some of the language used in the paper, such as “Bushmen”, pejorative.

As part of the TRUST project, Mr Chennells and his colleagues helped groups

of San develop the first code of ethics created by an indigenous group in Africa. It requires researchers wishing to study San culture, genes or heritage to submit proposals to a review panel set up by San communities. It also asks researchers to treat people with respect, and to consider how their work could benefit local health care, education and jobs.

Analysis of past transgressions has led TRUST's researchers to suggest a set of guidelines called the Global Code of Conduct for Research in Resource-Poor Settings. This aims to raise awareness of bad practices, and to identify potential offences. A cornerstone of the code is that ethics reviews be conducted in all participating countries—those where the work will be carried out as well as those paying for it. According to Dr Schroeder, two European funding agencies—the commission itself, and the European & Developing Countries Clinical Trials Partnership, a joint effort by the EU, Norway, Switzerland and a group of drug companies—have already accepted the code. Meanwhile, in America, Kiran Musunuru, a gene-editing expert at the University of Pennsylvania, who was one of the first to look at Dr He's data last year, suggests the creation of an international register for research involving the genetic modification of human embryos, with registration being a condition for subsequent publication.

The latest twist in the CRISPR-babies saga itself is that Dr Deem was supposed to take up a position this month as Dean of the College of Engineering at the City University of Hong Kong. The offer was made before news of the birth of genetically modified babies broke. Dr Deem's possible involvement in the affair has led the City University to put the contract on hold—at least until the investigation at Rice comes to a conclusion. The City University's press office would not say whether the university would terminate the contract if Dr Deem is found to have been involved in the project, and neither Dr Deem nor his lawyers would comment on the matter. But, as one senior faculty member of the City University, who spoke on condition of anonymity, puts it, if the accusations being made turn out to be

true, then “Dr Deem has committed a grave error of judgment and violated international norms. He is obviously not fit for such a senior academic position. We don’t want ethics dumping here.” ■



科学伦理

此处勿倾倒

近期一些事件突显了科研领域一种令人不快的操作：伦理倾销

中国的DNA测序专家贺建奎去年11月宣布，经他编辑了基因组的胚胎诞生出一对双胞胎女婴。事件引来一片义正词严、合情合理的谴责声。但外界也发出一片啧啧之声，认为这种事情发生在中国毫不意外，因为这个国家无论法律条文规定如何，执行都很松懈。然而，深挖下去，事情就开始变得更有意思。这起事件不再仅仅是一个特立独行者在一个监管松懈的地方误入歧途的个案，而可能是一个被称为伦理倾销现象的例子。

伦理倾销是指来自一国（通常是监管严格的富裕国家）的研究人员在另一国（通常是不那么富裕、并且监管较宽松的国家）开展不被其母国允许、或者虽可能被允许却也容易引发争议的实验。最令人担忧的情况发生在危及健康甚至生命的医学研究中。但其他研究——比如人类学考察——也可能以更轻率的方式在他国进行。随着科研变得越来越国际化，伦理倾销的风险有所上升，无论是存心还是无意。在贺建奎的案例中，有迹象显示他受到了美国一所大学一名研究人员的鼓励和协助。

这位研究人员就是迈克尔·迪姆（Michael Deem），就职于德州休斯顿市的莱斯大学（Rice University）。他在2007年至2010年期间曾担任贺建奎的博士生导师，后来也一直与他合作。两人共同撰写并发表了至少八篇论文，还有几篇共同撰写的论文尚未发表。迪姆的名字（以及包括贺建奎在内的其他九个中国人的名字）出现在论文《经艾滋病免疫基因组编辑后诞生的双胞胎》（Birth of twins after genome editing for HIV resistance）的作者名单上。贺建奎在香港的一个学术会议上宣布他的研究之前，曾向《自然》杂志提交这篇论文，被编辑拒稿（按照一般拒稿的惯例，该杂志也不会确认曾收到该论文）。

这项人类胚胎基因编辑项目利用一种名为CRISPR-Cas9的技术来敲除CCR5

基因——HIV进入细胞时附着的一种蛋白质。据参与了该项目的一位中国科学家称，迪姆作为项目成员参与了潜在志愿者签署知情同意书的过程。迪姆对此不置评，但他的律师发表声明称：“迈克尔·迪姆过去曾对细菌中的CRISPR做过理论研究，撰写了一篇关于CRISPR-Cas工作机制的综述文章。但迪姆博士不曾设计、实施或执行与CRISPR-Cas9基因编辑相关的研究或实验——这完全是两回事。他没有授权向任何期刊提交与CCR5或PCSK9[一种与该实验无关、与胆固醇转运有关的蛋白质]相关的论文，也不是任何此类论文的第一、最后或通讯作者。在据报道接受了CCR5基因编辑的孩子的父母提供知情同意时，迪姆博士不在中国，也没有在其他时候参与该实验。”

实际上，美国禁止将基因编辑胚胎植入女性子宫内。这样的试验性医疗程序需要得到美国食品药品管理局（FDA）的许可，而FDA不太会给予此类许可。据斯坦福大学的律师兼生物伦理学家汉克·格里利（Hank Greely）说，未经许可进行实验属联邦罪行，可能招致最高10万美元的罚款，并入狱一年。

但是，美国人在别国支持开展此类研究就是另一回事了。根据美国法律，这不属于违法行为。但如果迪姆在没有得到所在大学批准的情况下参与项目，那么他的行为仍然违反了联邦法规。莱斯大学正在调查他在该事件中的角色，并表示学校“对这项试验毫不知情”，并且据其所知，“该试验中没有任何临床工作在美国展开”。莱斯大学拒绝对正在进行的调查发表评论。迪姆及其律师也都拒绝评论他是否涉及伦理倾销。

在与美国相对的大西洋彼岸，欧盟委员会资助了一项为期三年、耗资270万欧元的伦理倾销调查。这项调查名为TRUST，由来自欧洲、非洲和亚洲的研究人员合作开展，于去年结束。该调查仔细审查了过往的伦理倾销案例，并寻求办法防止它们再发生。领导该项目的英格兰中央兰开夏大学（University of Central Lancashire）的多丽丝·施罗德（Doris Schroeder）说：“这有时是因为[对其他国家的法律]缺乏认识，有时是因为持双重标准。我们在一些案例中确实看到，有些人就是企图规避欧洲国家的法律。”

翟晓梅是位于北京的中国医学科学院生命伦理学研究中心的执行主任，同时也担任卫计委医学伦理专家委员会副主任，她对TRUST的工作表示欢迎。她说：“中国的伦理监管薄弱，成了发达国家出口有违伦理行为的诱人目的地。”中国有一个引人注目的案例涉及意大利神经外科学家塞尔吉奥·卡纳维罗（Sergio Canavero），他在自己的人类头部移植手术计划遭到强烈反对后，于2015年从都灵大学辞职。他知道欧洲或北美国家无一会批准这样的手术，就去了中国。他说，中国“与西方截然不同”，“有不一样的伦理规范”。

在那里，他与哈尔滨医科大学整形外科医生任晓平在狗、猴子和人类尸体上合作开展试验，去年还计划将一名颈部以下瘫痪的病人的头移植到一个已故捐献者的身上，但在最后一刻被卫计委叫停。“提议移植手术所基于的科学证据薄弱得惊人，”翟晓梅说，“不仅在伦理上站不住脚，而且违反中国法律。”卡纳维罗则认为：“我们当初不应该在[有关狗和人类尸体试验的]两篇论文发表之前宣布这个计划。”

TRUST出版了一本名为《伦理倾销：来自南北研究合作的案例研究》（Ethics Dumping: Case Studies from North-South Research Collaboration）的书，书中有发生在亚洲和非洲的十几个类似案例。其中三个值得注意的案例是于1998年至2015年间在印度进行的临床试验，由美国资助，目的是测试廉价宫颈筛查方法的功效。这些试验需要对照组，在美国，对照组中的妇女会接受旧有筛查方式。而在印度的试验中，并没有为对照组中共14.1万名妇女进行巴氏涂片检查，而这本应是当时印度筛查的标准做法（尽管实际上经常无法做到）。

研究人员在国外的不当行为并非要到危及生命时才不被接受。TRUST强调的另一个案例涉及非洲南部的桑人，这个民族因其狩猎和采集的生活方式、用到大量搭嘴音的语言以及古老的岩画艺术而闻名（并被深入研究）。2010年，在《自然》杂志上发表的一篇关于首个桑人基因组测序的论文引起了一些桑人的强烈抗议。根据南非斯坦陵布什大学（Stellenbosch University）的人权律师罗杰·彻奈斯（Roger Chennells）的说法，他们发现征求意见的程序不完善，而且文章中使用的如“布

须曼人”（Bushmen）等表达带有贬损的意味。

作为TRUST项目的一部分，彻奈斯和他的同事协助几个桑人群体制定了首部由非洲土著群体创建的伦理准则。准则要求那些有志于研究桑人文化、基因或遗产的研究人员向桑人社区设立的评审小组提交研究计划书，还要求研究人员尊重他人，并考虑他们的工作如何能造福当地的医疗、教育和就业。

在对过去有违伦理的行为展开分析后，TRUST的研究人员提出了一套指导方针——《在资源匮乏环境下做科研的全球行为准则》（Global Code of Conduct for Research in Resource-Poor Settings）。目标是加强对不当行为的认识，并识别可能有违伦理的行为。该准则的一个根本要求是所有参与研究的国家都要在本国进行伦理审查，包括将要开展研究的国家和为研究出资的国家。据施罗德称，两大欧洲资助机构——欧盟委员会以及由欧盟、挪威、瑞士和一些制药公司共同发起的欧洲与发展中国家临床试验伙伴关系（European & Developing Countries Clinical Trials Partnership）——已经接受了该准则。与此同时，在美国，去年首先研究贺建奎数据的学者之一、宾夕法尼亚大学的基因编辑专家基兰·穆斯努鲁（Kiran Musunuru）提议建立一个关于人类胚胎基因改造的国际注册制度，注册与否将成为后续发表相关论文的前提条件。

CRISPR婴儿事件有了最新发展：迪姆原本将于本月出任香港城市大学工学院院长一职。对他的邀请是在基因编辑婴儿出生的消息爆出之前发出的。由于他可能参与了该项目，城市大学决定暂缓履约，至少要等到莱斯大学的调查得出结论之后。城市大学的新闻办公室不肯透露一旦发现迪姆确实参与其中，学校是否会终止合同。迪姆和他的律师也都不愿对此事发表评论。但是，正如城市大学一位不愿透露姓名的资深教授所说，如果指控属实，那么“迪姆就犯了严重的判断错误且违反了国际规范，显然不适合担任这样一个高级学术职位。我们这里不欢迎伦理倾销。”■



Germany's economy

Time to worry

An economic golden age in Germany could be coming to an end

The world is used to a thriving German economy. A decade ago, during the financial crisis, it shed relatively few jobs, as unemployment soared elsewhere. Since then it has been an anchor of fiscal stability while much of the euro zone has struggled with debt and deficits. Its public debt is below the target of 60% of GDP set by EU treaties—and falling. Thanks to labour-market reforms introduced during the 2000s, Germans enjoy levels of employment that beat job-friendly Britain, even as inequality is barely higher than in France. Its geographically dispersed manufacturing industries, made up of about 200,000 small and medium-sized firms, have mitigated the regional disparities that have fuelled populism across the West (see article).

Yet the German economy suddenly looks vulnerable. In the short term it faces a slowdown. It only narrowly avoided a recession at the end of 2018. Temporary factors, such as tighter emissions standards for cars, explain some of the weakness, but there is little sign of a bounceback. Manufacturing output probably fell in January. Businesses are losing confidence. Both the IMF and the finance ministry have slashed growth forecasts for 2019 (see Finance section). In the longer term, changing patterns of trade and technology are moving against Germany's world-beating manufacturers. In response, on February 5th Peter Altmaier, the economy minister, laid out plans to block unwanted foreign takeovers and to promote national and European champions.

Germany is getting both the short and the long term wrong. Start with the business cycle. Many policymakers think the economy is close to

overheating, pointing to accelerating wages and forecasts of higher inflation. In their view, slower growth was expected, necessary even. That is complacent. Even before the slowdown, the IMF predicted that in 2023 core inflation will be only 2.5%—hardly a sign of runaway prices. In any case, higher German inflation would be welcome, as a way to resolve imbalances in competitiveness within the euro zone that would elsewhere adjust through exchange rates. The risk is not of overheating but of Europe slipping into a low-growth trap as countries that need to gain competitiveness face an inflation ceiling set too low by Germany.

The slowdown also portends deeper problems for Germany's globalised economic model. Weakness in part reflects the fallout from the trade war between China and America, two of Germany's biggest trading partners. Both are increasingly keen on bringing supply chains home. America is due soon to decide whether to raise tariffs on European cars. Trade is already becoming more regionalised as uncertainty grows. If global commerce splits into separate trading and regulatory blocs, Germany will find it harder to sell its goods to customers around the world.

Reform has made Germany's labour market strong, but it will soon face new challenges. Industrial jobs look particularly vulnerable to automation, yet lifelong learning and retraining are relatively rare in Germany. The workforce is ageing. Neither the government nor business is much digitised and neither invests enough. If technological change demands that its economy embraces digital services, Germany will struggle.

The government is not blind to these problems, but Mr Altmaier's protectionism is the wrong medicine. The left, meanwhile, wants to roll back labour-market reforms. Better to expand a recent boost to infrastructure spending and press ahead, at scale, with tax incentives for private investment. Both should help growth today and boost the economy's long-term prospects. Significantly lower taxes on households would

encourage a rebalancing away from exports and towards consumption. A dose of competition could invigorate coddled service industries. The German economy has had an impressive run, but cracks are appearing. It is time to worry. ■



德国经济

是时候担心了

德国经济的黄金时代可能行将终结

全世界已经习惯了德国经济的兴旺发达。十年前的金融危机期间，其他地方失业率飙升，德国减少的岗位相对较少。自那以后，欧元区多数地区都受困于债务和赤字，而德国一直是财政稳定的主心骨。其政府债务占GDP比重低于欧盟条约设定的60%的目标，而且还在下降。得益于在本世纪头十年开展的劳动力市场改革，德国的就业水平更胜失业率不高的英国，同时不平等情况也不比法国高多少。地区发展不平衡助长了西方的民粹主义，而德国的制造业（由约20万家中小型企业组成）分散于全国各地，有助于缓解地域差距。

但现在，德国经济突然显得脆弱起来。短期来看，德国将面临经济放缓。2018年年底它险些出现衰退。当前的疲弱一定程度是由于更严格的汽车排放标准等暂时性因素，但几乎看不出有反弹的迹象。1月份的制造业产出可能下滑。企业信心渐失。国际货币基金组织和德国财政部都调低了对2019年增长的预测。长远来看，贸易和技术模式正在改变，不利于德国那些世界一流的制造企业。作为应对，2月5日，德国经济部长彼得·阿尔特迈尔（Peter Altmaier）制定计划，阻止不合心意的外国收购案，并扶持国内和欧洲领军企业的发展。

从短期和长期来看，德国的行动都是错误的。先说商业周期。许多政策制定者认为德国经济接近过热，凭据是工资上涨加速和预计通胀上升。在他们看来，增长放缓是意料之中的，甚至是必要的。但这是自满的看法。即使在经济放缓前，国际货币基金组织预测到2023年核心通胀率仅为2.5%，根本谈不上是价格失控的迹象。在任何情况下，德国通胀上升都是好事，是解决欧元区内竞争力失衡的一种方式——在世界其他地区可以通过汇率来调整这种失衡。风险不是经济过热，而是德国把通胀上限设定过低，令欧元区内需要提升竞争力的国家受限，导致欧洲陷入低增长困

局。

经济放缓也预示着德国的全球化经济模式将出现更深层次的问题。德国经济疲软在一定程度上是受中美贸易战的影响，这两国是它最大的贸易伙伴。中美两国都越发渴望将供应链转移回国内。美国即将决定是否对欧洲汽车加征关税。随着不确定性增加，贸易已经开始变得更区域化。假如全球商业分裂为一个个贸易及监管集团，德国向世界各地客户销售商品将变得更困难。

改革令德国的劳动力市场变得强大，但新挑战也近在眼前。工业岗位看起来尤其容易受到自动化的冲击，而终身学习和再培训在德国相对稀少。劳动力正在老龄化。政府和企业的数字化程度不高，对这方面的投资也不足。如果技术变革需要其经济必须向数字服务转型，德国将陷入困境。

德国政府并非对这些问题视而不见，但阿尔特迈尔的保护主义却是一剂不对症的药方。与此同时，左翼人士希望撤回劳动力市场改革措施。更好的做法是进一步加大近期对基础设施支出的促进力度，并通过税收优惠大举推动私人投资。两者应该都有助当前经济增长并提振长期经济前景。大幅降低家庭税收将促使经济实现从依赖出口转为依靠消费的再平衡。引入竞争可以给娇生惯养的服务业带来活力。德国经济发展成绩骄人，但缺陷已经显现。是时候担心了。 ■



Bitcoin

Mining their own business

Will bitcoin's price crash cut into the currency's voracious energy use?

When gold prices fall, precious-metals firms suspend exploration and close mines with high operating costs. In theory, bitcoin miners should act similarly. Although bitcoin is a virtual currency, it is expensive to obtain. To “mine” new bitcoins—ones that do not already belong to someone else—users hook up their computers to a network, and instruct them to keep guessing the solution to a maths problem until they get it right.

The difficulty of these tasks protects the integrity of the system: anyone seeking to rewrite bitcoin’s transaction ledger would face the monumental burden of repeating them. However, such security is not cheap. Finding the answers requires lots of computing power, and thus lots of energy. At their peak in late 2018, bitcoin miners were thought to be using electricity at an annualised pace of at least 45 terawatt-hours per year, the average rate of all of Hong Kong.

As wasteful as it may seem, miners were rewarded handsomely for responding to a surge in demand for bitcoin. In 2017 the currency’s price rose from \$1,000 to nearly \$20,000, yielding profits for speculators and miners alike. But in order to limit the supply of coins, the system adjusts the difficulty of the maths problems in response to computers entering or leaving its network. As more computing power becomes available, the solutions become harder to guess, raising the amount of electricity needed to mine each coin. Moreover, during the past year the bitcoin bubble has burst. Its price is now \$3,400, down more than 80% from the peak.

With higher costs and lower proceeds, miners should have stamped out

of the market. But in fact, relatively few have departed. Bitcoin's daily energy consumption today is still 16 times its level of two years ago, and just 30% below its record high.

At the current price and bitcoin network size, mining returns are sensitive to energy costs. Even within one country, industrial electricity prices can vary widely. In Washington state, a part of America rich in hydropower, each bitcoin fetches 45% more than the market price of the energy needed to mine it on an average day. But in nearby California, electricity costs 2.5 times more. Bitcoin would need to rebound to \$6,200 to make full-time mining there profitable.

As the roller-coaster ride of bitcoin's price makes clear, the currency's value is impossible to predict. Miners have mostly weathered the crash so far. But a further decline of 50% or so would start forcing them out of business. The shake-out would only abate once the maths problems get easy enough that less power is needed, enabling the remaining miners to scrape by. ■



比特币

挖矿的难题

比特币价格崩溃会减少其庞大的耗电吗？

黄金价格下跌时，贵金属公司会暂停勘探并关停运营成本高昂的矿山。理论上，比特币挖矿者也应采取类似的做法。比特币虽然是一种虚拟货币，获取成本却很高。为了“挖掘”尚未被人拥有的新比特币，用户将他们的计算机连接到网络，并让计算机持续猜想一道数学题的答案直到最终解开。

这些数学题的难度保护了系统的诚信：任何试图重写比特币交易分类账的人都要承担巨量的重复运算。然而这种安全性的成本不低。找到答案需要大量的计算能力，也就需要耗费大量的电。据说在2018年末的高峰期，比特币挖矿机的年化耗电量达450亿度电，是全香港的年均用电量。

尽管看起来很费电，挖矿者还是因比特币的需求激增而获得了丰厚的回报。2017年，比特币价格从1000美元上涨到近2万美元，投机者和挖矿者都因此而获利。但是，为了限制比特币的供应，系统会根据计算机接入或离开网络的情况调整数学题的难度。随着可用计算能力的增多，数学题会变得更难攻克，这增加了开采单个比特币所需的电量。此外，在过去的一年里，比特币泡沫破灭。目前的价格是3400美元，比峰值下跌了超过80%。

由于成本增高而收益降低，挖矿者理应大量退出市场。但事实上离开的相对不多。现在挖掘比特币的日耗电量仍然是两年前的16倍，仅比历史最高水平低30%。

按照目前的价格和比特币网络的规模，挖矿的回报很容易受到电力成本影响。即使在一国之内，工业电价也可能差异很大。在美国水电资源丰富的华盛顿州，每个比特币的价格比平均挖掘它所需电力的市场价格高出45%。但在附近的加州，电力成本是华盛顿州的2.5倍多。比特币价格需要

反弹到6200美元，在那里全职挖矿才有利可图。

比特币价格的大幅波动充分表明其价值无法预测。到目前为止，大部分挖矿者经受住了这次的价格暴跌。但如果价格进一步下跌50%左右，他们将被迫退出市场。只有当数学问题难度降低、耗电量减少时，市场震荡调整的幅度才会减轻，让剩下的挖矿者能够勉强维持。 ■



Bezos v Pecker

In his prime

A billionaire, a scandal and what they say about power in America

A central curiosity of the contretemps between Amazon's boss, Jeff Bezos, and David Pecker, who runs the National Enquirer, is that an American scandal sheet sold in supermarkets holds such relevance in 2019. The internet vaporised the old business model of print publications, and social media diminished the news-stand appeal of celebrity gossip. A close examination of Bezos v Pecker suggests that it represents a last hurrah of the American tabloid, as well as a victory of sorts for the Amazon founder. But the affair also holds worrying lessons about how tangled and concentrated—and thus manipulable—power has become in the 21st century.

The saga has played out mostly online. On January 9th Mr Bezos announced on Twitter that he and his wife, MacKenzie, had agreed to divorce. Hours later the *Enquirer* said it would publish an exposé of Mr Bezos's extramarital affair; that 12-page report, including photographs and intimate texts, hit the aisles days later. On February 7th Mr Bezos turned to another online platform, Medium, to allege that the publisher of the *Enquirer*, American Media LLC, was blackmailing him.

Under the headline “No thank you, Mr Pecker”, Mr Bezos wrote that American Media executives threatened to publish more revealing photos of him and his paramour unless he agreed to declare publicly that their pursuit of the story about his affair was not motivated by politics or any other “external forces”.

Instead the Amazon boss thickened the plot. He piled emphasis on politics

and external forces, noting Mr Pecker's business ties to the kingdom of Saudi Arabia, whose regime is accused of murdering Jamal Khashoggi, a columnist for the *Washington Post*, which Mr Bezos owns. (In 2018 Mr Pecker reportedly sought backing from Saudi investors to bid for *Time* magazine, and American Media also published a glossy propaganda magazine extolling Muhammad bin Salman, the crown prince).

Mr Bezos also referred to Mr Pecker's friendship with President Donald Trump, who has relished attacking Mr Bezos, Amazon and the *Post* on Twitter. Mr Bezos suggested that his paper's coverage of both the Khashoggi murder and of Mr Trump have made "certain powerful people" conclude he is their enemy. He hinted at the possibility that there were other motives behind the *Enquirer's* coverage, including Mr Trump's animus towards him. After all, during the 2016 presidential campaign the *Enquirer* endorsed Mr Pecker's old friend, the first time it had ever backed a candidate. Mr Trump tweeted in mock sympathy for "Jeff Bozo" after the *Enquirer* published its account of the extramarital affair.

It will take time for investigators to untangle precisely who did what and why, and whether blackmail or other crimes were committed. To be sure, the *Enquirer* would have needed no encouragement from either Mr Trump or the Saudis to go after what is classic tabloid fare—exposing, as it were, the world's richest man, whose personal style has lately morphed from tech geek to muscle-ripped socialite.

The stakes for Mr Pecker and his company are particularly high. In 2018 American Media had entered into an immunity deal in connection with the successful prosecution of Michael Cohen, Mr Trump's former lawyer, in which Mr Pecker admitted to buying negative stories about Mr Trump in order to bury them, a practice known as "catch and kill". Federal prosecutors in New York's southern district are reportedly examining whether the company violated the terms of that immunity deal, which includes a

promise not to commit any crimes for at least three years.

On February 10th an attorney for Mr Pecker told ABC News that the company did nothing illegal, that the *Enquirer* merely reported on Mr Bezos's extramarital affair, and then conducted negotiations in which both sides wanted something. A lawyer experienced in tabloid litigation says that the case presents a murky legal question, in part because it is so unusual: "Normally, someone says, 'Pay me money, or I will publish photos.' This is a bit of a different situation." Under federal law, a threat can count as extortion if it seeks to extract something "of value", but prosecutors tend to be wary of pursuing media companies.

Beyond its legal implications, the story casts light on three shifts in the nature of power in modern business and politics. The first is about its fragility when digital privacy is increasingly at risk—even that of billionaires who spend heavily on physical security. In tabloid high jinks of yesteryear, a private eye might hope to get a snapshot outside a celebrity's bungalow, but he or she could hardly hope to get a "dick pic".

In the event Mr Bezos was able to stare down Mr Pecker, his alleged antagonist. But others in powerful positions might feel more vulnerable. There may be many cases of successful digital blackmail of powerful figures, including in the tech industry, that the public might never learn about. "I could name ten right now, people successfully extorted or very close to it," says Blair Berk, a criminal lawyer in Hollywood. "I represent folks who are targeted specifically because they are more vulnerable to having reputations ruined."

The second lesson compounds the worries presented by the first: that power is increasingly concentrated in the hands of a few global titans. Mr Bezos is a prime example, with his control of a tech platform that has become a formidable player everywhere it operates, and which, via Amazon Web

Services, has about a third of the cloud market for business. Even American Media appears to be an Amazon cloud customer.

Critics of Mr Trump have fretted that he could be unduly influenced by Russia or Saudi Arabia, where his family has had business dealings, or that he could be the victim of “kompromat” held by Vladimir Putin. But the concentration of technological and market power threatens to turn people like Mr Bezos and Mark Zuckerberg of Facebook into potential single points of vulnerability that could be as worrying. A successful blackmail of Mr Bezos in a decade, when, say, Amazon’s Alexa-controlled devices are widespread, would give the blackmailer a powerful platform.

A third change is that any scurrilous sort on the internet can become a digital tabloid unto themselves. Ms Berk says that celebrities have more to worry about from “the immediate power and terror of an Instagram post” than from prying tabloids. “Tabloids no longer have the power.”

Indeed the media group that allegedly held the power in this affair, the *Enquirer*, would seem all but crumbling. Its print circulation has fallen from 6m in 1978 to 218,000, according to the Alliance for Audited Media. American Media owns other titles, such as *ok!* and *Star*, that are also in decline. And the operation is heavily indebted. In January American Media managed to raise \$460m to refinance its debts. But the *Enquirer* may be in a precarious financial position as it spars with Mr Bezos.

As for Amazon, the personal troubles of its boss have not translated into reputational damage for the firm, although Mr Bezos admitted that his ownership of the *Post* is a “complexifier”. Shareholders are interested in what his impending divorce will mean for his 16% stake, which could fall by half. But they strongly back his leadership of Amazon, which has continued outperforming the stockmarket and its peers (see chart). Its shares have

barely budged since news of the divorce.

If his battle with American Media escalates in an unfavourable way for Mr Bezos, he could become more of a target, and a complexifier for his own company. Amazon frequently bids for government contracts, including with the Pentagon. It is opening new corporate campuses in New York City and in northern Virginia whose success in part depend on public sentiment. Yet for now, one senior Wall Street figure reckons Mr Bezos has shown where the true power lies, making Amazon stronger still. “Jeff’s willingness to put it all out there shows he is not blackmail-able...this guy’s a total badass, you can’t get him.” ■



贝佐斯对战佩克

权力顶峰

一个亿万富翁、一桩丑闻，以及由此体现的美国的权力较量

亚马逊老板杰夫·贝佐斯和掌管《国家问询报》（National Enquirer）的大卫·佩克（David Pecker）之间的龃龉最引人好奇的地方是，都2019年了，超市里卖的美国花边新闻小报居然还这么有影响力。互联网让印刷出版物的旧商业模式成了明日黄花，社交媒体削弱了报刊亭里名人八卦的吸引力。仔细研究贝佐斯与佩克的对决可以看出，它代表了美国通俗小报的最后一次欢呼，以及亚马逊创始人的某种胜利。但这起事件也给了人们一个令人担忧的教训：在21世纪，权力已变得盘根错节、高度集中，从而也易于操纵。

整个事件主要是在网上展开。1月9日，贝佐斯在推特上宣布，他和妻子麦肯齐（MacKenzie）已经决定离婚。几个小时后，《问询报》称将发布报道公开贝佐斯的婚外情；几天后，长达12页的报道摆上了超市货架，里面刊登了照片和亲密短信。2月7日，贝佐斯在另一个在线平台Medium上声称自己遭到了《问询报》的母公司美国传媒有限公司（American Media LLC）的勒索。

贝佐斯发布了标题为《不了，谢谢，佩克》（No thank you, Mr Pecker）的博文，称美国传媒的高管威胁要公布更多他和情人的不雅照，除非他同意公开声明他们对自己的追踪报道不是出于政治或任何其他“外部力量”的驱使。

而贝佐斯选择让事情变得更复杂。他一再强调政治和外部力量在其中的作用，指出佩克与沙特阿拉伯王国有商业关系，而沙特王室被指控谋杀了贝佐斯旗下《华盛顿邮报》的专栏作家贾迈勒·卡舒吉（Jamal Khashoggi）。（据称佩克为收购《时代周刊》杂志，曾于2018年向沙特投资者寻求支持，而且美国传媒还专门出版了一期精美的杂志宣传和颂扬

沙特王储穆罕默德·本·萨勒曼。）

贝佐斯在博文中还提到佩克与特朗普的交情，特朗普一贯喜欢在推特上攻击贝索斯、亚马逊和《华盛顿邮报》。贝佐斯表示，他的报纸对卡舒吉谋杀案和特朗普的报道都让“某些有权势的人”视他为敌人。他暗示《问询报》的报道背后可能还有其他动机，包括特朗普对他的敌意。毕竟，在2016年总统大选期间，《问询报》支持佩克的这位老朋友，这是该报首次在大选中站队支持一名候选人。在该报报道了贝佐斯的婚外情之后，特朗普发推文表达了对“杰夫·傻蛋”（Jeff “Bozo”）的同情。

调查人员需要慢慢抽丝剥茧，才能搞清楚到底谁干了什么、出于什么动机，以及是否犯有勒索或其他罪行。可以肯定的是，曝光世界上最富有的那些人从来都是小报那道经典主菜。在这方面，《问询报》不需要特朗普或沙特人的鼓励，而贝佐斯的个人风格近来似乎已从技术极客变成了肌肉虬结的社交名人。

佩克和他的公司为此冒了很大的风险。2018年，佩克承认买断从而压下了有关特朗普的负面消息（这种做法被称为“捕杀”），此举协助司法部门成功起诉了特朗普的前律师迈克尔·科恩（Michael Cohen），美国传媒因而获签了一项豁免协议。据报道，纽约南区的联邦检察官正在调查美国传媒是否违反了豁免协议的条款，其中包括承诺至少三年内不犯任何罪行。

本月10日，佩克的一位律师向美国广播公司新闻台（ABC News）表示，美国传媒没有违法之举，《问询报》只是报道了贝佐斯的婚外情，然后双方就各自的诉求展开了谈判。一位在小报诉讼方面经验丰富的律师表示，该案提出了一个模糊不清的法律问题，部分原因是因为该案极不寻常：“通常都是有人说，‘给钱，否则就公布照片。’这个案件的情况却有些不同。”根据联邦法律，如果发出威胁是为了索取某些“有价值”的东西，那么就可以视作勒索，但检察官对于起诉媒体公司往往很谨慎。

除了法律上的影响之外，这起事件还显现了现代商业和政治中权力性质的三个变化。首先是数字隐私风险越来越大时，权力变得脆弱——即使是那

些在实体安全方面投入巨资的亿万富翁也难保万全。在小报恣意八卦的过去，私家侦探可能也就指望在名人的豪宅外拍张快照，但几乎不可能奢望拍到一张不雅照。

此次事件中，贝佐斯能够顶住压力不向他所谓的敌手佩克示弱。但其他有权势之人可能会更感脆弱无力。对包括科技大佬在内的各色大人物成功实施数字勒索的案例可能很多，而公众也许永远不会知道。“我随口就可以说出十个名字，这些人都是被敲诈得逞，或者差一点就得逞的，”好莱坞刑事律师布莱尔·伯克（Blair Berk）说，“我代理的客户都是被人专门盯上的，因为他们更容易因声誉受损而受到负面影响。”

第二个变化加深了第一个变化带来的担忧：权力越来越集中在少数全球巨头手中。贝佐斯是一个典型的例子，他掌管的科技平台在其涉足的任何领域都已成为一个强大的企业，并且通过亚马逊网络服务（Amazon Web Services）夺取了大约三分之一的商业云市场。连美国传媒似乎也是亚马逊的云客户。

特朗普的批评者担心，他可能会受到俄罗斯或沙特阿拉伯的不当影响（特朗普家族在这两个国家都有生意），或者成为普京手中“污点材料”的受害者。但技术和市场力量的集中有可能让贝佐斯和Facebook的扎克伯格这样的人成为攻击的对象，这可能同样令人担忧。举个例子，如果有人在十年后亚马逊的Alexa控制的设备已经普及之时敲诈贝佐斯得手，那么敲诈者就将获得一个强大的平台。

第三个变化是互联网上任何下流胚子都可以自成一份数字小报。伯克说，更让名人们担心的是“Instagram帖子产生的即时影响力和恐怖感”，而不是八卦小报。“小报不再有影响力了。”

事实上，在此次事件中据称呼风唤雨的媒体集团《问询报》似乎要维持不下去了。根据审计媒体联盟（Alliance for Audited Media）的数据，其印刷发行量已从1978年的600万份降至21.8万份。美国传媒还拥有《ok!》和《星报》（Star）等其他出版刊物，但发行量也都在下降。公司负债累

累。1月，美国传媒筹集了4.6亿美元进行债务再融资。但《问询报》因与贝佐斯掐架，财务状况可能不稳。

至于亚马逊，其老板个人的麻烦并未对公司的声誉产生损害，尽管贝佐斯承认他对《华盛顿邮报》的所有权是一个“复杂因素”。股东们感兴趣的是完成离婚手续后他的16%股权会受到什么影响，离婚后这个比例可能会减半。但由于亚马逊的业绩表现持续超越大市及其同行（见图表），股东力挺贝佐斯在亚马逊的领导地位。离婚的消息传出后，亚马逊的股价几乎没有变化。

如果贝佐斯与美国传媒的战火升级并对他产生不利影响，他可能会更加成为攻击目标及他本人公司的复杂因素。亚马逊经常竞标包括五角大楼在内的政府合同。它正在纽约市和弗吉尼亚州北部开设新的企业园区，其成功部分要取决于公众舆情。不过就目前而言，华尔街的一位资深人士认为，贝佐斯已经证明了是谁掌握着真正的权力，这让亚马逊更为强大。“杰夫甘愿把丑事都抖露出来，表明他不会屈服于勒索……这个家伙非常牛叉，没法搞倒他。”■



Global trade

Gaming the rules

Big powers battle over how to govern e-commerce

“Satisfaction guaranteed!” promises the seller of “The Law and Policy of the World Trade Organisation” (wto). The magic of e-commerce means that the doorstopper can be exported from America to Tajikistan for a cool \$35.95 (plus shipping). A new initiative on digital trade the wto strives to add to the laws and policies described within its pages. But far from increasing general satisfaction, this plan is controversial.

At first glance, it is hard to see why. On January 25th representatives of 76 WTO members gathered at the annual shindig in Davos announced plans to negotiate new rules covering “trade-related aspects of electronic commerce”. Compared with the trade talks between America and China that restarted recently in Washington, this venture seems positively collegial. It makes sense: trade rules were written when cloud computing was the stuff of science fiction. What better way to demonstrate the value of the WTO, just as President Donald Trump is busy undermining it?

But a closer look reveals conflict. Though the 76 members account for 90% of global trade, they are a minority of WTO members. Many developing countries claim that tighter e-commerce rules would tie national regulators’ hands and that the issue is a distraction from others they care about more, such as limiting rich countries’ agricultural subsidies.

The plan is to sidestep such complaints, which have blocked agreement at the WTO for years. Instead of getting all members to sign up to a multilateral deal, a like-minded group will set rules among themselves. Hold-outs, like India and South Africa, will not be able to block progress if their demands

are not met. The cost is the legitimacy that a broader group would generate—and the fact that non-signatories will free-ride on any deal, gaining from others' commitments, without having to make any themselves.

Further battles lie ahead. "Countries don't have a shared definition of what they're negotiating," complains Susan Aaronson of George Washington University. The WTO defines e-commerce as the "production, distribution, marketing, sale or delivery of goods and services by electronic means." That is broad.

An agreement could include regulations covering spam emails or rules helping digital purchases zip through customs. It could reach deep into members' domestic regulations to cover cybersecurity or the protection of personal data. It could prevent barriers to cross-border data flows, or ban requirements to store citizens' data on local servers. Every two years WTO members renew a promise not to tax digitally provided goods, such as films from Netflix. A new deal could make that permanent.

American negotiators would like all of the above. Their technology firms benefit from data flowing freely, which helps them train algorithms and generate sales. Data-localisation is expensive, and could weaken security by giving hackers more targets. And, obviously, they would rather their digital sales were not taxed.

This powerful lobby group's ambitions have already been enshrined in deals away from the WTO. The United States-Mexico-Canada Agreement (USMCA), which America's Congress is supposed to ratify later this year, bans customs duties on digital products. So does the Trans-Pacific Partnership (TPP), which was negotiated by 12 countries, including America, and revived by the others when Mr Trump pulled America out. The TPP bars governments from forcing companies to hand over their source code,

and the USMCA goes further by including algorithms, too. Both ban data-localisation requirements.

Many worry that American technology companies are using trade rules to neuter national regulators. In theory, there are exceptions to the rules regarding data localisation and technology transfer. But critics fear that governments will be wary of invoking those exceptions, and that arbiters at the WTO will side with companies.

It will be hard to get European negotiators on board with some of this. European law treats privacy as a fundamental human right, and the free flow of data as secondary; the Americans (and Japanese) start from the premise that data should flow and only then consider exceptions on privacy grounds. Still, a recent deal between the European Union and Japan suggests the differences may not be insurmountable.

The biggest fight will be with China. Its government views data as an issue of sovereignty, and trade in data as a national-security matter. Chinese representatives reportedly tried to narrow the scope of the talks, threatening not to participate. They joined in the end, presumably deciding that it would be better to have influence over any new rules rather than see standards that could become global set without them. Other countries see little value in rules that enshrine China's draconian approach to data, but also know the value of having a country of China's size involved.

American administrations have tried to resolve these differences in the past. The Transatlantic Trade and Investment Partnership, a proposed deal between America and the EU, was supposed to cover the two sides' differing approaches to data. Together with the TPP, it was meant to draw China into a less hostile regulatory pattern.

Americans are once again working with other countries to pull in China.

In December Roberto Azevêdo, the WTO's head, described American efforts on e-commerce as "very active". But negotiators may be short of bargaining power. Plurilateral negotiations on narrow topics at least mean that China cannot block all discussion. But they also remove the opportunities to bargain unrelated concessions against each other, which is how trade negotiators reach consensus. This initiative could be the success the beleaguered WTO desperately needs. Or it could be another demonstration of its weakness. ■



全球贸易

新规博弈

众大国就如何管理电子商务展开较量

“包您满意！”《世贸组织法律与政策》（The Law and Policy of the World Trade Organisation）一书的卖家如此保证。凭借电子商务的魔法，这本大部头的书能以35.95美元的价格（外加运费）从美国出口至塔吉克斯坦。世贸组织正在发起一项数字贸易方面的新计划，寻求在这本书中阐述的法律和政策之外增添新内容。但该计划并没有提高普遍满意度，而是充满争议。

乍看之下，很难理解原因为何。1月25日，来自76个WTO成员国的代表齐聚一年一度的达沃斯世界经济论坛，宣布计划就“与贸易有关的电子商务议题”新规则进行协商。比起近日在华盛顿重启的中美贸易谈判，这项行动似乎带有明显的责任共担的色彩。这是合理之举：当初贸易规则制定之时，云计算还是科幻小说里的事物。在特朗普忙着破坏WTO的当口，还有什么更好的方法来体现该组织的价值？

但仔细探究一下就会发现冲突的存在。尽管76个成员国占据了全球贸易的90%，它们在WTO却只是少数派。许多发展中国家声称，更严格的电子商务规则会束缚国家监管机构的手脚，还会分散它们的注意力，使其难以专注自己更关心的问题，例如限制富裕国家的农业补贴。

多年来，正是这类抱怨阻碍了WTO成员达成一致。这次的计划便是绕开这些抱怨，不寻求让所有成员国都签署一项多边协议，而是由想法一致的小群体设立自己的规则。就算印度和南非这样的拒不合作者的要求没有被满足，它们也无法阻挡谈判的进程。代价就是谈判成果的合法性比不上一个更广泛的集团所达成的协议。此外，任何协议都会让那些非签署国白白沾光，令它们不用付出分毫便能从其他国家的投入中获益。

预期之后还会有更多争论。乔治·华盛顿大学的苏珊·亚伦森（Susan

Aaronson) 抱怨, “各国对于它们正在协商的事情连个一致认可的定义都没有。”WTO对电子商务的定义是“通过电子方式生产、分销、营销、销售或交付货物和服务”。这个界定很宽泛。

若能达成一项协议, 其中可能包括有关处理垃圾邮件或帮助数字采购快速通关的规定; 还可深入利用成员国的本国规章来处理网络安全或个人数据保护方面的问题; 防止对跨境数据流动设置障碍, 或禁止颁布将公民数据存储在本地服务器的要求。每隔两年, WTO成员国就会重申不会对以数字方式提供的商品(例如Netflix上的电影)征税的承诺。新协议也许会让该承诺成为永久性规则。

美国谈判代表会对上述种种表示欢迎。该国的科技公司受益于数据的自由流动, 靠这些数据来训练算法和推动销售。数据本地化的成本高昂, 还可能会给黑客提供更多攻击目标, 威胁数据安全。而且, 这些公司显然还是希望自己的数字商品不会被征税。

这个强有力的游说团体的宏愿在WTO之外的几项协议中都得到了保障。

《美国-墨西哥-加拿大协定》(USMCA)今年晚些时候应该会被美国国会批准, 该协定禁止对数字产品征收关税。《跨太平洋伙伴关系协定》(TPP)也做出了同样的规定。这一协定最初是由包括美国在内的12个国家敲定, 特朗普带领美国退出后又由其余国家重启。TPP禁止政府迫使企业披露源代码, USMCA又进一步将算法也包含其中。两项协定都禁止政府做出数据本地化的要求。

很多人担心美国科技公司是在利用贸易规则瓦解国家监管机构的影响力。理论上, 数据本地化和技术转让方面的规则也会有例外条款。但批评人士担心各国政府不会轻易诉诸这类例外条款, 而WTO的仲裁者会站在企业这一边。

要让欧洲的谈判代表加入某些议题的磋商也有难度。欧洲法律将隐私视为一项基本人权, 而数据的自由流动处于次要位置。美国(以及日本)的代表认为前提是先让数据流动起来, 然后才考虑涉及隐私的例外情况。不

过，欧盟和日本近期达成的一项协议表明这一分歧也许并非无法克服。

与中国磋商的难度将是最大的。中国政府视数据为主权问题，数据贸易事关国家安全。据说中国代表一开始要求缩小谈判范围，否则便不参与会谈。后来他们还是决定加入，大概是觉得比起坐观他人达成有可能为全球共同遵守的标准，还是亲身参与任何新规则的制定为好。中国对待数据的立场格外严苛，其他国家并不认同体现其如此立场的规则，但它们也明白有中国这样规模的国家参与意义重大。

美国历届政府过去曾尝试解决这些分歧。美国与欧盟之间正在商讨的《跨大西洋贸易与投资伙伴协定》（TTIP）应该会协调两方对待数据的不同方式。该协定和TPP一道，意在影响中国采取对数字贸易更友好的监管模式。

美国代表正再一次与他国携手以钳制中国。去年12月，WTO总干事罗伯托·阿泽维多（Roberto Azevêdo）称美国在电子商务方面做出了“非常积极的”努力。但谈判代表们可能欠缺谈判筹码。至少是在较具体的话题上展开的双边谈判意味着中国无法阻碍所有的讨论。但这样的谈判也剥夺了各方就与议题不相关的让步进行磋商的机会，而贸易谈判代表们正是靠这类商谈来达成共识的。此番协商也许会取得深陷困境的WTO迫切需要的成功，也有可能又一次证明其影响力之弱。 ■



Buttonwood

Catching the gold bug

When trouble strikes, where should you hide? The case for holding gold

Imagine you have an assignation in New York. You have not been told where you should meet the other person and she has not been told where to meet you. You have no understanding of where to find her or where she might usually be found. She is as ignorant of you. You cannot communicate. You must somehow guess how to find each other and make those guesses coincide. Where should you go? And at what time of day?

A good answer is Grand Central Station at noon. That was the response of the majority asked by Thomas Schelling, a game theorist and Nobel prizewinner in economics, in experiments reported “The Strategy of Conflict”, published in 1960. People are often able to act tacitly in concert if they know that others are trying to do the same, said Schelling. Most situations throw up a clue, a “focal point”, around which to co-ordinate, even if it takes imagination as much as logic to find it.

Now imagine the world economy goes into a tailspin. There is panic selling of risky assets. Where should you seek safety? Cash is the most liquid asset; but which kind? The dollar is a natural focal point. Yet America’s fiscal indiscipline and its sizeable current-account deficit might give pause. Other currencies have their faults, too. There is one other destination you might consider, if only because others are starting to think the same way. And that is gold.

A lot of people respond to this suggestion by backing away gently while claiming an urgent appointment elsewhere. Gold keeps some strange company. Ardent gold bugs seem to know a lot about firearms, the best

places with access to fresh water and the best ways to preserve food. And what, after all, are its merits? It is supposed to be an inflation hedge. Yet there is not much of that to hedge against. Inflation barely threatens the standard rich-world target of 2%. And after gaining \$100 an ounce recently, gold is hardly cheap by past standards, in inflation-adjusted terms (see chart).

Consider the alternatives, though. The euro is flawed. It has no unique sovereign issuer to stand behind it. And the yuan is not a currency you can trade easily. The yen, admittedly, is a good bolthole. Japan's net foreign assets—what Japan's residents own abroad minus what they owe to foreigners—are worth \$3trn, or 60% of annual GDP. In a crisis, some of that capital comes home, pushing up the yen. Those seeking safety follow suit. The Swiss franc has similar appeal. Still, there is a downside. Past form suggests both countries are likely to cap a rise in their currencies by printing more of them. Short-term interest rates have been negative for years in Japan, Switzerland and the euro area, in part to deter currency strength. By contrast gold's yield—zero—seems almost racy.

And the dollar? As a global currency it has no peers. During the last big crisis, in 2008, the dollar rallied. There had been lots of global borrowing in greenbacks. So when trouble struck, there was a scramble for dollar liquidity. The world still has a large short position on the dollar, in that there has been heavy borrowing in the currency beyond America's shores. Yet the world is also long dollar assets. America's listed firms make up the bulk of global stockmarket indices. Its government-bond market has swollen to 100% of GDP. And the dollar still accounts for the bulk of official reserves.

Tellingly, the managers of those rainy-day funds seem a mite concerned that they are crammed into the same spot. The share of dollars in the \$10.7trn of reserves reported to the IMF has dropped from over 65% when Donald

Trump was elected president to below 62% in the latest figures. This may in part be a response to growing political risks. The dollar's central role in global trade and finance allows America to impose financial sanctions to great effect. It has been doing so with greater frequency, so Russia, for instance, has drastically cut the dollar share of its reserves, to 22%, while raising the shares of euros and yuan. Russia has been a big buyer of gold, too. In that, it is not alone. Net purchases of gold by central banks rose by 74% last year to the highest since 1971, the year the dollar's peg to the gold price broke.

Now, as then, there are growing concerns that the dollar is a crowded trade. It is as if there are so many people in Grand Central Station that it is impossible to find the person you're supposed to meet there—or if you do find them, you cannot fight your way out without mishap. It is why gold is starting to appeal again as a spot to converge upon. You would have to mix with some strange people there. But can you really say that you would never visit? ■



梧桐

与黄金信徒有约

如果麻烦来了，该往哪里躲？持有黄金的理由

想象一下，你跟人在纽约有个密会。没人告诉你在哪儿见她，也没人告诉她去哪儿见你。你不知道去哪里找她，也不知道她一般会在哪里出现。她也不知道你的行踪。你俩无法联络。但你们必须猜出怎样能找到对方，而且答案要一致。那么你们该去哪里呢？又该在一天当中的哪个时间去呢？

中午的中央车站是个不错的答案。博弈论学者、诺贝尔经济学奖得主托马斯·谢林（Thomas Schelling）在1960年出版的《冲突的战略》（Strategy of Conflict）一书中提到了这个实验，大多数被访者给出的答案就是那里。谢林指出，人们往往能心照不宣地采取一致行动——当他们知道其他人也在努力达成一致时。大多数情况下都会有一条线索，一个“聚焦点”，人们会围绕着这个点协同行动，尽管找到它既需要逻辑又需要想象力。

现在想象一下世界经济持续恶化。人们恐慌地抛售风险资产。你该到哪里避险？现金是最具流动性的资产，但选哪一种呢？美元是个自然的聚焦点。但美国财政缺乏纪律、经常项目赤字庞大，可能会让人迟疑。其他货币也各有缺陷。你可能会考虑另一个目标，即便只是因为其他人也开始这么想。那就是黄金。

对于这个建议，许多人的反应是礼貌地退避，称自己要赶着去其他地方赴约。黄金总与一些奇怪的东西相伴。狂热的黄金信徒似乎对枪支、取淡水的最佳地点和保存食物的最佳方法都很了解。黄金到底有什么优点呢？它应该是一种通胀对冲手段。问题是目前没什么好对冲的——通胀仅勉强接近富裕国家2%的标准目标。而在最近每盎司上涨100美元之后，黄金经通胀调整后的价格以过去的标准衡量并不算便宜（见图表）。

然而其他选择还不如黄金。欧元有缺陷。它没有唯一的主权发行机构作后

盾。人民币不能自由兑换。诚然，日元是个不错的避风港。日本的净外国资产，即日本居民拥有的海外资产减去他们欠外国人的债务，价值三万亿美元，相当于日本年GDP的60%。发生危机时，部分资本回流，会推高日元汇率。那些寻求避险的人也会效仿。瑞士法郎也有类似的吸引力。但两种货币仍有不足之处。过去的情况表明，两国可能会通过增加印发本币来限制本币升值。日本、瑞士和欧元区的短期利率多年来一直为负值，部分原因是为了遏制本币走强。相比之下，黄金的零收益率简直很有吸引力了。

那么美元呢？作为一种全球货币，它无可匹敌。在2008年上一次大危机期间，美元反弹。那时全球有大量以美元计价的借款。因此，等到麻烦来临，市场上就出现了对美元流动性的争夺。如今全球仍有很大的美元空头头寸，因为在境外有大量以美元计价的借款。不过全世界也都在囤积美元资产。美国上市公司构成了全球股市指数的主体。美国政府债券市场已经膨胀到GDP的100%。美元仍然是官方储备的大头。

很明显，那些应急基金的经理们似乎有点担心他们挤在了同一个地方。最新数据显示，在向国际货币基金组织报告的10.7万亿美元的外汇储备中，美元所占比例已从特朗普当选总统时的超过65%降至目前的不到62%。这在一定程度上也许是对日益增长的政治风险的回应。美元在全球贸易和金融中扮演重要角色，这让美国能够实施效力巨大的金融制裁。而美国也在更频繁地发起制裁。于是，像俄罗斯就将美元在其外汇储备中的比重大幅削减至22%，同时增持了欧元和人民币。俄罗斯也是黄金的大买家。而在这方面不止它如此。去年，各国央行的黄金净购买量增长了74%，达到1971年美元与黄金脱钩以来的最高水平。

与当时一样，现在人们越发担心美元是一种拥挤的交易。这就好比中央车站的人太多，你不可能在那里找到你要见的人；即便找到了，你也不可能顺利地挤过去。因此黄金开始再次成为一个聚焦点。在那里你得和一些不熟悉的人打交道。但你真的能说你一辈子都不会去那里吗？■



Automotive engineering

Look! No brakes

The use of regenerative braking in electric cars will change the way people drive, and also the market for components

In 1894, when Louis Antoine Krieger started making electrically powered horseless carriages (pictured above), he introduced a feature that had appeared earlier on some electric trains. The motors that drove the front wheels of Krieger's landaulet could operate in reverse, to work as generators when the driver slowed down. That let them recover kinetic energy from the vehicle's forward motion, turn it into electricity and use this to top up the battery. But there was another benefit. The harvesting of this otherwise-lost energy also produced a handy braking effect, helping slow the vehicle without the driver having to apply the somewhat dodgy mechanical brakes.

Regenerative braking, as the technology Krieger used is now called, pretty much disappeared from road transport when electric power gave way to the internal-combustion engine. But, with sales of petrol- and diesel-powered vehicles peaking, and scores of new electric and hybrid cars appearing on the market, it is staging a comeback. Its principal advantage is that it increases the distance a vehicle is able to travel between charges. For example, according to its makers Audi, regeneration contributes 30% of the 400km maximum range of the firm's e-tron SUV. But regen braking, as it is known for short, also promises to do for the brake pedal what automatic gear boxes did for the clutch, and thus to make driving a one-pedal experience.

As Martin Tolliday, an automotive expert at Ricardo, a British engineering consultancy, observes, regenerative systems already encourage a different way of driving. Some cars, such as the Tesla Model 3, permit the driver

to choose levels ranging from mild to aggressive. Mild lets the car coast more freely. Aggressive pulls the car up more sharply and recovers the most energy. Carmakers put sensors in such vehicles to turn on the brake lights once the force of regen braking reaches a level similar to that of conventional braking.

Regeneration also permits braking methods to be blended. When a driver lightly touches the brakes in some models, it is not the friction brakes that are applied initially, but regen braking instead. Nissan, a Japanese firm, has taken this idea furthest. The latest version of its Leaf electric car features a switch that activates what it calls the ePedal. This combines acceleration and braking into a single action. As with other electric cars, when the driver relaxes pressure on the pedal, regenerative braking takes over. With an ePedal, though, if he takes his foot off altogether, the friction brakes are eventually applied as well.

The Leaf still has a brake pedal, but it is there for use only in extremities. In normal road conditions Nissan reckons the ePedal can meet 90% of a driver's deceleration needs and, particularly in heavy traffic, it avoids his having to shift his foot constantly from one pedal to another. Once he has got used to it, he rapidly learns how to play the ePedal when approaching junctions or stationary traffic ahead, and can bring his vehicle to a standstill without ever pressing the brake. He need not do so even going downhill. On inclines, the car will hold itself stationary until the ePedal is pressed, at which point it will set off again.

Nor are drivers the only people who will be affected by the rise of regen braking. So, too, will those who service cars and who make components for them. Conventional brakes work by clamping a set of friction pads onto a disc on the wheel hub. The result of this friction is wear and tear, so pads and discs need to be replaced at frequent intervals. Regen braking means those components may last the lifetime of the vehicle. Some taxi drivers

of elderly Toyota Prius hybrids reckon they are running on their vehicle's original set of brake pads, even with a million kilometres on the odometer.

Whether and when the brake pedal will disappear completely remains to be seen. Mr Tolliday thinks it is likely to happen eventually. Already, a number of cars use auto-braking, in which radar sensors apply the brakes if a vehicle gets too close to the one in front. In such a situation, if he is driving at all, a motorist with a single pedal could simply remove his foot and let the sensors work out how best to brake without the vehicle losing control of itself.

Correction: In "Eco-nomics" (Feb 9th), we described Hugh Possingham as moonlighting as chief scientist at the Nature Conservancy, while working at the University of Queensland. In fact, it is the other way around. Working at the Nature Conservancy is Dr Possingham's day job. Sorry. ■



汽车工程

看！没有刹车

在电动汽车上应用再生制动将改变人们的驾驶方式以及汽车配件市场

一八九四年，路易斯·安托万·克里格（Louis Antoine Krieger）开始制造电力驱动的无马马车（如图）。他引入了一个先前已出现在一些电力火车上的功能。驱动车辆前轮的电机可以反向运转，在司机减速时变为发电机。这些电机可以回收车辆前进时产生的动能，将之转换为电力，为电池充电。但这还有一个好处。在收集这些原本被浪费掉的能量时还会产生有用的制动作用，司机无需使用有些复杂的机械制动装置就能让车慢下来。

克里格曾使用的这项技术如今被称作再生制动，在电力被内燃机取代时几乎从道路交通中消失。但是，随着汽油和柴油车销量见顶而新的电动和混合动力车进入市场，它又东山再起。它的主要好处是延长车辆两次充电之间的行驶里程。例如，奥迪声称，它制造的e-tron SUV的最大续航里程为400公里，其中30%由再生制动提供。但是再生制动也有可能替代刹车踏板，就像自动变速箱替代离合器那样，从而让人们驾驶时只踩一个踏板就够了。

英国工程咨询公司里卡多（Ricardo）的汽车专家马丁·托里迪（Martin Tolliday）认为，再生制动系统已经促成了一种不同的驾驶方式。某些车如特斯拉Model 3能让驾驶者选择从温和到激进的不同刹车模式。在温和模式下汽车可以更自如地滑行。激进模式则会更迅猛地刹车并回收大部分能量。汽车制造商在这类车辆中安装了传感器，当再生制动力达到和传统刹车差不多的力度时就会亮起刹车灯。

再生制动还可以实现不同刹车方式混用。在某些车型上，如果驾驶者轻踩刹车，最先介入的不是摩擦式刹车，而是再生制动。日本汽车公司日产最充分地实践了这一理念。最新款的聆风（Leaf）电动车配备了一个开关，可以启动日产所说的ePedal的模式。这种模式把加速和刹车融合成了一个

动作。和其他电动汽车一样，当驾驶者放松踏板，再生制动会启动。而在ePedal模式下，如果驾驶者完全松开踏板，摩擦刹车最终也会启动。

聆风仍然保留了刹车踏板，但只在极端情况下使用。日产认为，在正常路况下，ePedal能满足驾驶者90%的减速需求，还可省去在两个踏板间不断切换的麻烦，这在堵车时尤其有用。一旦习惯后，驾驶者很快就可学会在接近交叉路口或者静止的车流时使用ePedal，并能够不踩刹车就把车停稳。即使下坡时都不需要踩刹车。在坡道上，车会自动停稳，在ePedal被踩下时才会再次启动。

再生制动的兴起不仅会影响驾车者，还会影响汽车维修厂和配件制造商。传统刹车使用一套摩擦片夹住汽车轮毂上的刹车盘。这样的摩擦会产生磨损，所以刹车盘和片需要频繁更换。有了再生制动，可能在一辆车的整个寿命期内都无需更换这些部件。一些开早期丰田普锐斯混动汽车的出租车司机相信车里用的还是原配的刹车片，就算里程表已经跑到了100万公里。

至于刹车踏板是否会彻底消失、何时会消失，还有待观察。托里迪认为这最终是有可能实现的。很多车已经在使用自动刹车，当车与前方的车距离过近时，雷达传感器会启动刹车。在这种情况下，如果当时司机还在操控汽车，在只有一个踏板的时候他可以直接松开踏板，让传感器决定如何最好地刹车而不会让车失控。





Energy and Climate

Crude awakening

ExxonMobil and the oil industry are making a bet that could end up wrecking the climate

In America, the world's largest economy and its second biggest polluter, climate change is becoming hard to ignore. Extreme weather has grown more frequent. In November wildfires scorched California; weeks ago Chicago was colder than parts of Mars. Scientists are sounding the alarm more urgently and people have noticed—73% of Americans polled by Yale University late last year said that climate change is real. The left of the Democratic Party wants to put a “Green New Deal” at the heart of the election in 2020. As expectations shift, the private sector is showing signs of adapting. Last year around 20 coal mines shut. Fund managers are prodding firms to become greener. Warren Buffett, no sucker for fads, is staking \$30bn on clean energy and Elon Musk plans to fill America's highways with electric cars.

Yet amid the clamour is a single, jarring truth. Demand for oil is rising and the energy industry, in America and globally, is planning multi-trillion-dollar investments to satisfy it. No firm embodies this strategy better than ExxonMobil, the giant that rivals admire and green activists love to hate. It plans to pump 25% more oil and gas in 2025 than in 2017. If the rest of the industry pursues even modest growth, the consequence for the climate could be disastrous.

ExxonMobil shows that the market cannot solve climate change by itself. Muscular government action is needed. Contrary to the fears of many Republicans (and hopes of some Democrats), that need not involve a bloated role for the state.

For much of the 20th century, the five oil majors—Chevron, ExxonMobil, Royal Dutch Shell, BP and Total—had more clout than some small countries. Although the majors' power has waned, they still account for 10% of global oil and gas output and 16% of upstream investment. They set the tone for smaller, privately owned energy firms (which control another quarter of investment). And millions of pensioners and other savers rely on their profits. Of the 20 firms paying the biggest dividends in Europe and America, four are majors.

In 2000 BP promised to go “beyond petroleum” and, on the face of it, the majors have indeed changed. All say that they support the Paris agreement to limit climate change and all are investing in renewables such as solar. Shell recently said that it would curb emissions from its products. Yet ultimately you should judge companies by what they do, not what they say.

According to ExxonMobil, global oil and gas demand will rise by 13% by 2030. All of the majors, not just ExxonMobil, are expected to expand their output. Far from mothballing all their gasfields and gushers, the industry is investing in upstream projects from Texan shale to high-tech deep-water wells. Oil companies, directly and through trade groups, lobby against measures that would limit emissions. The trouble is that, according to an assessment by the IPCC, an intergovernmental climate-science body, oil and gas production needs to fall by about 20% by 2030 and by about 55% by 2050, in order to stop the Earth’s temperature rising by more than 1.5°C above its pre-industrial level.

It would be wrong to conclude that the energy firms must therefore be evil. They are responding to incentives set by society. The financial returns from oil are higher than those from renewables. For now, worldwide demand for oil is growing by 1-2% a year, similar to the average over the past five decades—and the typical major derives a minority of its stockmarket value from profits it will make after 2030. However much the majors are vilified

by climate warriors, many of whom drive cars and take planes, it is not just legal for them to maximise profits, it is also a requirement that shareholders can enforce.

Some hope that the oil companies will gradually head in a new direction, but that looks optimistic. It would be rash to rely on brilliant innovations to save the day. Global investment in renewables, at \$300bn a year, is dwarfed by what is being committed to fossil fuels. Even in the car industry, where scores of electric models are being launched, around 85% of vehicles are still expected to use internal-combustion engines in 2030.

So, too, the boom in ethical investing. Funds with \$32trn of assets have joined to put pressure on the world's biggest emitters. Fund managers, facing a collapse in their traditional business, are glad to sell green products which, helpfully, come with higher fees. But few big investment groups have dumped the shares of big energy firms. Despite much publicity, oil companies' recent commitments to green investors remain modest.

And do not expect much from the courts. Lawyers are bringing waves of actions accusing oil firms of everything from misleading the public to being liable for rising sea levels. Some think oil firms will suffer the same fate as tobacco firms, which faced huge settlements in the 1990s. They forget that big tobacco is still in business. In June a federal judge in California ruled that climate change was a matter for Congress and diplomacy, not judges.

The next 15 years will be critical for climate change. If innovators, investors, the courts and corporate self-interest cannot curb fossil fuels, then the burden must fall on the political system. In 2017 America said it would withdraw from the Paris agreement and the Trump administration has tried to resurrect the coal industry. Even so, climate could yet enter the political mainstream and win cross-party appeal. Polls suggest that moderate and younger Republicans care. A recent pledge by dozens of prominent

economists spanned the partisan divide.

The key will be to show centrist voters that cutting emissions is practical and will not leave them much worse off. Although the Democrats' emerging Green New Deal raises awareness, it almost certainly fails this test as it is based on a massive expansion of government spending and central planning (see Free exchange). The best policy, in America and beyond, is to tax carbon emissions, which ExxonMobil backs. The *gilets jaunes* in France show how hard that will be. Work will be needed on designing policies that can command popular support by giving the cash raised back to the public in the form of offsetting tax cuts. The fossil-fuel industry would get smaller, government would not get bigger and businesses would be free to adapt as they see fit—including, even, ExxonMobil. ■



能源与气候

原油觉醒

埃克森美孚与石油业的发展大计可能会破坏气候

在美国这个世界最大经济体和第二大污染国，气候变化变得越来越难以忽视。极端天气日益频繁。去年11月，山火炙烤加州；几周前，芝加哥比火星上的一些地方还要冷。科学家更急切地发出警告，而民众也已经留意到了问题——去年年底耶鲁大学的民调显示，73%的美国人认为气候变化确实在发生。民主党左翼打算把“绿色新政”作为2020年美国大选的核心理念。随着期望的转变，私营部门也显示出随之调整的迹象。去年约有20个煤矿关闭。基金经理纷纷敦促企业加强环保。一向不追逐潮流的巴菲特在清洁能源上投资了300亿美元，马斯克则打算让电动汽车遍布美国的高速公路。

然而，在这一片喧闹中却存在一个扎眼的、不和谐的现实。石油需求不断上升，美国乃至全球的能源行业正计划投资数万亿美元来满足需求。最积极践行这一战略的公司莫过于埃克森美孚——一个让竞争对手艳羡而令环保人士厌恶的行业巨头。这家公司计划在2025年比2017年增产25%的石油和天然气。业内其他公司即便只是追求微小的增长，也可能给气候带来灾难性后果。

埃克森美孚的行动表明，单靠市场本身无法解决气候变化的问题。需要强有力的政府行动。与许多共和党人所担忧的（也是部分民主党人所希望的）相反，这并不意味着政府权力会就此膨胀。

二十世纪的大部分时间里，雪佛龙、埃克森美孚、荷兰皇家壳牌、BP和道达尔这五大石油巨头影响巨大，更甚于一些小国家。虽然它们的影响力已经减弱，但仍占到全球石油和天然气产量的10%及上游投资的16%，并为相对较小的私营能源公司（占到另外四分之一的投资）定下了基调。而且这些石油企业的利润与数以百万计的退休人员和其他储蓄者的生计息息相关。

关。在欧洲和美国股息最高的20家公司中，四家是石油巨头。

2000年，BP承诺“不只贡献石油”。而从表面上看，这些巨头确实有所改变。它们都表示支持《巴黎气候协定》以控制气候变化幅度，也都在投资太阳能等可再生能源。壳牌最近表示将控制其产品的碳排放。但对于这些企业，我们不应听其言，而是要观其行。

埃克森美孚表示，到2030年全球石油和天然气需求将增长13%。不仅仅是埃克森美孚，所有石油巨头预计都会提高产量。整个行业不但没有关闭所有气田和喷油井，还在投资各种上游项目，从开发德克萨斯页岩到高科技深水井等。石油公司直接或通过行业机构游说以反对限排措施。问题是，根据政府间气候变化专门委员会（IPCC）的估计，要令地球气温相比工业化前水平上升幅度不超过1.5°C，石油和天然气到2030年要减产约20%，到2050年减产约55%。

但不能就此认定能源公司必然是邪恶的。它们是在响应社会设定的激励。石油的财务回报高于可再生能源。目前，全球石油需求每年增长1%到2%，与过去50年的平均水平相近；一般石油巨头的股票市值中有一小部分来自2030年后的利润。尽管被气候斗士们（他们很多人既开车也坐飞机）狠批，但这些企业追求利润最大化不仅合法，也是股东有权做出的要求。

有些人寄望石油公司会逐步转向新的方向，但这似乎太过乐观了。想依赖卓越的创新来挽救局面，未免轻率。全球每年对可再生能源的投资为3000亿美元，相比对化石燃料的投资仍相形见绌。在汽车行业，即便有大量新款电动车源源推出，但预计在2030年大约85%的车辆仍将使用内燃机。

“道德投资”的兴起也一样。资产总计32万亿美元的多个基金加入进来，对全球最大的一些排放企业施压。面对传统业务的崩溃，基金经理很乐意出售环保类产品——有助益的一点是这类产品的收费也更高。但很少有大型投资集团抛售大型能源企业的股份。尽管在宣传上大张旗鼓，但石油企业

近年对环保投资者的承诺仍然很有限。

而且也别指望法庭能解决多少问题。律师们正采取一系列行动，对石油公司作出了从误导公众到造成海平面上升的种种指控。一些人认为石油公司 will 遭受与烟草公司（在上世纪90年代面对巨额和解赔偿金）相同的命运。但他们忘了烟草巨头至今屹立不倒。去年6月，加州一名联邦法官裁定，气候变化属国会和外交事务，法官们管不了。

未来15年对气候变化至关重要。如果创新者、投资者、法院和企业自身利益无法抑制化石燃料，那政治系统就必须负起重担。2017年美国表示将退出《巴黎气候协定》，特朗普政府也试图复兴煤炭业。即便如此，气候问题仍可进入政治主流并赢得跨党派关注。民调表明，年轻温和的共和党人关注气候问题。几十位著名经济学家最近对气候问题做出的联合呼吁更是跨越了党派分歧。

关键将在于向中间派选民表明减少排放是切实可行的，也不会让他们的处境变坏。虽然民主党推出的“绿色新政”理念提高了人们对气候问题的关注，却几乎做不到这一点，因为这套方案基于大幅提高政府支出和扩大集中规划。在美国和其他地区，最好的办法是对碳排放征税，埃克森美孚也支持这一做法。法国“黄马甲”运动显示了实施的难度。这需要设计政策，以补偿性减税的形式把征收的资金返还给公众，从而赢得民众支持。化石燃料行业的规模将缩小，政府不会膨胀，企业也有视情况自行调整的自由——就算埃克森美孚也一样。 ■



Chaguan

The pursuit of happiness

A new book examines why China is gloomier than its economic success would predict

It took 125 years for America's Declaration of Independence to reach a wide Chinese audience, and when it did, some lofty phrases got lost. The earliest known Chinese translation of the declaration, published in 1901 by young nationalists burning to overthrow the Qing empire, is an impatient, combative text. The document's name, noted the scholar who rediscovered it, Frank Li of the Chinese Academy of Social Sciences, became the "American War Proclamation of Independence". The rights it deemed inalienable—"life, liberty and the pursuit of happiness"—turned into something bleaker: "life, liberty and all interests".

Happiness remains a thorny subject in China. Since 2012 the UN has sponsored a World Happiness Report, for which residents of about 150 countries are asked how satisfied they are with their lives. China ranked 86th in the latest report, below Russia and even war-torn Libya. Some foreign observers find it easy to explain China's relative gloom. They see a system built on an unsentimental bargain between rulers and ruled. Citizens may enjoy the fruits of economic growth but may not protest against the costs, from pollution to yawning inequality. Such experts scoff when today's Communist leaders say that they set great store by increasing public happiness as part of the Chinese Dream, President Xi Jinping's campaign to make China great again. These cynics imagine that Team Xi's true priority is to keep the economy growing quickly, on the assumption that material gains are the only thing that can keep a long-suffering public in line.

This cynical theory is popular but wrong. "Chinese Discourses on

Happiness” is a timely new collection of essays edited by two sinologists based in Britain, Gerda Wielander and Derek Hird. It explores how China’s propaganda machine devotes extraordinary efforts to promoting the idea that the Chinese people enjoy good and meaningful lives under Communism—precisely because economic growth alone does a poor job of generating happiness.

Back in 1974 Richard Easterlin, an American economist, spotted a puzzle. Although richer countries are generally more contented, rising material prosperity does not necessarily lead to ever-higher levels of self-reported well-being. “Chinese Discourses” calls China a giant Easterlin Paradox. Chinese real GDP per person grew more than fivefold between 1990 and 2015. Yet, rather than climbing in lockstep with the economy, the self-reported happiness of the Chinese fell sharply from 1990, reaching a nadir in 2000-05 (a time of breakneck GDP growth) before recovering. It has probably yet to regain the level of 1990.

A chapter of the 2017 World Happiness Report, co-written by Mr Easterlin, dug into Chinese data from the previous quarter-century and found weak correlations between happiness and several trends commonly blamed for gloom. Take inequality of income, which in China marched upwards between 1980 and about 2010. During the same period levels of self-reported happiness fell and rose in a U-shape. The chapter studies other “predictors” of happiness, including the consumption of coal (a proxy for pollution), housing prices, GDP per person, healthy-life expectancy, self-reported levels of freedom to make big decisions and corruption (measured by asking whether bribery is acceptable). None of these indicators tracks happiness closely in China. Two others are a good fit: unemployment and access to social safety nets. Misery, notably among low-income Chinese, deepened as unemployment spiked and safety nets collapsed in 2000-05, as state-owned firms were restructured. As employment rebounded, so did happiness.

Even people normally considered clear beneficiaries of China's economic opening—the hundreds of millions of rural migrants who found work in cities over the past 30 years—are not collectively cheerier. The most recent World Happiness Report, from 2018, finds that, on average, Chinese migrants secure higher incomes by moving to cities but, once there, say they are less happy than long-established city folk. More surprisingly, such migrants are also unhappier than cousins who stayed in the countryside. Dig into the numbers, and the jobs of the unhappiest migrants are unusually insecure, harsh and badly paid, thrusting them into an underclass made more painful by *hukou* residency laws that limit their access to schooling for their children and other public services. Rising prosperity cannot compensate for a sense of being left out.

“Chinese Discourses” suggests that party chiefs have long worried about such risks. In the 1950s they pledged to build a “prosperous and happy socialist society”. Today, in the Xi era, a similar message is rammed home in television shows, posters and websites lauding model citizens who find joy in serving the country. Some propaganda is plain sneaky. A contributor to the new book, Jigme Yeshe Lama of the University of Calcutta, notes that state media declared the tense, heavily policed Tibetan capital, Lhasa, “China’s happiest city” for six years in a row. That improbable feat was achieved by deeming government policies, from imposing tight security to building highways or pushing Tibetans into modern jobs, to be the definition of happiness.

Other propaganda is more subtle. Party homilies about collective happiness, common in the 1950s, have been replaced by stories about well-being on two levels: the personal and the national. Individuals are told that they are *xingfu*, or “happy and blessed”, because Chinese families are made strong by traditional values. In turn, Mr Xi likes to say, families are made secure and prosperous by loyal membership of “the great family of the Chinese nation”. With his stories about tradition and belonging, Mr Xi may just be on

to something. A happiness gap between rich and poor has narrowed as the lowest earners report greater well-being, to an extent that economic growth numbers alone do not explain. To stern Communist Party chiefs, few rights are inalienable. But the human need to be promised a good life? That is self-evident. ■



茶馆

追求幸福

一本新书探讨为何中国人不像国家经济成功所预示的那么开心

美国的《独立宣言》花了125年的时间才为广大中国读者所知，而到了这里，文中一些崇高的词汇丢失了。已知最早的中文译本是1901年由急于推翻清王朝的年轻的民族主义者印行的，是一篇急躁而好斗的文字。重新发现了这个版本的学者是中国社会科学院的李道揆，他注意到文章的标题变成了《美国独立檄文》。文中认为不可剥夺的权利——“生命、自由和追求幸福的权利”——变成了更索然无味的东西：“生命自由，及一切利益之事”。

幸福在中国仍然是一个棘手的话题。联合国自2012年以来主办了《世界幸福感报告》，询问约150个国家的居民对自己生活的满意度。中国在最新一期报告中排名第86位，低于俄罗斯，甚至是饱受战争蹂躏的利比亚。一些外国观察家认为中国相对悲观的情绪很容易解释。他们看到了一个建立在统治者和被统治者之间无情交易之上的制度。公民可以享受经济增长的成果，但不可抗议其代价，无论是污染还是日益增长的不平等。今天的共产党领导人说他们极为重视把提升公众的幸福度作为中国梦（习近平主席的“让中国再次伟大”的运动）的一部分，这些专家对此嗤之以鼻。在这些愤世嫉俗者的想象中，习近平领导层真正的头等大事是保持经济快速增长，他们觉得唯一能让长期受苦的公众乖乖听话的东西就是物质利益了。

这种愤世嫉俗的理论很受欢迎，却是错的。由英国两位汉学家葛维兰（Gerda Wielander）和德雷克·赫德（Derek Hird）编辑的新文集《中国幸福论丛》（Chinese Discourses on Happiness）正逢其时。它探讨了中国的宣传机器如何花大力气传播“中国人民在共产主义体制下享受着美好而有意义的生活”这一认知，而这恰恰是因为经济增长本身并没有带来足够的幸福。

早在1974年，美国经济学家理查德·伊斯特林（Richard Easterlin）发现了一个谜团。虽然富裕国家通常都更为满足，但物质愈加丰富并不一定会让自我报告的幸福水平更高。《中国幸福论丛》称中国是一个巨大的伊斯特林悖论。在1990年至2015年间，中国实际人均GDP增长了五倍多。然而，中国人自我报告的幸福感却并未与经济同步攀升，反而从1990年开始大幅下降，在2000至2005年间（GDP飞速增长的时期）达到最低点，然后才开始反弹，但可能至今都没有恢复到1990年的水平。

在伊斯特林参与撰写的《2017年世界幸福感报告》中，有一章挖掘了中国近25年的数据，发现在幸福感与几种通常被认为会导致悲观的趋势之间呈弱相关性。比如收入不平等——中国在1980年至2010年左右呈上升趋势，而在同一时期，自我报告的幸福水平先降后升，呈U形。这一章还研究了幸福感的其他“预测因子”，包括煤炭消耗量（污染指标）、房价、人均GDP、预期健康寿命、自我报告的做重大决策的自由，以及腐败（用询问贿赂是否可接受来衡量）。在中国，这些指标都没能密切贴合幸福感。另外两个指标则吻合很好：失业率和获得社会安全网的机会。在2000至2005年，随着国有企业的重组，失业率飙升，安全网崩溃，低收入中国人感受到的困苦尤其加重了。而随着就业的反弹，幸福感也随之回升。

即使是那些通常被认为明显受益于中国经济开放的人——过去30年在城市找到工作的数亿农民工——总体上也并没有变得更开心。最新的《2018年世界幸福感报告》发现，平均而言，中国移民迁移到城市可获得更高的收入，但一旦进了城，他们说自己不如原本就扎根在此的城里人幸福。更令人惊讶的是，这些移民也不如他们留在乡下的亲戚幸福。深入研究数字后会发现，最不幸福的移民所做的工作非常不稳定、条件恶劣且报酬微薄，被推到社会底层，而户口法限制其子女就学和获得其他公共服务，更是雪上加霜。经济状况的改善无法弥补被社会排斥的感觉。

《中国幸福论丛》认为，党的领导人一向担心这类风险。在上世纪50年代，他们承诺建立一个“繁荣幸福的社会主义社会”。如今在习近平时代，电视节目、海报和网站上赞颂乐于为国家服务的模范公民，一再强调类似的讯息。有些宣传是赤裸裸的诡计。新书的撰稿人之一，加尔各答大学的

晋美耶喜喇嘛（Jigme Yeshe Lama）指出，国家媒体连续六年将局势紧张、监控严密的西藏首府拉萨宣布为“中国最幸福的城市”。这一不可思议的成就是将政府政策——从实施严密安保到建设高速公路或将藏人推向现代化工作——定义为幸福而实现的。

另一些宣传更巧妙些。上世纪50年代常见的关于集体幸福感的党性说教已经被关于两个层面的叙事所代替——个人与国家福祉。个人被告知他们十分“幸福”，即“幸运又有福”，因为传统价值观让中国的家庭十分强健。反过来，习近平喜欢说，忠诚地融入“中华民族大家庭”让家庭变得安全又繁荣。习近平关于传统和归属感的叙事可能确实抓到了某些窍门。随着最低收入者报告的幸福感提升，富人和穷人之间的幸福差距缩小了，单靠经济增长数据已经无法解释这一点了。对于严厉的共产党领导人来说，很少有什么权利是不可剥夺的。但需要向人民许诺美好生活吗？这就不用说了吧。 ■



Free exchange

Replacebook

Imagine a world without Facebook. It might be a better place

There has never been such an agglomeration of humanity as Facebook. Some 2.3bn people, 30% of the world's population, engage with the network each month. Economists reckon it may yield trillions of dollars' worth of value for its users. But Facebook is also blamed for all sorts of social horrors: from addiction and bullying to the erosion of fact-based political discourse and the enabling of genocide. New research—and there is more all the time—suggests such accusations are not entirely without merit. It may be time to consider what life without Facebook would be like.

To begin to imagine such a world, suppose that researchers could kick a sample of people off Facebook and observe the results. In fact, several teams of scholars have done just that. In January Hunt Allcott, of New York University, and Luca Braghieri, Sarah Eichmeyer and Matthew Gentzkow, of Stanford University, published results of the largest such experiment yet. They recruited several thousand Facebookers and sorted them into control and treatment groups. Members of the treatment group were asked to deactivate their Facebook profiles for four weeks in late 2018. The researchers checked up on their volunteers to make sure they stayed off the social network, and then studied what happened to people cast into the digital wilderness.

Those booted off enjoyed an additional hour of free time on average. They tended not to redistribute their liberated minutes to other websites and social networks, but chose instead to watch more television and spend time with friends and family. They consumed much less news, and were thus less aware of events but also less polarised in their views about them than those

still on the network. Leaving Facebook boosted self-reported happiness and reduced feelings of depression and anxiety.

It also helped some to break the Facebook habit. Several weeks after the deactivation period, those who had been off Facebook spent 23% less time on it than those who had never left, and 5% of the forced leavers had yet to turn their accounts back on. And the amount of money subjects were willing to accept to shut their accounts for another four weeks was 13% lower after the month off than it had been before. Users, in other words, overestimate how much they value the service: a misperception corrected by a month of abstention. Even so, most are loth to call it quits entirely. That reluctance would seem to indicate that Facebook, despite its problems, generates lots of value for consumers, which would presumably vanish were the network to disappear.

Yet that is not quite clear. Consider the choice faced by the treatment group when the deactivation period is over: to rejoin the network or remain off while the rest continue to like and share. It is possible that a user might not want to go without a service used by 2.3bn others, but also that the world would be better off if the service did not exist at all.

How could that be? A social network thrives thanks to increasing returns to scale. The more people on a network, the more potential connections it facilitates and the larger its value to each user. Such effects helped power Facebook's rise; founded in 2004, it took off as the share of the population online grew explosively. New netizens naturally gravitated to the social network used by most of their friends and family, which reinforced Facebook's advantages—in much the same way that a booming city attracts new residents because of the opportunities created by the large pool of people already there. You could say Facebook is the world's first digital megacity, thronging with people, enabling huge amounts of human contact, both good and bad.

In the life of physical cities, the attraction of being close to others can lead to remarkable durability. Industrial towns sprouted along the Great Lakes in the 19th century because of the advantage of being close to water transport—especially once canals linked the lakes to the Atlantic. Great Lakes shipping is not the economic force it once was, yet millions of people remain in cities like Chicago and Detroit, Cleveland and Buffalo. Interpreting that durability is tricky. Suppose a team of researchers were to approach a few thousand midwesterners and ask them, for the sake of experiment, to spend a month in southern California. The subjects of the experiment might find the experience surprisingly enjoyable, yet nonetheless return home because of the friends, family and professional contacts who remain in the Midwest. The choice to return could reflect the unique value created by midwestern cities. But it might instead mean that midwesterners are stuck in a bad equilibrium: that well-being would go up if only they could agree, collectively, to decamp to sunnier climes.

Such things occur outside idle thought experiments. Guy Michaels, of the London School of Economics, and Ferdinand Rauch, of the University of Oxford, studied the fortunes of Roman-era towns in Britain and France. When the empire foundered, those fortunes diverged; the French political order was less disturbed by the collapse than the British, and more towns continued to function in France than in Britain. As a result, new towns arose more readily in Britain than in France when, in later centuries, the advantages of proximity to navigable water became apparent. Between 1200 and 1700, populations grew much faster in towns with access to the coast than in those without. Britons benefited from having their urban network “reset”, while the French were stuck liking and sharing the towns their Roman ancestors occupied.

Such ruts are hard to spot in real time, and there may well be net value in a Facebook-like network. Were Mark Zuckerberg to turn off his creation, another, similar platform might be propelled to dominance. But the

Facebook era could instead be the product of unique, fleeting historical circumstances. In that case, a sunnier social-network ecology might be achievable—if only the citizens of Facebook could be nudged to seek something better. ■



自由交流

变脸

想象一个没有Facebook的世界。那可能是个更好的世界

从没有什么像Facebook这样把那么多不同的人聚集在一起。每月约有23亿人（占全球人口三成）使用这个网络。经济学家认为它可能会为其用户带来数万亿美元的价值。但它也被指责带来了各种各样的社会性恐怖现象：从成瘾、霸凌，到侵蚀基于事实的政治言论和驱动种族灭绝。层出不穷的新研究表明这种指摘并非全无道理。现在可能是时候想一想如果没有Facebook，生活会变成怎样了。

要开始想象这样一个世界，我们得假设研究人员能从Facebook上踢出去一些人并观察在他们身上会发生什么。事实上，几个学者团队已经做到了这件事。今年1月，纽约大学的亨特·阿尔科特（Hunt Allcott）和斯坦福大学的卢卡·布拉吉耶里（Luca Braghieri）、萨拉·艾希迈尔（Sarah Eichmeyer）和马修·根茨科（Matthew Gentzkow）公布了迄今为止规模最大的一项实验的结果。他们招募了数千名Facebook用户，将他们分成对照组和治疗组。2018年底，治疗组成员被要求停用Facebook四周时间。研究人员追踪这些志愿者以确保他们不用Facebook，然后研究这些被投入了“数字荒野”的人的状况。

这些被驱逐者平均多出了一小时的空闲时间。他们通常都没有把这些多出来的时间重新分配给其他网站和社交网络，而是用来看更多电视以及与亲友共度时光。他们看的新闻大为减少，对各种新闻事件的觉察度也因而降低，但他们对这些事件的看法也不像那些仍然留在Facebook上的人那么极端了。离开Facebook提升了自我报告的快乐水平，减轻了抑郁和焦虑的感觉。

它也帮助一些人打破了上Facebook的习惯。在停用期结束几周后，受试者花在该平台上的时间比那些从未离开的人少了23%，并且有5%的受试者至

今未重新登录Facebook账户。而且，受试者愿意将自己的账户再关闭四周而换取的“赔偿金”数额比试验前减少了13%。换句话说，用户高估了自己对这项社交网络服务的重视程度，“戒Facebook”一个月纠正了这种错误认知。不过，即便如此，大多数人都不愿意完全退出这个平台。这种不情愿似乎暗示了尽管Facebook存在问题，它仍为消费者带来了很多价值，如若它不再存在，这些价值想必也会消失。

但这一点并不是很明确。想一想治疗组成员在停用期结束时所面临的选择：重新加入该网络，或者继续戒断——而与此同时其他人还在继续点赞和分享。用户可能不想失去一个其他23亿人都在使用的服务，但同样有可能的是，如果这一服务压根不曾存在过，世界会变得更好。

怎么会是这样呢？一个社交网络的蓬勃发展源于其规模扩大带来的收益递增。网络上的人越多，它促成的潜在连接越多，对每个用户的价值也越大。这种效应帮助推动了Facebook的崛起：它成立于2004年，随着上网人口比例的爆炸式增长而迅速流行。新网民自然而然地被一个自己大多数亲友都在使用的社交网络吸引，这继而强化了Facebook的优势。这很像一个蓬勃发展的城市因为已经居住在这里的大量人群所创造的机会而吸引到新的居民。你可以说Facebook是世界上第一个数字大都会，这里挤满了人，促成了大量人与人的连接，无论是好是坏。

在真实的城市生活中，接近他人的吸引力可以为城市带来非凡的持久性。19世纪时，工业城镇在五大湖沿岸迅速崛起，这缘于这里靠近水路的优势——等到有运河将这些湖泊与大西洋连接起来时就更是如此。如今，五大湖航运已没有了过去那样的经济影响力，但仍有数以百万计的人留在芝加哥、底特律、克利夫兰和布法罗等城市。这种持久性不太容易解释。假设一组研究人员招募几千名中西部人，出于实验目的请他们去南加州住一个月。实验对象可能会发现这次体验出乎意料地愉快，但由于他们的朋友、家人和职业人际网络还留在中西部，他们还是会回到家乡。这样的选择可以反映出中西部城市创造的独特价值。但它也可能反映了另一件事，即中西部居民陷入了一种糟糕的均衡：唯有当他们集体同意迁居更阳光明媚的地区时，他们的福祉才会上升。

这样的事情并不只存在于神游的思想实验之中。伦敦经济学院的盖伊·迈克尔斯（Guy Michaels）和牛津大学的费迪南德·劳赫（Ferdinand Rauch）研究了英国和法国在罗马时代修建的城镇的命运。当罗马帝国崩溃时它们的命运分化了：相比英国，法国的政治秩序较不受崩溃的影响，更多城镇继续发挥其功能。其结果是，在后来的几个世纪中，当靠近通航水路的优势变得明显时，新城镇在英国的崛起比在法国更快。1200年至1700年间，沿海城镇的人口扩张远快过其他城镇。英国人从其城市网络的“重置”中受益，而法国人只能继续“点赞”和“分享”其罗马人祖先占据的城镇。

这种陷于一成不变之中的情形难以被实时察觉，而在一个类似Facebook的网络中很可能还是存在着净价值的。如果扎克伯格把自己的创造物关闭，另一个类似的平台可能会被推向统治地位。但Facebook时代也许就是一个独一无二、稍纵即逝的历史环境的产物。如果是这样的话，一个更阳光的社交网络生态或许是可实现的——如果能推动Facebook公民寻找一片更好的土地的话。 ■



Demography and automation

Robots that look after grandma

Because of ageing, the world needs a robotics revolution. The machines don't seem ready for one

When Gill Pratt sat down to discuss the job of running the Toyota Research Institute, the carmaker's new research division, his Japanese interviewers wrote one word on a piece of paper and asked him to talk about it. The word was dementia. That might seem a strange topic to put to one of the most respected figures in the world of robotics, a man who had previously run a competition to find artificially intelligent, semi-autonomous robots for the Pentagon. But, Mr Pratt says, the company's interest in ageing was a big reason for him to take the job. "The question for all of us", he says, "is, how can we use technology to make the quality of life better as people get older?"

Ageing and robots are more closely related than you might think. Young countries with many children have few robots. Ageing nations have lots. The countries with the largest number of robots per industrial worker include South Korea, Singapore, Germany and Japan, which have some of the oldest workforces in the world.

The connection does not merely reflect the fact that young countries tend to be poor and cannot afford fancy machines, which they do not need anyway. It holds good within rich countries, too. Those with relatively few robots compared with the size of their workforce include Britain and France, both of which (by rich-country standards) are ageing slowly.

Two recent studies quantify the connection. Daron Acemoglu of the Massachusetts Institute of Technology (MIT) and Pascual Restrepo of Boston University show that, between 1993 and 2014, the countries that invested the most in robotics were those that were ageing the fastest—measured as a rise

in the ratio of people over 56 compared with those aged 26-55. The authors posit a rule of thumb: a ten-point rise in their ageing ratio is associated with 0.9 extra robots per thousand workers.

A study from Germany used different measures but reached the same conclusion. Ana Abeliantsky of the University of Göttingen and Klaus Prettner of the University of Hohenheim found that the growth in the number of robots per thousand workers rises twice as fast as the fall in the growth rate of the population (ie, if population growth falls by 1%, the growth in robot density rises by 2%). Population growth is closely related to age structure.

These findings should not be surprising. Robots typically substitute for labour. That is why many people fear that they will destroy jobs. Countries with plenty of young workers do not need labour substitutes. Wages there also tend to be low, making automation unprofitable. But ageing creates demand for automation in two ways. First, to prevent output falling as more people retire, machines are necessary to substitute for those who have left the workforce or to enable ageing workers to continue to do physical labour. Second, once people have retired they create markets for new kinds of automation, including robots that help with the medical and other requirements of caring for people who can no longer look after themselves.

As a result, the connection between robots and ageing is a powerful one. Mr Acemoglu reckons that ageing is the biggest single influence upon how many robots a country has. He estimates it explains close to 40% of the variation in the numbers of robots countries introduce.

The influence will grow. This year, there will be more people over 65 than under five for the first time in human history. By 2060, the number of Americans over 65 will double, to 98m, while in Japan, 40% of the population will be 65 or older. There will not be enough younger people to

look after so many, unless robots help (and probably an influx of migrants is permitted, too).

Shrinking and ageing workforces matter as much. China is now the world's largest robot maker, producing 137,900 industrial robots (typically, machines used in assembly lines) in 2017. Between 2015 and 2040, according to the UN, China's working-age population (aged 20 to 64) will fall by a staggering 124m, or over 13%. Applying Mr Acemoglu's rule of thumb to this decline, China would by the end of the period need to install roughly 2m more robots. That is more than four years' worth of all the industrial robots produced in the world in 2018 and six times as many as the increase in worldwide production over the past nine years.

Such problems loom even in countries ageing more slowly than China—such as Britain. Between 2016 and 2025, according to Mercer, a consultancy, the proportion of British workers who are under 30 will fall by four percentage points and that of over 50s will rise by ten points. That sounds manageable. But it masks big regional swings. In that period, London (which is relatively youthful) will see the share of its labour force under 30 fall by a quarter and the share over 50 rise even more.

That will put enormous pressure on some industries. A third of teachers and building workers in Britain are over 50, as are more than a third of health-care workers, farmers and lorry drivers. They are quitting in droves. A poll in 2015 found that a third of doctors planned to retire by 2020. And this is in a country whose ageing is relatively gentle. Automation is not the only way to deal with skills shortages (immigration and later retirement also help) but it is one of the most important.

Over the next few years, demography will change the kinds of robots people need, as well as increase the number in use. At the moment, the robotics market is dominated by industrial machines, the sort used to assemble cars

or electrical equipment. Sales of industrial-robotics systems were \$48bn in 2017, seven times as much as “service robots”, a category that includes logistics robots for running warehouses, medical robots, robotic milking machines, exoskeletons that help people lift heavy objects and household robots that vacuum the floor.

As demographic change speeds up, service robots will become more important. One day, their makers hope, they will enable old people to live alone and stay mobile for longer. Robots will help assuage loneliness and mitigate the effects of dementia. They will make it easier to look after people in nursing homes and enable older workers who want to stay employed to keep up with the physical demands of labour. These robots will also be fundamentally different from industrial ones, which usually replace human activity—fitting a car windscreen, for example. By contrast, service robots extend it. For example, if an exoskeleton helps someone lift something heavy, the person still has to be there.

You can see the stirrings of this robot revolution most clearly in Japan. AIBO, a robotic puppy with artificial intelligence (AI) made by Sony, and Paro, a furry seal made by Japan’s National Institute of Advanced Industrial Science and Technology, are therapeutic robots for children and patients with dementia. Pepper, made by SoftBank, is a humanoid robot which can carry out conversations on a limited range of topics, so long as its human interlocutor does not stray too far from the script. MySpoon is a robot for those who cannot feed themselves. HAL, by Cyberdyne and Muscle Suit, by Innophys, are exoskeletons, helping nurses pick up and carry patients (HAL stands for hybrid-assistive limb). Panasonics’ Resyone is a robotic bed that transforms itself into a wheelchair. And so on.

Demand for these gizmos is growing fast, if from a low base. Sony said it had sold 11,111 AIBOs in the three months after the new model went on sale in

January 2018. Japan's government reckons that 8% of nursing homes now have lifting robots, and its national robot strategy (every country should have one) calls for four-fifths of the elderly receiving care to have some care provided by a robot by 2020.

For the time being, though, the technology remains a long way from transformative. According to the International Federation of Robotics, an estimated 20,000 robots were sold in 2018 that could realistically be described as helpful for ageing (medical robots, handicap assistance, exoskeletons and the like). That is less than 5% of industrial robots.

The number will doubtless grow. The question is how quickly. Mr Pratt is optimistic. Over the past five years, he argues, there have been huge advances in artificial intelligence, enabling machines to surpass humans in certain kinds of information-processing, notably pattern recognition which (within limits) robots can perform more quickly and reliably than humans. New firms are pouring into the business. A third of robot companies are less than six years old and make service robots. The costs of research and development are coming down and investment is rising. Within a decade, Mr Pratt reckons, domestic robots will help people cook at home and car-guidance systems will keep them mobile for longer.

But for that to happen, robots will have to perform a dauntingly long list of things they cannot yet do. They cannot navigate reliably around an ordinary home, move their hands with human dexterity, or conduct open-ended conversations. Although they can provide some physical assistance to the elderly, one robot can do only one thing, so multiple tasks would require your home to be stuffed with machines.

Their pattern recognition is not 100% reliable. One image classifier could not tell the difference between a snow plough and an overturned school bus. Robots struggle to operate on the basis of incomplete information, or

to adapt to novelty as quickly as humans do. Driverless cars are proving harder to develop than most people expected. Rodney Brooks, a professor at MIT, reckons that driverless services comparable to those offered by conventional taxis are unlikely before 2032. Google's Duplex, an AI-enabled personal assistant launched in 2018, can so far make appointments only for hair salons and restaurants. All this suggests that, as solutions to the problems of ageing, robots have some way to go.

Their limitations have significant implications. Robots that make the end of life more bearable are likely to remain expensive for many years, so only rich people will buy them. That may limit their wider social acceptance. Companies may not be able to automate their way out of future skills shortages. Other responses, such as raising wages, attracting more women into paid work and allowing more migration, will be just as important. Last, there may be room for the expansion of global supply chains, as work shifts from ageing China and other middle-income countries, to Africa and poorer places with more labour. Ageing demands a robotics revolution but it may be slow to arrive. ■



人口结构与自动化

照顾祖母的机器人

面对老龄化，世界需要一场机器人革命。但机器们似乎还没有准备好

吉尔·普拉特（Gill Pratt）坐下来，与日本面试官讨论担任丰田研究所（丰田汽车新设立的研究部门）负责人的事宜。对方在纸上写了一个词，让他再说说想法。“痴呆症”。普拉特是机器人领域最受尊敬的人物之一，曾组织竞赛为五角大楼寻找半自动人工智能机器人。要他聊这个题目看起来好像有点怪。但是，普拉特说，丰田对老龄化的关注是他接受这项工作的一个重要原因。“我们所有人面对的一个问题，”他说，“是怎样利用技术，在人们变老之时提高生活质量？”

老龄化和机器人之间的关系比我们以为的更密切。出生率高的年轻国家机器人数量少，老龄化国家则很多。每个产业工人对应的机器人数量最多的国家包括韩国、新加坡、德国和日本，这些国家的劳动力是全球最高龄的。

老龄化与机器人之间的这种关联性不只反映了年轻国家往往因贫穷而买不起精密的机器这一事实（它们本来也不需要这些机器）。在富裕国家同样也成立。与劳动力规模相比机器人数较少的国家有英国和法国，这两个国家按富国标准老龄化的速度都较慢。

最近的两项研究量化了这种关系。麻省理工学院的达龙·阿西莫格鲁（Daron Acemoglu）和波士顿大学的帕斯卡尔·雷斯特罗（Pascual Restrepo）表示，在1993年至2014年期间，对机器人投资最多的国家是老龄化进程最快的国家（按56岁以上人口与26至55岁人口之比的增幅计算）。作者提出了一个经验法则：这些国家的老龄化速率每提高10个百分点，每千名工人对应的机器人数量就增加0.9个。

德国的一项研究使用了不同的衡量方法，但得出了相同的结论。哥廷根大学的安娜·阿比兰斯基（Ana Abeliansky）和霍恩海姆大学的克劳斯·普雷特

纳（Klaus Prettner）发现，每千名工人对应机器人的数量的增速是人口增速下降速度的两倍（即人口增长率每下降1%，机器人密度增长2%）。人口增速与年龄结构密切相关。

这些发现应该不足为奇。机器人通常会替代劳动力，所以才有许多人担心它们会破坏工作岗位。拥有大量年轻工人的国家不需要替代劳动力。那里的工资水平往往很低，自动化无利可图。但老龄化以两种方式创造了对自动化的需求。首先，随着越来越多的人退休，为了防止产出下降，必须用机器替代减少了的劳动力或辅助老龄工人继续从事体力劳动。其次，一旦人们退休，就会为新型自动化创造市场，包括满足无法自理人士的医疗及其他护理要求。

因此，机器人与老龄化之间有强关联性。阿西莫格鲁认为，老龄化是对一国机器人数影响最大的单一因素。他估计各国机器人数差异中接近40%是由该因素决定的。

这一影响将不断增强。今年，65岁以上的人口数量将在人类历史上首次超过五岁以下人口。到2060年，65岁以上的美国人口将翻一番，达到9800万人；而在日本，40%的人口将在65岁及以上。除非有机器人的帮助（而且可能还要接受大量移民），否则将没有足够的年轻人去照顾这么多老年人。

劳动力队伍的萎缩及老龄化也有同样大的影响。中国现在是世界上最大的机器人制造国，2017年生产了13.79万台工业机器人（一般都是装配线上使用的机器）。据联合国统计，2015年至2040年，中国的劳动年龄人口（20至64岁）将大幅减少1.24亿，降幅超过13%。按阿西莫格鲁的经验法则计算，到这一时期末端，中国将需要再安装大约200多万台机器人。这是2018年全世界工业机器总产量的四倍多，是过去九年全球新增机器人数量的六倍。

即使在英国这样老龄化速度比中国慢的国家也存在这些问题。咨询公司美世（Mercer）称，2016年至2025年，英国30岁以下劳动人口的占比将下降

4个百分点，而50岁以上劳动人口占比将上升10个百分点。这听起来问题不大，但它掩盖了地区间的巨大差异。在同一段时期，伦敦（还是相对年轻的城市）30岁以下劳动人口占比将下降四分之一，而50岁以上的占比将上升得更多。

这将给一些行业带来巨大压力。目前英国三分之一的教师和建筑工人、超过三分之一的医疗工作者、农民和货车司机都已经年过五旬。他们正在大批地退休。2015年的一项民意调查发现，三分之一的医生计划到2020年退休。这还是一个老龄化进程相对温和的国家。自动化不是解决技能短缺的唯一方法——移民和延迟退休也有帮助，但它是最重要的方法之一。

接下来的几年里，人口结构变化将改变人们需要的机器人种类，并增加机器人实际部署的数量。目前，机器人市场的主体是用于组装汽车或电气设备的工业机器人。2017年工业机器人系统的销售额为480亿美元，是“服务机器人”的七倍。服务机器人包括用于仓库作业的物流机器人、医疗机器人、挤奶机器人、帮助人们搬运重物的外骨骼机器人和为地板吸尘的家用机器人。

随着人口结构变化加快，服务机器人将变得更加重要。服务机器人的制造商希望，有朝一日，它们将帮助老年人更长时间地独自生活 and 保持行动能力。机器人将有助于缓解孤独感并减轻痴呆症的影响。它们将让照顾养老院里的老人变得更加容易，并帮助想要继续工作的老年劳动者应付工作中的体力要求。这些机器人也将与工业机器人有着根本的不同，工业机器人往往是代替人类工作，比如安装汽车挡风玻璃。相比之下，服务机器人则是扩展人类的能力。例如，如果外骨骼机器人帮助某人搬起重物，那么这个人仍然必须在场。

在日本能最清楚地看到这场机器人革命的萌芽。索尼制造的人工智能机器小狗爱宝（AIBO）和日本国立产业技术综合研究所（National Institute of Advanced Industrial Science and Technology）制造的毛茸茸的机器海豹Paro是针对患儿和痴呆患者的治疗型机器人。软银制造的Pepper是一个人形机器人，可以就限定的主题与人对话，只要人类对话者不偏离话题太

远。MySpoon是为那些无法自己进食的人开发的喂饭机器人。Cyberdyne研制的HAL和Innophys研制的Muscle Suit是帮助护士搬抬患者的外骨骼机器人（HAL是“混合辅助肢体”的缩写）。松下的Resyone是一种可以变形成轮椅的机器床。各类机器人花样繁多，不一而足。

对这些新奇机器人的需求正在快速增长，尽管基数很小。索尼表示，新款爱宝在2018年1月上市后的三个月里售出了11,111台。日本政府估计，现在8%的养老院有起重机器人，而日本的国家机器人战略（每个国家都应该有一个机器人战略）要求到2020年，五分之四接受护理的老年人要由机器人提供部分护理。

但就目前而言，这项技术距离带来变革性影响还有很长的路要走。国际机器人联合会（International Federation of Robotics）称，2018年估计售出了2万台可以说是真正有助于应对老龄化的机器人（医疗机器人、残障辅助机器人、外骨骼机器人等）。这还不到工业机器人的5%。

这个数字无疑会增长，问题是有多快。普拉特很乐观。他认为，在过去五年中，人工智能取得了巨大进步，这让机器能够在从事某些类型的信息处理任务时超越人类，特别是在模式识别方面，机器人（在一定范围内）可以比人类更快、更可靠地执行任务。新企业正在涌入这一市场。目前三分之一的机器人公司成立不到六年，专门制造服务机器人。研发成本正在下降，投资也在增加。普拉特估计，十年内，家用机器人将能帮助人们在家做饭，而汽车引导系统将让人们能够乘车出行更长时间。

但要实现这样的前景，机器人将必须能够执行大量目前还无法完成的任务。它们还无法在一个普通住宅中安全可靠地行动，无法像人那样灵活地使用双手，也无法展开开放式对话。虽然它们可以为老年人提供一些身体上的帮助，但一个机器人只能做一件事，要执行多个任务就需要家里堆满机器。

机器人的模式识别并非百分百可靠。有一个图像分类器无法区分雪犁和翻覆的校车。机器人很难根据不完整的信息作业，或像人那样快速适应新状

况。无人驾驶汽车的开发比大多数人预期的更难。麻省理工学院的教授罗德尼·布鲁克斯（Rodney Brooks）认为，在2032年之前不太可能实现可与传统出租车相媲美的无人驾驶服务。谷歌的人工智能助理Duplex在2018年推出，到目前为止只能向发廊和餐馆做预约。所有这些都表明，要成为老龄化问题的解决方案，机器人还有一段路要走。

机器人的局限性具有重要影响。让生命最后阶段变得好过些的机器人在未来很多年里仍有可能很昂贵，只有富人才会购买。这可能会限制机器人在社会上的普及。企业可能无法依靠自动化来解决未来技能短缺的问题。提高工资、吸引更多妇女从事有偿工作，以及接受更多移民等其他政策也同样重要。最后，随着工作从老龄化的中国和其他中等收入国家转移到劳动力较多的非洲和其他贫困地区，全球供应链可能会有扩大的空间。老龄化需要机器人革命，但这场革命可能会来得很慢。■



Border-control technology

The invisible boundary

New systems could make hard frontiers disappear, but the level of background surveillance would be uncomfortable

It is an all too familiar scene. Long queues of people and vehicles waiting to cross a border, paperwork all in a flutter and stony-faced customs officials rummaging through belongings and peering into the backs of lorries. A question on many minds is whether technology can do away with such perturbations. And the answer is yes. New systems are making it easier to cross borders on land, at ports and in air terminals. Within a few years it should be possible, at least in theory, for a border to become invisible. People and goods would flow through without stopping, leaving all the formalities to take place electronically and out of sight.

This might appear the ideal answer to the seemingly intractable problem of the nature of the border between Britain and Ireland when Britain leaves the European Union. Neither side wants the return of a “hard” border of physical infrastructure, with its associated security and customs checks. But retaining an open border would impose legal constraints on Britain’s freedom to change its laws in ways that diverge from the EU’s. To many on the British side, this would be tantamount to keeping Britain in the EU.

If technology could make the border invisible on the ground, leaving legal checks to be done elsewhere, that might satisfy most parties. Yet as promising as the technology to do this is, in practice the cost of fully deploying the kit required for an open border is likely to be expensive, and the accompanying level of electronic surveillance too high for many to stomach, especially in Ireland.

Despite these concerns, a number of borders around the world are being

modernised with new technology, in order to become more open. The starting-point is taking the “paper” out of the paperwork. Documentation involved in shipping goods from one country to another is going virtual. Electronic customs declarations are being made easier to submit, allowing the pre-clearance of shipments and the online payment of tariffs.

Switzerland, for one, aims to digitise its border procedures with the EU fully by 2026. A SFr400m (\$400m) programme known as DaziT will provide a central online portal for all customs services. This will, for instance, let travellers use smartphones and tablets to declare foreign purchases on which duties may be owed.

The security of such systems is likely to be protected by blockchain, the technology that underpins cryptocurrencies like Bitcoin. A blockchain records transactions on a decentralised register in a way that is difficult to tamper with. Last May Singapore introduced electronic certificates of origin, based on blockchain, for goods travelling into and out of the country. The system, developed by vCargo Cloud, a local firm, allows a mobile-phone app to be used to scan a QR code, a fancy type of matrix bar code, attached to the goods in question. The app will reveal the certificate.

Singapore’s busy port, along with ports in Hong Kong, Rotterdam, Philadelphia and other places, have started to use a blockchain-enabled process called TradeLens. This is the result of a collaboration between Maersk, a big Danish shipping firm, and IBM, an American computer firm. TradeLens provides access to a range of electronic data tracking shipping containers and their contents for importers, freight forwarders, port operators and customs authorities.

One of the advantages of using blockchain is that it readily reveals if things have been tampered with. Every time a code or a sensor attached to goods is scanned, that event is logged in the blockchain and tagged with other data,

such as the location of the goods. But no system is foolproof, so authorities will want to ensure that whatever crosses their borders is what the data purport it to be. Hence some sort of facility for physical checks will still be needed.

That is largely the case at one of the most technologically advanced land borders: that between Sweden, an EU member, and Norway, which is part of the EU's single market but not a member of the EU's customs union. The 1,600km border is largely open for travellers, although automatic number-plate recognition (ANPR) cameras are used to monitor passing vehicles, and officials will pull over any suspicious ones. Electronic pre-arrival customs declarations have been introduced and, in some cases, Norway will let companies ship goods across unmanned crossings. Most lorries, however, still need to stop at specific manned crossings to have their details checked. If it is not too busy, this need take only a few minutes.

Lars Karlsson, a Swedish customs expert, looked at what technologies could be used to reduce or eliminate the need to stop and undergo border checks, with a particular reference to Ireland, in a report presented to the European Parliament in 2017. Mr Karlsson said any such system would, as a starting-point, require a fully electronic environment for documentation and payments.

It would work something like this. Pre-registered companies, sometimes called "trusted traders", would have to submit additional information, such as details of the lorry being used and the person driving it. The driver might need an enhanced licence containing biometric data (facial scans, for example). As the lorry approached a border it would be identified by ANPR cameras. Other roadside sensors would detect a code placed on the driver's mobile phone, which would identify him. The system would text a customs release note to the driver and alert authorities that the goods stated on an electronic manifest have just passed over. At a hard border, the release note

might instead open a gate automatically for the lorry to drive through.

No country has yet put together all these elements to create an open border. The obstacles are not technological, though. For one thing, since it would need co-ordination between different customs authorities, the negotiations could be protracted. Some companies have also expressed concern that trusted-trader schemes might prove bureaucratic and expensive, especially for small firms.

Assuming such problems can be overcome, authorities would still want ways to catch smugglers. Again, technology can help. It is now reasonably straightforward to use mobile-phone networks and satellites to track people, goods and vehicles. This would let authorities check that cargo arrives at its intended destination. Fujitsu, a Japanese firm, says that cameras can be used to read not just number plates but also the identification markings on containers, and check that seals have not been tampered with. Using artificial-intelligence techniques, the company reckons cameras can be taught to recognise the faces of drivers as well.

At some point physical checks will be needed, although these do not have to be carried out at a border. Vehicles could be pulled over at other locations for random shakedowns or because the data flag something as suspicious. Mobile customs units could carry out checks, even at delivery locations, using hand-held devices to scan, at a distance, smart tags attached to individual products and cartons. And other techniques are available, too. Container x-ray scanning is becoming faster, more powerful and capable of identifying not just outlines but also detail, including people hiding inside. Some of this scanning equipment is mobile.

As for keeping an eye on people crossing borders, systems being developed for use at airports might find wider use. One idea is a single digital travel

“token” to speed people through airport terminals, even on multiple legs of a journey. A prototype of such a system has been developed by SITA Lab, a Swiss technology group owned by the airline industry.

In SITA’s system the token resides on a traveller’s mobile phone and represents encrypted travel documents, passport details and other information. Whenever the traveller arrives at a checkpoint or is stopped by an official, the app is used to generate a QR code. That code is then scanned to confirm the traveller’s details. These are held in a database secured, as might be expected, by blockchain. Regular commuters across land borders could carry similar tokens on their mobile devices.

For remote borders with little or no infrastructure, there are various techniques that can keep an eye, or rather an ear, out. QinetiQ, a British firm, has a system called OptaSense, which uses a fibre-optic cable laid in the ground. Sound from above creates vibrations in this cable. These affect its light-carrying properties. Those changes can be detected at a distance by shining a laser through the cable. The equipment is sensitive enough to discriminate between the sounds made by different types of vehicle, such as a tractor or a lorry, and to detect people walking about.

Given enough money and determination, it should therefore be possible to make a hard border disappear. The difficult bit is the politics—especially whether the level of background surveillance required would be acceptable to people. In Ireland, with its long history of troubles, that is unlikely to be the case. Even a solitary ANPR camera at an Irish border crossing might be blown up. However, in other parts of the world, where hard borders now exist, travellers are likely to find that their passage will become easier. ■



边界控制技术

无形的边界

新系统可能会让实体边界消失，但后台监控的程度会令人不快

这种场景再熟悉不过了：等待过境的人员和车辆大排长龙，文书工作一派忙乱，面无表情的海关官员翻查物品、窥看货车车厢。许多人不禁要问，技术能否终结这样的麻烦？答案是肯定的。新型系统的出现使得陆路、港口和航站楼的过境都变得更加便捷。不出几年，至少在理论上，“无形边界”有望得以实现。所有手续都将实现电子化和无形化，人员和货物无需停驻便能过境。

这似乎为一个看起来很棘手的问题提供了理想的解决办法：脱欧后的英国与爱尔兰之间的边界该是什么样？双方都不希望恢复有实体基础设施的“硬”边界，以及附带的安全和海关检查。但保持该边界的开放将使英国受到法律限制，不能以脱离欧盟法律的方式修改自身法律。在很多英国人看来，这无异于让英国继续留在欧盟。

如果技术真能让地面边界无形化，让法定检查挪到其他地点进行，可能会令多方满意。然而，尽管技术上有望实现这一目标，但在实际操作中，全面部署开放型边界所需的设备可能成本不菲，随之而来的电子监控程度之高也会令很多人难以接受，特别是在爱尔兰。

尽管存在这些担忧，全球有一些边界正在利用新技术实现现代化，以求变得更开放。首先是让文书工作“无纸化”。跨国货运的相关文件已逐步虚拟化。电子报关单的提交变得更加简便，从而可实现货物预清关和在线支付关税。

举个例子，瑞士力争到2026年全面实现与欧盟的边界手续数字化。斥资4亿瑞士法郎（合4亿美元）打造的名为DaziT的项目将提供一个集合了所有海关服务的中央门户网站。例如，旅客可以使用智能手机和平板电脑在该网站申报可能需要缴纳关税的商品。

这类系统的安全性很可能由区块链来保障。区块链是比特币等加密货币的底层技术，在一个去中央化的分类账上记录交易，难以篡改。去年5月，新加坡推出了基于区块链的原产地电子证书，用于进出口货物。该系统由新加坡本土公司vCargo Cloud开发。用户使用一款智能手机应用扫描商品上的二维码（一种异常复杂的矩阵式条码）后，应用中就会显示原产地证书。

繁忙的新加坡港，还有香港、鹿特丹、费城等港口也已开始采用一种叫作TradeLens的区块链平台。TradeLens是丹麦大型船运公司马士基与美国计算机公司IBM合作的成果。它为进口商、货运代理、港口经营商及海关当局提供一系列追踪集装箱及内部货物的电子数据。

使用区块链的优点之一是数据若遭篡改，很容易就会被发现。每次扫描货物上的编码或传感器，都会被作为一起事件录入区块链，并标上货物位置等其他数据。但是，没有哪个系统能做到万无一失，因此各国海关当局若想确保所有跨境物品都与数据所示相符，就仍需要配备某些设备用于现场检查。

瑞典和挪威两国边界的情况大体就是如此。这里是技术部署最为先进的陆地边界之一。瑞典是欧盟成员国，挪威虽属于欧盟单一市场，却不是欧盟关税同盟的成员。两国间1600公里的边境线大部分都对旅客开放，不过仍有自动车牌识别（ANPR）摄像头监控过往车辆，边境工作人员也会拦停任何可疑车辆。两国边境已采用电子预办报关，在某些情况下，挪威还允许公司通过无人值守的过境口岸运送货物。但大多数卡车仍需在有人值守的特定过境口岸停留，接受盘查。口岸不是太过繁忙的情况下，过程只需几分钟。

瑞典海关专家拉尔斯·卡尔松（Lars Karlsson）2017年向欧洲议会提交了一份报告，研究了可采用哪些技术来减少或消除拦停车辆接受边检的需要，其中特别提到了爱尔兰。卡尔松表示，所有此类系统一开始都需要一个全电子化的文书处理和支付环境。

其流程大致如下。预先注册的公司——有时也被称为“受信任的贸易商”，必须提交运货卡车及其司机的详细资料等附加信息。司机可能需要一个包含其生物特征数据（如面部扫描）的加强版驾照。当卡车靠近边界时，ANPR摄像头会尝试识别它。路边其他的感应器会探测到司机手机上的一个编码，从而识别其身份。系统会向司机发送海关放行单的短信，并提醒海关当局电子舱单上申报的一批货物刚刚通过。如果经过的是一个具有实体设施的硬边界，放行单可能会自动打开门，让卡车通过。

目前还没有哪个国家将所有这些元素整合起来，创建一个开放的边界。但障碍并不在技术上。比如，由于需要不同的海关当局作出协调，相关谈判可能会旷日持久。一些企业还表示担心“受信任贸易商”计划涉及繁复的审批而又价格高昂，尤其会令小公司难以负担。

假设这些问题都能解决，海关当局仍需要想办法来抓捕走私犯。技术再次派上用场。现在已经可以比较容易地使用移动电话网络和卫星来追踪人员、货物和车辆。这能让当局核实货物是否到达原定目的地。日本富士通公司表示，摄像头不仅可用来读取车牌，还能读取集装箱上的标识，并检查封条是否被动过手脚。富士通认为，依靠人工智能技术，还可以训练摄像头对司机进行人脸识别。

现场检查仍然需要，但不必在边界进行。车辆可能会在其他地点被拦停接受随机盘查，也可能会因为数据显示存在可疑之处而被拦停。流动海关小组甚至可以在交货地实施检查，使用手持设备从远处扫描贴在产品和纸箱上的智能标签。还有其他技术可供使用。集装箱X射线扫描正变得更快速，也更强大，不仅能识别轮廓，还能辨认细节，包括躲藏在里面的人。有一些扫描设备还是可移动的。

在监视过境人员方面，某些研发中的用于机场的系统可能会有更广泛的用途。方案之一是使用个人专属的数字旅行“标识”来加快人员的离港速度，即便涉及同一个旅程的多个行程段。航空业下属的一个瑞士技术机构SITA Lab已经开发了这样一个系统的原型。

在SITA的系统中，“标识”存在于旅客的手机中，它包含了加密的旅行证件、护照资料和其他信息。每当旅客抵达边检站或被海关官员拦下时，就可以使用应用程序来生成一个二维码。该二维码会被扫描以确认旅客的详细信息。这些信息都被储存在一个数据库中。正如所料，这个数据库由区块链保护。定期出入陆路边界的通勤者可以在他们的移动设备上装载类似的标识。

对于几乎或完全没有基础设施的偏远边界，有各种各样用于监视（或者更确切地说是监听）的技术可供使用。英国公司QinetiQ开发的OptaSense系统使用了铺设在地下的光缆。地面声音在光缆中产生的振动会影响光缆的导光性。通过在光缆中发射激光可以远距离探测到这些变化。这套设备的灵敏度足以区分拖拉机或卡车等不同车型发出的声音，并能探测到人的走动。

因此，只要有足够的资金和决心，硬边界应该还是有望消除。难就难在政治方面，尤其是后台监控所需达到的程度能否为人们接受。饱受长期动乱的爱尔兰就不大可能接受。在爱尔兰的过境口岸，单单放置一个ANPR摄像头都有可能被炸毁。然而，在世界其他地方的硬边界，旅客们应该会发现通行变得更加便捷了。 ■



China's economy

Can pandas fly?

If Xi Jinping reforms the economy, he could both calm the trade war and make China richer

For the past two weeks Chinese and American negotiators have been locked in talks in Beijing and Washington to end their trade conflict before the deadline of March 1st, when America will ratchet up tariffs on Chinese goods or, perhaps, let the talks stretch into extra time. Don't be distracted by mind-numbing details on soyabean imports and car joint-ventures. At stake is one of the 21st century's most consequential issues: the trajectory of China's \$14trn economy.

Although President Donald Trump started the trade war, pretty much all sides in America agree that China's steroidal state capitalism makes it a bad actor in the global trading system and poses a threat to security. Many countries in Europe and Asia agree. At the heart of these complaints is the role of China's government, which funnels cheap capital towards state firms, bullies private companies and breaches the rights of foreign ones. As a result, China grossly distorts markets at home and abroad.

The backlash is happening just as China's model of debt, heavy investment and state direction is yielding diminishing returns. Growth this quarter may fall to 6%, the worst in nearly three decades. Many suspect that the true figure is lower still. By opening the economy and curbing the state, Xi Jinping, China's autocratic leader, could boost performance within China's borders and win a less hostile reception beyond them. He is loth to limit the power of the government and the party, or to accept American demands. But China's path leads to long-term instability.

Its leaders are entitled to feel smug. The party has presided over one of

history's great successes. Since 1980 the economy has grown at a 10% compound annual rate as nearly 800m people have lifted themselves out of poverty. A country that struggled to feed itself is now the world's biggest manufacturer. Its trains and digital-payments systems are superior to those of Uncle Sam, and its elite universities are catching up in the sciences. Although inequality and pollution have soared, so have living standards.

Yet since Mr Xi took power in 2013, China has in some ways gone backwards. Two decades ago it was possible, even sensible, to imagine that China would gradually free markets and entrepreneurs to play a bigger role. Instead, since 2013 the state has tightened its grip. Government-owned firms' share of new bank loans has risen from 30% to 70%. The exuberant private sector has been stifled; its share of output has stagnated, and firms must establish party cells which then may have a say over vital hiring and investment decisions.

Regulators meddle in the stockmarket, critical analysis is suppressed and, since a botched currency devaluation in 2015, capital flows are tightly policed. Mr Xi has ignored Deng Xiaoping's advice to "hide your capabilities and bide your time", launching the "Made in China 2025" plan, an attempt to use state direction to dominate high-tech industries. This has alarmed the rest of the world, though it has yet to produce results.

Make no mistake, Mr Xi's approach can continue for some time. Whenever the economy slows, stimulus is injected. In January banks extended \$477bn of loans, a new record. But structural shifts are working against China. The working-age population is shrinking. Investment is a swollen 44% of GDP. As resources are sucked up by wasteful projects and inefficient state firms, productivity growth has slowed. Now that debt has surged, interest payments will amount to nearly three-quarters of new loans.

The backlash abroad risks becoming yet another drag. As barriers to trade

rise, China cannot rely on the rest of the world for growth. Its share of world exports will struggle to rise above today's 13%. Its biggest and most sophisticated firms, such as Huawei, are viewed with suspicion in Western markets (see Business section). Mr Xi promised a "great rejuvenation" but what beckons is lower growth, more debt and technological isolation.

China's leaders have underestimated the frustrations behind the trade war. They have assumed that America could be placated with gimmicks to cut the trade deficit, and that the row will end when Mr Trump leaves the Oval Office. In fact American negotiators, with the support of Congress and the business establishment, have demanded deep changes to China's economy. Western opposition to China's model will outlast Mr Trump.

To deal with hostility abroad and weakness at home, Mr Xi should start by limiting the state's role in allocating capital. Banks and financial markets must operate freely. Failing state firms should go bust. Savers must be permitted to invest abroad, so that asset prices reflect reality, not financial repression. If money flows to where it is productive, the charge that the economy is unfairly rigged will be harder to sustain and the build-up of bad debts will slow.

Mr Xi also needs to temper China's industrial policy. It is too much to imagine that it will privatise its 150,000 state firms. But it should copy Singapore, where a body called Temasek holds shares in state firms, giving them autonomy while requiring that they operate as efficiently as the private sector. Spending on industrial policy should shift away from grandiose schemes such as Made in China 2025 towards funding basic research.

Lastly, China must protect the rights of foreign firms. Within China that means giving foreigners full control of subsidiaries, including over their technological secrets. Beyond its borders it means respecting intellectual

property, which will be in China's interest as its firms grow more sophisticated.

Given China's poor record, America will need room to respond through tariffs or arbitration if China does not meet its commitments. But America should also reward good behaviour. If Chinese firms can use greater transparency to persuade it that they are operating on commercial principles, they should be treated like businesses from any other country.

Today, these reforms seem a distant prospect. But they were accepted wisdom among China's technocrats a decade ago. They are also popular at home. Corporate bosses and senior officials say that they want American pressure to get through to Mr Xi in a way they cannot. Under him, China is becoming trapped in a bad cycle of sluggish growth, debt, state control and hostility abroad. A more economically liberal China would end up richer and make fewer enemies. It is time for Mr Xi to change course. ■



中国经济

熊猫能飞吗？

如果习近平进行经济改革，他既可能平息贸易战，又能让中国更富裕

在过去的两周里，中美谈判代表在北京和华盛顿紧锣密鼓地谈判，以期在3月1日截止日期之前结束贸易冲突，否则届时美国将对中国商品加征新的关税，或者也可能延长谈判。别把注意力放在大豆进口和汽车合资企业等令人头昏脑胀的细节上。谈判影响最大的是21世纪最重大的议题之一：规模达14万亿美元的中国经济的发展走向。

虽然贸易战是由特朗普发起，但美国几乎各方都同意，中国强势的国家资本主义让它成了全球贸易体系中的坏分子，对安全构成了威胁。欧洲和亚洲的许多国家也都认同这一点。它们不满的核心是中国政府扮演的角色：它将廉价资本输送给国有企业，欺凌私营公司，侵犯外国公司的权利。结果就是中国严重扭曲了国内外市场。

外界出现这些强烈反弹之时，恰逢中国“举债、大量投资和政府指导”的发展模式带来的收益在缩减。本季度中国经济增速可能降至6%，是近30年来的最小增幅。许多人怀疑真实的数字还要更低。中国的专制领导人习近平可以通过开放经济和限制政府权力来提升中国国内的经济表现，并减轻国外对中国的敌意，让世界更接纳中国。他不愿意限制政府和共产党的权力，或接受美国的要求。但这样一来中国就会走向长期不稳定。

中国领导人有权感到洋洋自得。共产党主政领导了历史上的巨大成功之一。1980年以来，近八亿人摆脱了贫困，经济年复合增长率达10%。一个曾挣扎在温饱线上的国家现在已是世界上最大的制造国。它的高铁和数字支付系统比山姆大叔的更好，它的顶尖大学正在科学领域迎头赶上。虽然不平等和污染水平骤升，生活水平也急速提高了。

然而，自习近平2013年掌权以来，中国在某种程度上出现了倒退。20年前，人们还可以想象中国会逐步放开市场并让企业家发挥更大的作用，这

样的预期甚至可说是明智的。然而，自2013年以来，政府加强了控制力。国企占新增银行贷款的份额从30%上升到了70%。蓬勃发展的私营部门受到遏制，占经济产出的比例停滞不前。企业必须建立党组织，而党组织可能在重要的招聘和投资决策上有发言权。

监管机构干预股票市场，批判性分析遭到压制，而在2015年拙劣的货币贬值措施之后，资本流动也受到了严格监管。习近平不顾邓小平“韬光养晦”的忠告，推出了“中国制造2025”计划，试图通过政府指导来主导高科技产业。尽管尚未有成果，但这让世界其他地区感到紧张。

毫无疑问，习近平的做法还能维持一段时间。每当经济放缓，政府就会采取刺激措施。1月，银行贷款额创下4770亿美元的新高。但正在发生的结构性转变却对中国不利。劳动年龄人口正在萎缩。投资占GDP比重过大，达到44%。由于资源被铺张浪费的项目和效率低下的国有企业“吸干”，生产率增长已经放缓。由于债务激增，利息支付将达到相当于新增贷款的近四分之三。

国外的强烈反对可能会成为另一个不利因素。随着贸易壁垒的升高，中国不能依赖世界其他地区来实现增长。它在全球出口中的份额将难以超过今天的13%的水平。华为等中国最大最先进的企业在西方市场受到质疑。习近平承诺实现“伟大复兴”，但可能会迎来增长放缓、债务增加和技术孤立的局面。

中国领导人低估了贸易战背后的不满。他们以为只要要点花招减少贸易逆差就能安抚美国，而等特朗普离开椭圆形办公室贸易争端就能结束。事实上，在国会和商界的的支持下，美国谈判代表要求中国进行深层次的经济改革。西方对中国模式的反对将比特朗普的任期更长久。

要应对国外的敌意和国内的疲弱，习近平首先应限制政府在分配资本方面的作用。银行和金融市场必须自由运作。亏损的国有企业应该破产。必须允许有储蓄的人在国外投资，让资产价格反映现实，而不是金融抑制。如果资金流向效率更高的地方，外界就更难继续指控中国以不正当手段操纵

经济，坏账的累积也将减缓。

习近平还需要调和中国的产业政策。若想象中国会将其15万家国有企业全部私有化有些不切实际。但它应该效仿新加坡。该国的淡马锡公司持有国企的股份，给予国企自主权，但同时要求它们像私营部门那样高效运作。产业政策支出应该从诸如“中国制造2025”这样浮夸的计划转向资助基础研究。

最后，中国必须保护外国企业的权利。在国内，这意味着让外国企业能完全控制其子公司，包括它们的技术机密。在海外，这意味着尊重知识产权，而随着中国企业变得越来越高精尖，这也将符合中国的利益。

鉴于中国以往的不良记录，如果中国不履行承诺，美国将需要有空间通过关税或仲裁做出回应。但美国也应对其良好行为予以奖励。如果中国企业可以提高透明度，说服美国它们是在按照商业原则运作，那么就应该受到和任何其他国家的企业一视同仁的对待。

今天，这些改革看似遥遥无期。但在十年前它们是中国技术官僚们的共识。如今在国内仍然有很多人期冀这样的改革。企业老板和高级官员说，他们希望美国的压力能让习近平想明白，而这件事是他们做不到的。在习近平的领导下，中国正陷入增长缓慢、债务累积、国家控制和他国敌视的恶性循环之中。一个经济更自由的中国最终会更加富裕也更少树敌。现在是习近平改变方向的时候了。 ■



Unwinding quantitative easing

A delicate balance

Is the Fed's shrinking balance-sheet causing market turbulence?

AS DULL AS "watching paint dry". That was how Janet Yellen, the former head of the Federal Reserve, described plans for a gradual unwinding of its \$4.5trn balance-sheet announced in September 2017. The Fed's stock of assets had swelled during the previous decade as it engaged in "quantitative easing" (QE), seeking to ease the pernicious effects of the global financial crisis. Now that the economy had recovered, it planned to shrink its balance-sheet again.

The plan was to set a path and proceed on autopilot. This, it was hoped, would avoid the pace of unwinding being taken as a signal of the direction of interest rates. It would start slowly, just \$10bn a month from October 2017, and smoothly pick up pace. By October 2018 it had quickened, as planned, to \$50bn.

That coincided with the start of a bout of market turbulence. The S&P 500 index of leading shares fell by 14.0% in the final three months of 2018. The yield on ten-year Treasuries fell by 0.7 percentage points, peak to trough, suggesting growing pessimism about long-term growth. The coincidence of timing led many to blame the turbulence on the tightening.

The Fed's expanding balance-sheet was intended to achieve different things at different times. The first was to provide banks in crisis with liquidity. The second was to signal to markets that monetary policy would remain loose for some considerable time. The third was to reduce bond yields, encouraging investors to buy riskier assets.

The current unwinding is unlikely to affect liquidity much: banks still hold significant excess reserves. And any signal sent by shrinking the balance-sheet would have come when the policy was announced, not when it was carried out. Since the Fed was on autopilot, “the path of the balance-sheet should already have been baked in to the market”, says Richard Benson of Millennium Global, a hedge fund.

That leaves the question of whether QE encouraged investors to buy riskier assets, like stocks. “If you thought QE reduced yields in the first place, you should think the reversal might have the opposite effect,” says Glenn Hubbard, chairman of George W. Bush’s Council of Economic Advisers. The Fed’s economists estimated that the effect of QE had been to lower long-term bond yields by one percentage point.

But that does not imply that shrinking the balance-sheet caused market troubles. That yields would rise by as much as they fell is unlikely for several reasons. The Fed does not plan to shrink its balance-sheet to pre-crisis levels. Nor is all else equal. The end of QE in Europe, announced last December, is a new source of uncertainty. If the market thought a big rise in long-term rates was likely, the term premium—the difference between short- and long-term interest rates—would have jumped as unwinding was announced (it did not). Besides, bond investors have other worries. Tim Duy of the University of Oregon, the author of a widely read blog, “Fed Watch”, points to increased issuance of Treasuries, a consequence of a bigger fiscal deficit.

The problem facing the Fed is how to react to the charge that its unwinding of QE is causing the market’s jitters. If Jerome Powell, its chairman, ignores these concerns, it could cause further turbulence. But the more he says about the pace of unwinding, the more likely it is that markets start to read it as a signal of broader monetary policy. On January 4th he said he “would not hesitate” to slow down if policymakers decided that it was “part

of the problem". Markets rejoiced: the S&P 500 rose by 3.4% that day. But, by speaking, Mr Powell drew markets' attention to the Fed's balance-sheet—just what he least wanted to do. ■



退出量化宽松

微妙的平衡

美联储缩减资产负债表规模引发市场动荡？

就像“看着油漆变干”那样乏味。美联储前主席珍妮特·耶伦曾这样形容美联储于2017年9月宣布的计划：逐步缩减其规模高达4.5万亿美元的资产负债表。在此前的十年里，美联储的资产存量因为实行“量化宽松”政策（QE）而膨胀，该政策的目的是缓解全球金融危机的负面影响。彼时经济已经复苏，美联储遂计划再次缩减资产负债表的规模。

其计划是先设定好路线，再以“自动模式”推进。美联储希望以此避免人们把缩减资产规模的速度看作利率走向的信号。计划于2017年10月启动，一开始动作缓慢，每月仅缩减100亿美元，然后平稳地加快步伐。到2018年10月，已按计划提高到每月缩减500亿美元。

此时恰逢市场开始新一轮动荡。2018年最后三个月，标普500指数下跌14.0%。十年期国债收益率从波峰至谷底缩水了0.7个百分点，表明人们对长期增长的前景愈发悲观。时间上的巧合导致许多人将市场波动归咎于紧缩计划。

美联储原本是在不同时期为实现不同目标而不断扩大资产负债表的。首先是为危机中的银行提供流动性。再来是向市场发出信号，表明货币政策将在较长的时期内保持宽松。最后是降低债券收益率，鼓励投资者购买风险较高的资产。

目前的缩表行动不会对流动性产生太大影响，因为银行仍持有大量超额准备金。而缩表带来的任何信号在政策宣布时就已发出，而非等到计划执行时。由于美联储是以“自动模式”缩表，“资产负债表的变化路径应该已经被市场提前消化”，对冲基金千禧全球（Millennium Global）的理查德·本森（Richard Benson）表示。

那就剩下最后一个问题：量化宽松是否鼓励了投资者购买股票等风险较高的资产。小布什执政时的经济顾问委员会主席格伦·哈伯德（Glenn Hubbard）说：“如果你认为量化宽松降低了债券收益率，那么你也应该会想到政策逆转可能产生相反的效果。”美联储的经济学家估计量化宽松让长期债券收益率降低了一个百分点。

但这并不意味着缩表导致了市场动荡。债券收益率不太可能当年跌多少现在就回升多少，这有几个方面的原因。美联储不打算将其资产负债表缩减到危机前的水平。而且其他各方面的情况也不等同。去年12月，欧洲宣布结束量化宽松，这是一个新的不确定因素。如果市场认为长期利率会大幅上升，那么长短期利差就会随着美联储宣布缩表而加大（但事实并非如此）。此外，债券投资者还有其他担忧。著名博客美联储观察（Fed Watch）的作者、俄勒冈大学的蒂姆·杜伊（Tim Duy）就指出，扩大财政赤字导致了增发国债。

美联储面临的问题是如何应对那些认为是退出量化宽松导致了市场波动的指责。如果美联储主席杰罗姆·鲍威尔（Jerome Powell）无视这些担忧，可能会引发进一步动荡。但他越是谈论退出的步调，市场就越有可能将其解读为更广泛货币政策的信号。1月4日，他表示，如果政策制定者认定这是“问题的一部分”，那么他“会毫不犹豫”放慢脚步。市场欢欣鼓舞，标普500指数当天上涨3.4%。但是，鲍威尔的此番言论引来了市场对美联储资产负债表的关注，而这正是他最不希望发生的。■



Autonomous cars

It takes a village

Why retired people could be ideal passengers in self-driving cars

New technologies, from the Walkman to the iPhone, have tended to be adopted first by the young. But when it comes to self-driving cars, the most logical early adopters are the retired. That, at least, is the conclusion reached by Voyage, a startup based in Silicon Valley. It is testing its autonomous vehicles (AVs) in The Villages, a retirement community in Florida with a population of 125,000 people. Retirement towns are ideally suited to AVs for three reasons, says Oliver Cameron, Voyage's CEO.

First, the environment is simpler and easier for an AV to navigate than a bustling city centre. Speed limits are lower, road layouts are less complex and there are fewer other vehicles. Second, there is strong demand for mobility. Active retirees want the ability to get around but they may not want the expense and hassle of owning a car. For residents who are unable or have lost the confidence to drive, summoning a vehicle when needed has obvious appeal. Prototype AVs have attracted criticism and outright hostility from locals in some parts of America. Voyage has been warmly welcomed in The Villages, says Mr Cameron.

Third, there is a clear road to a large market. The Villages is America's largest retirement community and one of the fastest-growing residential areas in the country. "We expect it to be the first city in the world to adopt AVs as the primary means of transport," says Mr Cameron. The number of such communities is growing fast as America ages.

There are other reasons why retirement communities and AVs fit together neatly. People generally prefer to retire to warm, sunny regions, so there is

little risk of snow confusing an AV's sensors. Because the roads are private property, there are fewer reporting requirements on AV operators and the regulatory situation is much simpler. And because everyone is retired, demand for rides is consistent throughout the day, which should make it easier to handle peaks without the need for a large fleet.

Voyage is now operating six prototype AVs in The Villages, with safety drivers on board for the time being to monitor performance and handle unexpected situations. It is also testing in a retirement community in San Jose. As part of its deal to become the exclusive provider of AV services in these places, Voyage granted a 0.5% stake in the firm to the owners of the two communities. That helps align incentives, says Mr Cameron. The final pricing model has yet to be decided. But he favours monthly contracts covering a certain number of trips (just as mobile-phone plans provide set amounts of calls and data).

Replacing car ownership for the aged may be easier than providing ride-sharing for young urbanites. "The state of the art in AVs is not ready for downtown San Francisco," says Mr Cameron. A 93-year-old woman who rode in one of Voyage's cars told him that she recalls travelling in a horse-drawn cab as a young girl. In old age, some people retreat into their past. But some Americans in retirement may already be living in the future. ■



无人驾驶汽车

集全村之力

为什么退休老人可能是无人驾驶汽车的理想乘客

从随身听到iPhone，种种新技术总是先被年轻人使用。但要说到无人驾驶汽车，早期使用者理应是退休人士。至少硅谷创业公司Voyage是这么看的。它正在佛罗里达的一个退休社区测试自己的无人驾驶汽车，这个名叫The Villages的社区居住着12.5万人。Voyage的CEO奥利佛·卡梅隆（Oliver Cameron）说，有三个原因让养老小镇成了使用无人驾驶汽车的理想之地。

首先，相比熙熙攘攘的城市中心，这里的环境更简单，更适合无人驾驶汽车行驶。限速较低，道路布局不那么复杂，其他车辆也更少。其次，这里的出行需求强劲。那些活跃的退休人士希望能够随处走动，但可能又不想负担养车的开销和繁琐。对那些不能开车或没信心开车的人来说，在有需要时能有车召之即来显然很有吸引力。无人驾驶原型车在美国的一些地方引来了批评和完全的敌意。而卡梅隆说Voyage在The Villages受到了热烈欢迎。

再者，通往一个庞大市场的路径很清晰。The Villages是美国最大的退休养老社区，也是发展最快的居住区之一。“我们希望这里成为全球首个以无人驾驶汽车为主要交通工具的城市。”卡梅隆说。随着美国人口的老龄化，这样的社区数量正在快速增加。

养老社区和无人驾驶汽车如此契合还有其他原因。人们退休后通常喜欢住在阳光充沛、气候温暖的地区，在这些地方，无人驾驶汽车的传感器不大可能会因为下雪而受干扰。这里的道路为私有，因而对无人驾驶汽车运营商的报告要求也较少，监管环境要简单得多。而因为住的都是退休老人，一天里的乘车需求比较均衡，也就不需要部署大量车辆来应对高峰期。

Voyage目前在The Villages里运营着六辆无人驾驶原型车，目前都有安全

驾驶员在车上监控车辆运行和处理意外事件。它还在圣何塞的另一个养老社区做测试。根据成为这些社区的独家无人驾驶汽车服务供应商的协议，Voyage向社区所有方授予0.5%的股份。这有助于让双方利益一致，卡梅隆说。最终的收费模式尚未确定。但他偏向包含一定行程次数的包月模式（就像包含一定通话时间和流量的手机套餐）。

让老年人放弃自有汽车可能要比向城市年轻人提供拼车服务容易。“最新的无人驾驶汽车技术还不能在旧金山市中心投用。”卡梅隆说。一位坐过Voyage车的93岁老妇人对他说，这让她想起自己年少时坐出租马车的经历。一些人老了以后会活在回忆中。但一些美国的退休老人可能已经活在未来了。 ■



UNIQLO

Back to basics

The third-largest clothing retailer wants to dominate the world from Asia

When asked what guides his vision of Uniqlo, Tadashi Yanai, its founder and chief executive, pulls off the shelf the 1987 autumn/winter collection catalogue of Next, a mass-market British retailer. All of the clothes are so classic, he says, that they could be worn today. While Inditex of Spain, which owns Zara, and Hennes & Mauritz of Sweden, the world's two largest clothing retailers, slavishly follow fashion trends, uniqlo, the main brand of the third-largest, Fast Retailing, of Japan, sticks to timeless basics.

Mr Yanai has a solid base at home from which to expand into his Western competitors' main markets of Europe and America. But instead his priority remains Asia. He wants to turn UNIQLO into the world's largest clothing retailer by becoming the first Asian "SPA" or speciality store retailer of private-label apparel. "Asia is the engine of growth today," he says, pointing to the millions of consumers across the region who are reaching the middle class. UNIQLO will open its first shop in India this year and is considering whether to expand into Vietnam and other countries (it has already opened networks of shops in Indonesia, Singapore and Thailand).

The success or not of UNIQLO's overseas operations matters greatly to investors at home. Fast Retailing's shares—Mr Yanai owns just over 20% of the firm—have been rising since 2015, largely, analysts reckon, owing to its international expansion and improved logistics. At home the firm is closing stores because the population is shrinking. Fast Retailing's operating profit in the year to August 2018 was ¥236.2bn (\$2.15bn), the bulk of which is made up by UNIQLO. Last year UNIQLO's international revenue overtook its domestic sales for the first time and its foreign operating profit almost

equalled its Japanese equivalent.

UNIQLO has a strong Asian foothold by way of China, home to over half its overseas shops. China contributed around 70% of total international revenues last year. This success has surprised some, and not only because of ill-feeling towards Japan from many Chinese because of the latter's wartime record. China is not an easy place to work, and, in clothing at least, Chinese consumers tend to revere brands. But even the label-obsessed need plain bits and bobs for layering or co-ordination. Chinese consumers are after quality, and UNIQLO's special fabrics, especially its Heattech range for cold weather, function well. Above all analysts point to the company's savvy Japan-educated Chinese executives who understand both the culture of the Japanese business and that of China.

But the rest of Asia may be harder to crack. For one thing, a warm climate in several countries means that UNIQLO cannot rely on its cold-weather products as a main driver of sales. It may have to tweak its formula, which could be risky, says Takahiro Saito, a fashion-retail analyst and author of a book comparing UNIQLO and Zara.

Though they are very different markets, Europe and America offer a cautionary tale. UNIQLO in America struggled outside the big cities of the east and west coasts. Growth in the heartlands remains elusive for UNIQLO both there and in Europe. In part that is because the same business model exists there already with firms such as Gap, says Mr Saito. But UNIQLO could do better at explaining what it does. Well thought-out partnerships with ambassadors, such as tennis player Roger Federer, and collaborations with designers, like Jil Sander, are starting to help.

Mr Yanai, an ardent fan of globalisation unlike many Japanese executives (the firm's working language is English and many employees, even in Japan, are foreign), is confident that he can guide UNIQLO through the changes

needed. He also talks of expanding into shoes as well as dresses and skirts, where UNIQLO currently has only slim offerings.

The backlash against globalisation is the biggest risk to UNIQLO's Asian plans, he says. It could limit free movement of goods and people, disrupting both supply chains and workers. Still, a Japanese firm that has managed as much foreign success as UNIQLO should be able to cope. ■



优衣库

回归基本

全球第三大服装零售商希望立足亚洲，主宰世界

当被问及对优衣库的愿景以什么为导向时，公司创始人兼首席执行官柳井正从架子上抽出了一本册子——英国大众服装零售商Next早在1987年的秋冬系列目录。他说，这里面所有衣服都是那么经典，今天穿出去也不过时。全球最大的两家服装零售商——Zara的母公司西班牙Inditex集团和瑞典的H&M——对潮流亦步亦趋，而位列第三大的日本迅销公司（Fast Retailing）旗下主打品牌优衣库却坚守不会过时的基本款。

柳井正在本土打下了坚实的根基，可以从这里向其西方竞争对手的主要市场欧洲和美国挺进。但他最重视的市场仍是亚洲。他希望通过成为亚洲第一的自有品牌服饰专营店，将优衣库打造成全球最大的服装零售商。他说，“亚洲现在是增长引擎”，因为该地区数以百万计的消费者正在步入中产阶级。优衣库今年将在印度开设第一家门店，并正考虑是否扩展到越南等其他国家（它已在印尼、新加坡和泰国建立了店铺网络）。

优衣库海外业务的成败对日本国内投资者而言关系重大。迅销公司的股票（柳井正仅拥有略超过20%的股份）自2015年以来一直在上涨，分析师们认为这主要归功于公司的全球扩张和物流的改进。在日本，由于人口减少，公司正在关闭门店。截至2018年8月的一年里，迅销的营业利润为2362亿日元（21.5亿美元），大部分来自优衣库。去年，优衣库的国际收入首次超过国内销售收入，海外营业利润几乎与在日本的盈利相当。

优衣库通过经营中国市场在亚洲打下了强大的基础，其海外门店超过半数都在中国。去年，优衣库约有70%的国际收入来自中国。这样的成功令一些人感到惊讶，不仅是因为许多中国人因日本的战时暴行而对该国怀有抵触情绪。中国消费者倾向于崇尚名牌，要打开中国市场不容易，至少在服饰行业是这样。但即便是痴迷名牌的人也需要一些朴素的服饰来叠穿或

者做搭配。中国消费者追求品质，优衣库的特殊面料表现不俗，尤其是适合在寒冷天气穿着的Heattech系列。最重要的是，分析师指出，公司有一批在日本接受过教育的中国高管，他们对业务很在行，精通两国不同的商业文化。

但亚洲其他国家的市场可能更难攻占。比如，有几个国家气候温暖，使得优衣库不能依赖其御寒产品作为主要销售推动力。曾著书对比优衣库和Zara的时装零售分析师斋藤孝浩表示，优衣库可能必须改变套路，而这是有风险的。

虽然欧美市场与亚洲的情况迥异，但优衣库在欧美的经营还是可以作为前车之鉴。在美国，优衣库在东西部沿海大城市以外的地方举步维艰。它在美国和欧洲的内陆地区都增长乏力。斋藤孝浩表示，这在一定程度上是因为当地已有商业模式与之类似的公司，比如Gap。但优衣库可以在宣传自身品牌理念上多下功夫。精心策划的与网球运动员罗杰·费德勒（Roger Federer）等代言人以及吉尔·桑德（Jil Sander）等设计师的合作已初见成效。

柳井正与许多日本高管不同，是全球化的狂热分子。其公司的工作语言是英语，有许多外国员工，即便在日本也是如此。他相信自己可以引领优衣库开展所需的变革。他还谈到计划扩大鞋履和裙装产品线，优衣库目前只有少量这类产品。

他表示，反全球化浪潮是优衣库亚洲扩展计划面临的最大风险。商品和人员的自由流动会受限，从而干扰供应链和劳动力。尽管如此，一家日本公司能在海外市场取得如此成功，它应该也应付得了这些问题。■



Philanthropy

The maniacal and the miraculous

The productive anger of Bill Gates

Getting killed in a video game, receiving unfair treatment from a teacher, seeing a relative go to jail: the teenagers taking part in Chicago's Becoming a Man (BAM) initiative admit to a variety of frustrations, some trivial, some tragic, that can stir their anger. The initiative, which teaches young men how to regulate their emotions, aims to lower crime rates and improve graduation rates. Recently one BAM group invited an unusual guest into their counselling circle: Bill Gates, the second-richest man in the world. So what pushes his buttons?

Mr Gates answers that question in his latest annual letter, written with his wife Melinda, describing the work of the \$50bn charitable foundation they oversee. He admits to being "pretty harsh" with his parents as a child and "tough" on people at Microsoft. ("Over the decades I've mellowed out on that," he says.) He also remembers "getting mad" at a meeting when he learned that polio cases were increasing.

In his first letter ten years ago, Mr Gates argued that a "maniacal focus on drawing in the best talent and measuring results" would make a difference in the foundation's fields of interest: global health, development and American education. In health, he feels vindicated. The progress in research, vaccine delivery and statistical monitoring to which they have contributed is "more miraculous than the digital revolution," Mr Gates says.

But in education, results are less striking: test scores have been harder to budge. Even in health, the eradication of polio has proven maddeningly elusive. In 2003 he thought the disease would be gone in a couple of years.

But it lingers.

What explains this uneven impact? Partly, a paradox of progress: the more successful development efforts become, the less effective they look. Now that polio has been eliminated from countries like India, only the hardest cases remain, such as Afghanistan. The unevenness also reflects underlying differences in the problems the foundation tackles.

Such problems can be roughly divided into three categories (following a taxonomy by Lant Pritchett of Harvard and Michael Woolcock of the World Bank). Some require the exercise of ingenuity and discretion by small teams (eg, inventing a new vaccine); some demand the programmatic mobilisation of legions of people (immunisation drives). Others require both.

Improving education falls into this third, difficult category. It is not a problem that a small team of brilliant people can crack. Nor can a good education be delivered, like a vaccine, by following a strict protocol to the letter. Instead it requires legions of teachers to respond thoughtfully and conscientiously to pupils' needs. Mr Gates left his BAM circle wishing every classroom could emulate its intimacy and respectfulness. But that is hard to bottle.

Some problems that seem to belong to one category end up in another. Mr and Mrs Gates first thought the fight against malaria would require a breakthrough vaccine. To their surprise, the world has instead made headway by rolling out bed nets, a programmatic not technical solution.

An opposite example is sanitation. Removing the dirt and danger of human waste would not seem to require much innovation. Effective sewers and toilets have been around for over a century. But installing them is no longer feasible in many poor countries, Mr Gates argues, where cities are too big and water too scarce. Instead he wants to reinvent the toilet. In Beijing last

year, he reviewed the latest self-contained models that, in effect, are their own sewage treatment plant, killing pathogens on site.

“If you want to improve the world,” Mr Gates once wrote, “you need something to be mad about.” The letter contains many candidates, including the neglected causes of climate change (“trucks, cement and cow farts”) and the shortage of data on women’s unpaid work. But does he worry that his passions might distort his foundation’s priorities? “I might be the last person people would accuse of setting strategies based on non-numeric emotions,” he says. The BAM circle touched his heart, his wife writes. But she’s also careful to cite a University of Chicago study showing it cut arrests for violent crime by almost half. ■



慈善

狂暴的和不可思议的

比尔·盖茨的怒火结出硕果

在游戏中被干掉，受到老师的不公正对待，目睹亲属进监狱……参加芝加哥“长大成人”（Becoming a Man，简称BAM）项目的青少年坦承，自己会因为各种各样的打击而愤怒。有些是琐事，有些很不幸。这个项目教导年轻男性管理自己的情绪，以求降低犯罪率、提高毕业率。最近，一个BAM小组请来了一位不同寻常的客人加入他们的团体咨询：全球第二富有的比尔·盖茨。那什么事情又会让他“一点就着”呢？

盖茨在他刚发布的最新年度公开信中回答了这个问题。他和妻子梅琳达共同撰写的公开信描述了两人负责的规模达500亿美元的慈善基金所做的工作。盖茨在信中承认自己幼时对父母的态度“相当粗鲁”，后来对微软的工作人员也很“严厉”。（“过去几十年，我在这方面已经变得淡定平和。”他说。）他还回忆，在某次会议上，当听到脊髓灰质炎的病例数量上升的消息时，自己当场“大发雷霆”。

在十年前的首封年度公开信中，盖茨指出，“狂热地专注于吸引最优秀的人才及衡量结果”将积极影响基金会关注的领域：全球健康、全球发展，以及美国的教育。在健康方面，他认为这一点已经得到了印证。他说，由于优秀人才的贡献，在研究、疫苗输送和统计监测方面取得了“比数字革命更令人不可思议”的进步。

但教育方面的成绩就没那么骄人了：要想略微提高学生的考试分数都很难。而即使在健康方面，事实证明脊髓灰质炎还是难以根除，令人恼火。2003年时，盖茨以为这种病再过两三年就会消失，结果到现在也没能被彻底铲除。

为何进步的水平如此悬殊？一定程度上是由于进步的悖论：为推进发展所做的工作越成功，看起来就越低效。脊髓灰质炎在印度等国已被消灭，那

么就只剩下类似阿富汗这样最难啃的骨头了。不均衡的结果也反映出基金会尝试解决的难题存在着根本的差异。

按照哈佛大学的兰特·普里切特（Lant Pritchett）和世界银行的迈克尔·乌尔科克（Michael Woolcock）的分类法，这些难题大致可以分为三类。有些需要小型团队运用才智与判断力去攻克，例如发明一种新疫苗；有些问题要求有计划地动员大批人马，例如推进免疫接种行动。其余的问题需要两种方式并进。

改善教育状况就落到了颇有难度的第三类。这不是个依靠一小群聪明人就能解决的问题。良好的教育也不像疫苗那样，精确地遵照严格的规程就能输送到各方。相反，教育需要大批的教师周全而尽责地回应学生的需求。离开BAM的活动时，盖茨表示希望每一间教室都能像BAM的小组那样，既亲密无间又彼此尊重。但这种氛围可不像疫苗那样可以装在瓶子里运走。

有些问题看似属于某一类，结果却是另一类。盖茨夫妇起先以为要抗击疟疾就要在疫苗上有突破，没想到全世界靠推广蚊帐在这场艰难的战役中取得了进展，而这属于策略而非技术性解决方案。

一个相反的例子是公共卫生。要消除人类排泄物带来的脏污和危险似乎用不着太多创新。能做到这一点的下水道和厕所在一个多世纪前就已出现。但盖茨指出，很多贫穷国家的城市规模过大，水资源又十分紧缺，在那里安装这些设施已不再可行。他想到的方法是改造厕所。去年在北京，盖茨推介了最新研发的厕所，它们自成一体，可以充当自己的污水处理厂，就地杀死病原体。

“如果你想让世界变得更好，”盖茨曾写道，“就得有让你觉得火大的事情。”信中列出了很多供人着急上火的事情，像是被忽视的造成气候变化的原因（“卡车、水泥和牛放的屁”），以及有关女性无薪酬工作的数据有多么不足。但是他是否担心他的激愤会影响基金会的工作重点呢？“我也许是最不可能被人指责在制定策略时感情用事、不看数据的人了。”他说。梅琳达在信中写道，BAM的活动令盖茨很受触动。但她也不忘引用芝

加哥大学的一项研究结果，称BAM项目令参与者的暴力犯罪逮捕率下降了近一半。 ■



Free exchange

Pillar of strength

In a new book, Raghuram Rajan argues that weakened communities threaten liberal democracy

Until recently, economists' prescription for struggling places was bloodless: let them die. "Some towns cannot be preserved", this newspaper argued in 2013, attracting a larger-than-usual volume of correspondence from dissenting readers. But the electoral successes of Donald Trump and the campaign to yank Britain out of the European Union (EU) have shaken the dismal science. Prominent economists have begun to consider what an efficient response to geographic inequality might look like. In a paper published in 2018, for example, Benjamin Austin, Edward Glaeser and Lawrence Summers of Harvard University argued for employment subsidies targeted at struggling places.

The reconsideration of place-based policies can often seem grudging—something to be tolerated, in order to keep those on the losing end of regional inequality from embracing populism or killing themselves with drugs. Economists' reluctance is understandable: efforts to help struggling communities might well deter people from moving when they would otherwise have relocated to more promising places. But it is also short-sighted, argues Raghuram Rajan, an economist at the University of Chicago and the former head of India's central bank. In a compelling new book, "The Third Pillar: How Markets and the State Leave the Community Behind", he argues that communities are not so much a source of friction inhibiting the smooth operation of the global economy, as an indispensable part of a healthy society.

Mr Rajan believes in markets but has often made himself the bearer of

awkward economic news. In 2005 he soured the mood at an annual conference of central bankers by asking whether financial innovation had made the world a riskier place. In a book published in 2010 he argued that the policies that unwittingly led to the global financial crisis, for example mortgage subsidies, were often responses to economic “faultlines”, such as inequality; those faultlines are still in place, ready to wreak future havoc. “The Third Pillar” similarly urges economists to recognise a blind spot. The places where people grow up, live and work are not simply agglomerations of economic activity. They shape people’s identities and “anchor the individual in real human networks”. Communities provide leverage to those who might otherwise find themselves bullied by the state or by markets. Their function has changed dramatically since pre-industrial times, but communities remain a critical piece of social infrastructure.

That community matters might seem a banal observation to non-economists. But it sits inconveniently alongside many aspects of an economist’s worldview. Economic progress has often meant the replacement of personal, community interactions with efficient but more impersonal ones. The less sentimental people are about where they live or who they work for, the more readily they can move in response to market pressures, boosting productivity and limiting the damage from creative destruction. Community-based economic activity, by contrast, can be inefficient. Lending a friend money or caring for an ailing relative seem like nice things to do. But larger and more transparent financial markets attract more funds and expand access to credit, while a market for care work allows for welfare-enhancing specialisation and trade.

Mr Rajan acknowledges the negative effects of tight-knit communities. The book provides a short history of the evolution of community, state and market in Europe, which begins in the stifling world of the feudal manor. Community relationships governed nearly every aspect of life, maintaining order and stability at the cost of economic stasis and oppression.

Disruptions to that world created the conditions for the maturation of the state, and for economic progress. As the world became more interconnected, states and markets assumed roles once played by the community—from insuring against hardship to funding investment.

Communities today can still be intrusive and intolerant. But they also provide support, inspiration and a backdrop for people's emotional and spiritual lives. Communities, furthermore, are where the abstractions of global economics and politics become real. Strong states and deep markets might have enabled unprecedented prosperity and individual liberty, but they are prone to excesses. It has often fallen to communities to correct imbalances of power. Mr Rajan points to social movements, born of community action, that were responsible for the spread of primary education and the expansion of the franchise.

The past half-century has been difficult for the third pillar, however. Globalisation and technological change have deprived many places of sources of employment and wealth. Regions' fates seem increasingly determined from afar, by supranational organisations like the EU or by fickle global financial markets. Trade and technology have transformed many industries into winner-takes-all affairs. Opportunity has become concentrated in expensive superstar cities, which attract the most talented members of communities and leave everyone else without such opportunities. Mr Rajan reckons that the weakening of communities that has followed these trends makes the world vulnerable. The frustrated residents of struggling places mistrust elites, and seek meaning instead in the ugly politics of populist leaders.

Promising solutions are hard to come by. Still, Mr Rajan offers reasonable recommendations. Devolution of policymaking authority might invigorate community spirit. Governments should also practise “responsible sovereignty”, he reckons, and limit unnecessarily disruptive forms of

economic integration, like reckless financial globalisation. But the thrust of “The Third Pillar” is that society matters after all. Having been insufficiently mindful of this over the past few decades, business and government leaders may have little option but to brace themselves for frustrated communities demanding change. ■



自由交流

力量之柱

拉古拉姆·拉詹的新书认为社区的衰弱会威胁自由民主

直到最近，经济学家给贫困地区开出的药方一直是冷血的：让它们自生自灭。本刊在2013年提出“一些城镇无可挽救”，引来大批读者来信表达反对意见。但特朗普当选和英国脱欧运动动摇了这门沉闷的科学。知名经济学家们开始考虑有什么方法能有效地解决地区发展不平等的问题。例如，在2018年发表的一篇论文中，哈佛大学的本杰明·奥斯汀（Benjamin Austin）、爱德华·格莱瑟（Edward Glaeser）和劳伦斯·萨默斯（Lawrence Summers）主张向贫困地区提供就业补贴。

人们对于反思以地区为本的决策往往显得不情不愿，好像是要硬着头皮干的事，只是为了避免不平等地区的人们投入民粹主义的怀抱或者滥用药物致死。经济学家的这种不情愿倒是可以理解：帮助穷困社区可能让人们不愿迁居，而迁到更发达地区本来是更好的方法。但芝加哥大学的经济学家、印度央行前行长拉古拉姆·拉詹（Raghuram Rajan）认为，这种观点也是短视的。在一部引人入胜的新书《第三支柱：社区如何落到了市场和国家后头》（The Third Pillar: How Markets and the State Leave the Community Behind）中，他指出社区并非阻碍全球经济平稳运行的摩擦源，而是健康社会不可或缺的组成部分。

拉詹信奉市场力量，但常常成为尴尬经济消息的信使。2005年，他在央行行长的年度会议上发出金融创新是否已令世界风险增加的疑问，给大家泼了一盆冷水。在2010年出版的一本书中，他认为，抵押贷款补贴等无意中导致全球金融危机的政策往往是对经济“断层线”（如不平等问题）的应对手段；这些断层线依然存在，未来随时会造成严重破坏。同样地，《第三支柱》也促使经济学家们看到一个盲点。人们成长、生活和工作的地方不仅是经济活动的集中地，还塑造了人们的身份，并“把个人锚定在真实的人际网络中”。社区为那些可能受政府或市场压迫的人提供了某种发挥影

响力的平台。自前工业时代以来，社区的功能发生了巨大的变化，但仍旧是社会基础结构的关键组成。

在经济学家以外的人群看来，“社区很重要”似乎是个平淡无奇的发现。但其实它与经济学家的世界观在诸多方面都不相容。经济进步通常意味着以高效但更冷漠的方式取代个人和社区互动。人们对居住地或雇主的眷恋越少，就越容易根据市场压力做出转变，从而促进生产率并减少创造性破坏带来的损害。相比之下，基于社区的经济活动可能效率低下。借钱给朋友或照顾生病的亲戚似乎是在做好事，但更大规模、更透明的金融市场能吸引更多资金并扩大贷款渠道，而护理工作市场则有利于实现专业化和交易，提升人们的福祉。

拉詹承认，内部关系紧密的社区有负面影响。该书简要介绍了欧洲社区、国家和市场的演变历史，一切始于令人窒息的封建庄园体系。社区关系几乎统治着生活的方方面面，以经济停滞和压迫为代价维持秩序和稳定。后来这一一体系崩塌，为国家的成熟和经济进步创造了条件。随着世界变得越来越紧密相连，国家和市场担当起社区曾经扮演的角色——从保障人们的正常生活到募集投资。

今时今日，社区仍可能有侵扰性且不够包容。但它们也为人们的情感和精神生活提供支持、启发和舞台。此外，社区是全球政治经济的抽象概念变为现实的地方。强大的国家和深度市场可能带来了前所未有的繁荣和个人自由，但它们的影响力容易过度，往往需要由社区来纠正权力失衡。对此，拉詹指出，正是源自社区行动的社会运动带来了基础教育的普及和公民选举权的扩大。

然而，在过去半个世纪里，这第三个支柱遭遇了重重困难。全球化和技术变革剥夺了许多地区的就业和财富来源。地区的命运似乎愈发由遥远的力量决定，包括欧盟等超国家组织，或变幻不定的全球金融市场。贸易和技术将许多行业变成了赢家通吃的世界。机会集中在昂贵的超级城市，它们吸引了社区里最有才能的人，而其他人无法得到这样的机会。拉詹认为，这些趋势使得社区弱化，令世界变得脆弱。贫困地区沮丧的居民不信任社

会精英，转而在民粹主义领导者的丑恶政治中寻求意义。

要找到有效的解决方案不容易。不过，拉詹提出了合理的建议。决策权下放可能会激发社区精神。他认为，政府也应该实行“负责任的主权”，并限制带来不必要破坏的经济一体化形式，如鲁莽的金融全球化。但《第三支柱》的主旨是社会力量终究是重要的。由于在过去的几十年里对此关注不够，企业和政府领导人也许别无选择，只能准备好应对那些忍无可忍的社区要求变革的现实。 ■



Soyabean

Soy sources

Trade wars have upended the global soyabean market

“We’ve been gambling up to this point,” says Tim Bardole, a soyabean farmer from Iowa. After the price of soyabean crashed last summer (see chart), he held on to most of his harvest and waited for the market to recover. But seven months later, and with large loans to repay, he sold up. “We decided we’d better take what we have,” he says.

The cause of the crash was a 25% tariff on American soyabean imposed by China, the world’s biggest importer, as one shot in the trade war between the two countries. Yet peace is supposedly in the offing as the two countries are locked in negotiations over a deal. That Mr Bardole cut his losses despite those talks is not that surprising. Even if the tariff is lifted—which is far from certain—the past year’s disruption will probably leave a permanent scar.

The trade war caught American soyabean farmers at a particularly bad time. They had just planted a bumper crop, encouraged by strong demand and a drought in Argentina, a competitor. When the tariff was implemented it was too late to switch to other crops such as corn. Demand from China—which in 2017 accounted for 60% of American exports—collapsed. The result was a glut.

To replace American beans China has ramped up its imports from Brazil, pushing up prices in South America. Meanwhile the European Union, Mexico and even Argentina have been tempted by low American prices—but not enough to replace lost Chinese demand. To help American farmers cope, Mr Trump’s administration handed them a one-off payment of \$1.65 per

bushel (\$61 per tonne). Without it Mr Bardole would have lost money on this year's crop. He might have sold his crop anyway, but the support has allowed others to sit on theirs. Farmers will have 25m tonnes of beans in stock at the end of this year's selling season, according to an official estimate, up from 12m tonnes last year.

In January Liu He, China's deputy prime minister, said China would buy 5m tonnes of soyabeans after meeting Mr Trump. Even so, the pace of Chinese purchases is a fraction of what it would ordinarily be around this time of year.

If the tariffs are lifted, some Chinese demand will recover. The billions of dollars'-worth of infrastructure that facilitates American sales to China is still in place. And China could turn back to America for other reasons. To cope with the loss of American exports of soyabeans, for instance, it has lowered the minimum protein content in pig feed. But that risks hogs' health and can stunt their growth. Furthermore, Chinese pig farms have been hit by a nasty bout of African swine fever, forcing farmers to cull 5-15% of their hogs, according to Michael Magdovitz of Rabobank, a firm that specialises in financing agriculture. But this should prove temporary.

Despite all this, many are sceptical that Chinese demand will ever fully recover. "It was nice" to have guaranteed demand from China, says Mr Bardole, but "those days are gone." Others worry that the Chinese will respond to this episode by investing more in developing Brazilian agricultural infrastructure, permanently decreasing their reliance on America.

Not everyone is pessimistic. The current situation "is nothing compared with what we went through in the 1980s," says Randy Souder, another Iowan farmer. He remembers that he coped with low prices then by producing more efficiently. If some farmers are forced out of business, he reckons

others will “pick up the acres” and spread their equipment costs over a larger area of land.

Prices have crept up in recent months. Mr Magdovitz says they have been supported by the limited Chinese purchases, optimism that a deal will be agreed and Mr Trump’s subsidies. America’s economy as a whole may not depend on exporting to China. But if recent experience is anything to go by, soyabeans are an exception. ■



大豆

大豆来源

贸易战颠覆了全球大豆市场

“我们赌到了现在。”爱荷华州的大豆种植户蒂姆·巴多尔（Tim Bardole）说。自去年夏季大豆价格暴跌（见图表）后，他囤积了大部分收成，等待市场复苏。但七个月后，由于需要偿还大笔贷款，他还是卖光了存货。他说：“我们决定还是能收回多少是多少。”

此次价格暴跌，原因是全球最大的大豆进口国中国对美国大豆征收25%的关税，这也是两国贸易战中的一次交锋。不过两国目前正在紧锣密鼓地谈判，据信即将握手言和。尽管如此，巴多尔仍选择趁早止损，这样的做法也不足为奇。就算这项关税被取消（这还很难说），过去一年里的纷乱仍可能留下永久的创伤。

对美国大豆种植户来说，这场贸易战来得特别不是时候。受强劲市场需求和竞争对手阿根廷一场大旱的驱动，当时他们刚刚大面积种植了大豆。等到关税实施时，已经来不及改种玉米等其他作物了。2017年中国占到了美国大豆出口总量的60%，中国需求的雪崩造成美国大豆供过于求。

为替代美国大豆，中国加大了从巴西的进口量，推高了南美的大豆价格。与此同时，欧盟、墨西哥，甚至阿根廷都被美国的低价大豆吸引，但这不足以弥补中国市场流失带来的损失。为帮助美国豆农应对这一冲击，特朗普政府向他们一次性支付每蒲式耳1.65美元（每吨61美元）的补贴。如果没有这笔补贴，巴多尔今年的种植就会亏本。他可能无论如何都还是会卖掉自己的大豆，但补贴让其他农民可以待价而沽。官方估计，本年度销售季结束时，农民的大豆库存将达2500万吨，而去年为1200万吨。

今年1月，中国副总理刘鹤在会见特朗普之后表示将购买500万吨大豆。即便如此，中国的采购进度与往年此时相比相去甚远。

如果关税被取消，中国的需求将会部分恢复。美国价值数十亿美元的对华大豆销售基础设施还在。而中国可能会出于其他原因吃美国的回头草。例如，为应对美国大豆出口的减少，中国下调了猪饲料中蛋白质含量的最低标准。但这有可能损害猪的健康并妨碍其生长。而且，专门从事农业融资的荷兰合作银行（Rabobank）的迈克尔·麦多维茨（Michael Magdovitz）指出，中国养猪场遭遇了严重的非洲猪瘟疫情，养殖户被迫扑杀了5%至15%的猪。但疫情应该是暂时的。

尽管如此，还是有很多人怀疑中国的需求能否完全恢复。巴多尔说，过去铁定存在的中国需求“真好”，但“好景不再了”。其他人担心中国将对这一事件做出反应，加大对巴西农业基础设施的投资，从而永久性地降低对美国的依赖。

并非所有人都悲观。另一名爱荷华州的农民兰迪·苏德（Randy Souder）说，目前的情况“跟我们在一九八几年经历的相比根本不算什么”。他回忆说，当时他应对低价的办法是提高生产率。如果一些农民不得已破产，他认为其他人会“接手那些土地”，将农机成本分摊到更大面积的土地上。

近几个月，大豆价格攀升。麦多维茨指出，这得益于中国有限度的采购、对达成协议的乐观预期，以及特朗普政府的补贴。美国经济整体而言可能并不依赖对中国的出口。但从近期发生的事情来看，大豆是个例外。■



Buttonwood

Smooth operators

The true appeal of private equity

John McGahern's novel, "That They May Face the Rising Sun", is set in a remote corner of Ireland. There is a lake, a church, two bars and not much else. Gossip is prized but in short supply. Much of it concerns John Quinn, a womaniser who has buried two wives and is looking for a third. His quest takes him to Knock, a shrine to the Virgin Mary, which has become a place to find a partner. Like many pilgrims, John Quinn is outwardly pious. But his mind is fixed on earthly matters.

The masking of intent may also be true of visitors to the temple of private equity. On the surface, investors in such funds might hope to harvest a reward—an "illiquidity premium"—for locking up their money for five to ten years. That allows private-equity funds time to turn sluggish businesses into world-beaters. The pitch is seductive. Capital has flooded in as readily as pilgrims flock to the shrine at Knock.

Perhaps, though, private equity's pilgrims are really after something else. These institutional investors may face limitations on how much they can borrow. Private equity offers a way round such constraints: it is liberal in its use of debt to juice up returns. And that is not all. The value of privately held assets are not assessed all that often. That is a plus for those who, for ignoble reasons, would like not to be told how volatile their investments are.

This is a conclusion of a new paper from AQR Capital Management. Its authors look at the returns on private-equity purchases ("buy-outs") of American businesses. They find that, after fees, private equity outperformed the S&P 500 index of large companies by an average of 2.3% a year between

1986 and 2017. That is quite the winning margin. But on closer examination, it looks less impressive. Buy-out targets tend to be small firms that are going cheap—that is, they have a low purchase price relative to their underlying earnings. An investor would have achieved higher returns from a basket of small-capitalisation “value” stocks than by putting his money in private equity.

The edge that private equity had over large listed stocks seems also to have dulled. In the past decade returns have been no better than the S&P 500. This may be because more capital is chasing buy-out targets. Private-equity funds once purchased businesses that were much cheaper than S&P 500 firms, says AQR. But the gap in valuations has closed.

Why are pension funds still so keen to push money into private equity? A tenet of textbook finance is that investors can build a portfolio that fits their preferences by choosing the right mix of equities, the risky asset, and cash, the risk-free asset. Nervous types might keep most of their assets in cash. At the other extreme, a risk-loving investor may wish to borrow (ie, have a negative cash holding) so that stockholdings exceed 100% of his capital. An investor with a limited ability to borrow can instead turn to private equity. Its funds take on \$1-2 of debt for every \$1 of equity.

The AQR authors point to another appeal. Illiquid assets, such as private-equity holdings, are not revalued in line with the price of publicly traded companies—“marked to market”—all that often. A common practice is to rely on self-appraisals. These tend not to reflect the day-to-day fluctuations in the price of listed firms. All this makes for artificially smooth returns.

Such smoothing has several advantages. When stock prices fall, the value of private-equity funds appears to fall less sharply. A mixed portfolio of public and private equity will look less volatile than a pure portfolio of listed stocks. The true riskiness of private equity would only become apparent in a

prolonged bear market. Otherwise, it appears to offer diversification, albeit of a specious kind.

Some investors are forced to sell stocks (to “de-risk”) when prices fall, to comply with solvency rules. In such cases a bit of returns-smoothing is helpful, as a rigid marking to market would oblige investors to sell stocks at rock-bottom prices. That said, capital tends to flood into private equity when markets are booming. A lot of buy-outs will then be at peak prices.

The best private-equity funds are skilful investors. But the discretion they all have over how they report returns makes it hard for investors to judge who the best are. One study finds that half of funds claimed to be in the top quartile. Still, smoothed returns and leverage may be what investors are really after. Like lovelorn pilgrims to Knock, they will treat any other reward as a bonus. ■



梧桐

平稳操盘

私募股权真正的吸引力

约翰·麦克葛汉（John McGahern）的小说《面向朝阳》（That They May Face the Rising Sun）以爱尔兰的一个偏远地区为背景。这里除了一个湖、一座教堂、两间酒吧，几乎就再没什么了。人们热衷八卦，但苦于谈资不多。他们津津乐道的主要人物是风流成性的约翰·奎因（John Quinn）。这个已经死了两任妻子的男人正在寻觅第三个配偶。为此他来到敬奉圣母玛利亚的诺克（Knock），一个已经演变成了婚恋角的朝圣地。和很多朝圣者一样，奎因看似虔诚，心思却全在凡尘俗务上。

那些拜访私募股权圣殿的人也许同样会掩盖自己的意图。表面上，这类基金的投资者将自己的钱锁定五到十年，可能是希望获得“非流动性溢价”的回报。私募基金如此就有较充裕的时间将不景气的企业变成国际巨头。这种论调很具诱惑力。就像朝圣者在诺克聚集那样，资金迅速涌入。

然而，私募股权的朝圣者实际上可能另有所图。这些机构投资者可能面临贷款额度的限制，而私募股权提供了一种绕开这些限制的方法——它可以自由地通过借债来提高收益。不止如此，私人持有资产的价值还不会那么频繁地被评估。一些人因为不可告人的目的不愿被告知自己的投资有多不稳定，对他们来说这是个有利因素。

这是美国AQR资本管理公司（AQR Capital Management）的一篇新论文得出的结论。论文作者研究了私募股权收购（即“买断”）美国企业的收益率。他们发现，1986到2017年间，在扣除管理费后，私募股权的回报率平均每年比由大企业构成的标普500指数高出2.3%。这是很显著的差距。但进一步观察就会发现差距没那么可观。私募股权的收购目标往往是那些廉价出售的小公司（这些公司的收购价格相对于它们的基本盈利状况而言较低）。与投资私募股权相比，投资者从一篮子小盘“价值型”股票中获得的

回报会更高。

相比大型上市公司的股票，私募股权一度拥有的优势似乎也已减弱。在过去的十年里，私募股权的收益率并不比标普500指数高。这可能是因为有更多资本在追逐收购目标。AQR指出，私募股权基金过去对企业的收购价格远低于标普500公司，但现在估值差距已经缩小。

为什么养老基金仍然非常热衷于投资私募股权？金融学教科书的一条原则是，投资者可以通过合理配置高风险的股票和无风险的现金，组建符合自己偏好的投资组合。胆小的投资者可能会以现金形式持有大部分资产。而在另一个极端，风险偏好型投资者可能会想要借款（即现金持有为负数）而令自己持有的股票超过资本的100%。借款能力有限的投资者可以转而求助于私募股权。私募股权基金为每1美元的股权借债1到2美元。

AQR论文的作者还指出了私募股权的另一个诱人之处。私募股权持股等流动性较差的资产并不像上市公司的股价那样，要经常性地被重新估值（所谓的“盯市”），而通常是依靠自我估价。自我估价往往不会有上市公司股价那样的逐日波动。这人为地导致了收益率的稳定。

这种人为的稳定有几点好处。当股价下跌时，私募股权基金的价值似乎下降得没那么剧烈。与只持有上市公司股票的组合相比，公募和私募股权组合看上去波动性更小。私募股权的真正风险只有在长期的熊市中才会显现。而在平常情况下，它貌似提供了投资多元化，尽管这样的多样性只是表象。

当股价下跌，一些投资者不得不抛售股票（“去风险”）以遵守偿付能力规则。在这种情况下，少许的人为稳定收益率的做法是有益的，因为严格的盯市将迫使投资者以最低价格出售股票。尽管如此，资本往往会在市场繁荣时涌入私募股权。届时大量收购将以最高价成交。

最好的私募股权基金是老道的投资方。但这些投资方都有自行决定如何公布收益率的自由，这让外部投资者无从判断孰优孰劣。一项研究发现，半数基金都声称自己排名在前25%。不过，人为稳定的收益率和杠杆作用或

许是投资者真正追逐的目标。就和涌向诺克的缺爱的朝圣者一样，投资者也会把任何其他回报当作意外收获。 ■



Business and global warming

Hot, unbothered

Corporations need to rethink how they approach climate risk

Chief executives who care about climate change—and these days most profess to—often highlight headquarters bedecked with solar panels and other efforts to lower their carbon footprint. Last month Volkswagen, a carmaker, told its 40,000 suppliers to cut emissions or risk losing its custom. Plenty of investors, meanwhile, say they are worried about being saddled with worthless stakes in coal-fired power plants if carbon taxes eventually bite. Yet the reality is that meaningful global environmental regulations are nowhere on the horizon. The risk of severe climate change is thus rising, posing physical threats to many firms. Most remain blind to these, often wilfully so. They should start worrying about them.

Nature disrupting supply chains is nothing new. Businesses have coped with floods, droughts and storms since long before the joint-stock company became popular in the 19th century. Two things have changed. First, supply chains have grown complex and global (just look at VW). As links have multiplied so, too, have points of possible failure. Many sit in the tropics, more given to weather extremes than the temperate West.

Second, global warming is fuelling more such extremes everywhere (see Books and Arts section). In 2017 Houston experienced its third “500-year flood” in less than four decades, California suffered five of its 20 worst wildfires ever and parts of the Indian subcontinent were underwater for days following epic monsoon downpours. That year insurers paid out a monumental \$135bn in compensation. Another \$195bn in estimated losses was uninsured. Power plants often run slow because the river water they use for cooling is too hot. Last year commercial traffic along the Rhine, the

world's busiest waterway, ran aground when rains failed to replenish its sources.

Corporate-risk managers have just about come to grips with tangled supply chains. But they are rotten at assessing their exposure to a changing climate (see Business section). Unfamiliar with bleeding-edge climate models, which tell you what disruption to expect next, risk managers fall back on retrospective tools like flood maps, which are tried, tested—and wrong.

One study last year found that accounting for physical risks to corporate assets would shave 2-3% off the total market value of over 11,000 globally listed firms. That is less than many stocks move in a given day, and a fraction of the estimated 15% downward effect of a transition to cleaner energy. Unlike the energy transition, though, some physical harm to corporate assets is all but guaranteed. Not only that, but the risks rise as the world warms. And the average conceals a huge range. Some companies would lose nearly one-fifth of their enterprise value. Most have no clue where they stand.

They have few pressing incentives to find out. Markets tend to punish honesty about previously unacknowledged risks, not reward it. Rather than learn that nature poses a “material” threat—which firms are obliged to disclose to shareholders—it is safer not to look in the first place. Although credit-raters and insurers are busily reassessing climate risk, companies’ premiums and credit have scarcely got more expensive. On the rare occasion markets do reprice a company’s risk, they do so in a hurry. PG&E, a Californian utility, was forced into bankruptcy protection in January after insurers and creditors fled when they concluded that it could be on the hook for billion-dollar liabilities over its possible role in sparking wildfires.

Such cases would be rarer if companies were legally obliged to assess and disclose their climate vulnerabilities. An international group set up by the

Financial Stability Board, a global set of regulators, issued voluntary guidelines for public companies in 2017. These should be made mandatory.

It is in businesses' long-term interest to own up to the threats they face. A post-disaster payout from a cheap insurance policy is better than nothing—but a lot worse than avoiding disruption. Adaptation could mean erecting flood barriers around factories or battening down warehouse roofs to withstand stronger gales. Insurers reckon a dollar spent on such measures saves five in reconstruction. It may involve lobbying politicians to fill the estimated \$110bn-280bn shortfall in annual public spending on resilience. In extreme cases, it may require retreat from a business. If this lays bare the seriousness of global warming's effects, the world may even get serious about tackling its causes. ■



商业和全球变暖

棘手，却不急人

企业需要重新考虑如何处理气候风险

关心气候变化的CEO——这年头大多数CEO都自称关心——常常强调他们的企业总部采用了太阳能电池板和其他降低碳足迹的措施。上月，汽车制造商大众要求其四万家供应商减少排放，否则就可能失去大众这个大客户。与此同时，许多投资者表示，他们担心如果碳税最终开始起作用，自己会被变得不值钱的燃煤发电厂股票拖累。然而现实是，实质性的全球环境法规还未见踪影。因此，严重气候变化的风险正在上升，对许多企业的实体资产构成了威胁。大多数企业对此仍然无动于衷，其中有许多是故意视而不见。但它们应该要开始担心了。

自然灾害破坏供应链并不是什么新鲜事。早在19世纪股份公司开始流行之前，企业就已经在应付洪涝、干旱和风暴了。有两件事发生了变化。首先，供应链变得越来越复杂和全球化（看看大众公司就知道了）。关系链成倍增加，可能出现问题的环节也就相应增加。很多环节是在热带地区，受极端天气的影响更甚于温带的西方国家。

其次，全球变暖正在各地催生出更多极端天气事件。2017年，休斯顿在不到40年的时间内经历了第三次“500年一遇的洪水”，加州遭受了史上20场最严重的山林大火中的五场，印度次大陆的部分地区在漫长的季风雨季过后遭水淹多日。那一年，保险公司总共支付了1350亿美元的巨额赔偿金。估计另有约1950亿美元的损失没有投保。发电厂经常低负荷运行，因为用于冷却的河水水温太高了。去年，世界上最繁忙的水道莱茵河因降雨不足以补充水源而中断了商业通航。

企业风险管理人才刚刚要认真着手处理复杂的供应链问题。但他们在评估气候变化风险上的能力一塌糊涂。由于不熟悉能预测未来破坏性天气的前沿气候模型，他们只能依赖洪水地图这样被反复使用却全不准确的回溯

工具。

去年的一项研究发现，把企业资产的物理风险纳入会计核算后，会让全球1.1万多家上市公司的总市值减少2%至3%。这比很多股票任何一天的股价变动幅度都要低，也大大小于向清洁能源转型对公司股价的下行影响（估计为15%）。然而，与能源转型不同的是，对公司资产的某些物理损害几乎肯定会发生。不仅如此，随着全球变暖，受损的风险也随之上升。而平均值掩盖了不同企业遭受损失的巨大差异。有些会损失近五分之一的企业价值，而大多数公司都不知道自己面临的风险有多大。

企业没什么紧迫的理由去寻找答案。对于诚实披露从前未承认的风险的举动，市场倾向于做出惩罚，而非奖励。企业一旦了解到自身受到大自然的“重大”威胁之后，就有义务向股东披露这些威胁，所以反倒是干脆置之不理来得更安全。虽然信贷评级机构和保险公司正忙着重新评估气候风险，但企业的保费和信贷成本几乎没有升高。就算市场难得重新评估一下某家企业的风险，也是匆忙为之。加州的公用事业企业太平洋煤气电力有限公司（PG&E）于今年1月被迫进入破产保护状态，因为保险公司和贷款机构认定该公司可能引发野火而要承担数十亿美元的赔偿，纷纷避之不及。

如果企业在法律上有义务评估和披露自身面临的气候风险，就能尽可能避免上述情况。2017年，由一些国家的监管机构组成的国际组织金融稳定委员会（Financial Stability Board）为上市企业发布了自愿性指导方针。这些指导方针应该强制执行。

企业承认自身所面临的威胁符合它们的长远利益。灾后从廉价保单获得的赔款聊胜于无，但远不及未雨绸缪所能避免的损失。应对措施可以是在工厂周围建立防洪屏障，或加固仓库屋顶以抵御更强的风暴。保险公司估计，每在这些措施上花一美元，就可以节省五美元的重建费用。可能需要游说政客，以填补每年在灾害复原能力方面1100亿至2800亿美元的公共支出缺口。在极端情况下可能还需要退出某项业务。如果这能充分暴露全球变暖的严重影响，那么全世界也可能会开始认真对付它的成因。■



Schumpeter

The conglomeroach

Conglomerates will never die out. But their form is evolving

Industrial conglomerates have long been considered the megafauna of the corporate world: big beasts like mastodons, who were condemned to extinction by spear-wielding corporate raiders in the 1980s. But a better analogy is with cockroaches because, against the odds, conglomerates have refused to die out. They flourish in most climates and are highly adaptive. And they have long been considered pests—at least to shareholders and business-school professors, if not to their numerous employees.

Today the industrial world is in full cockroach-extermination mode. There has recently been a slew of proposed break-ups and spin-offs, most notably at America's General Electric (GE), United Technologies Corp (UTC), DowDuPont and Honeywell, and at their European counterparts, ThyssenKrupp, ABB, and Siemens. UTC's Greg Hayes, a strapping chief executive who drives a pickup truck and tells it like it is, says that even Warren Buffett's Berkshire Hathaway and Jeff Bezos's Amazon are too big to manage. While investors tolerate Berkshire and the digital conglomerates for now, the double standard will not last for long.

There are several reasons why executives at industrial firms have a soft spot for unwieldy structures, despite the fact that shareholders usually detest them. The biggest is megalomania: bosses believe they are best placed to run empires. Executives also place undue emphasis on history, conventional wisdom and emotional ties. In order to break up a conglomerate, all of these arguments usually have to be confronted.

The experience at UTC is illustrative. Last year, after adding Rockwell Collins

to its Pratt & Whitney aerospace business thanks to a \$30bn takeover, it said it would spin off UTC's two other divisions, lifts, and temperature and security, retaining aerospace as its focus. The break-up came only after a painstaking effort by Mr Hayes, a UTC veteran, to convince himself and the board that the old sprawl was no longer viable. All the excuses had to be taken on.

First history. The firm dates back to the 1920s, when Pratt & Whitney was part of the granddaddy of aerospace monopolies with Boeing and what would become United Airlines. When that was broken up in the 1930s it became United Aircraft, changing its name to UTC in 1975, after which it bought Otis, a lift company, and Carrier, created by the inventor of air-conditioners.

In 82 years UTC has never missed a dividend, added to which it is now worth more than GE, an ailing rival in whose shadow it long stood. So it was not obviously begging to be put out of its misery. When Mr Hayes first presented the board with his proposal for a break-up, half of its members resisted, as did some shareholders.

On top of that was conventional wisdom. For years it had been axiomatic that UTC needed the cash from the lucrative servicing contracts of Otis and Carrier to support the long-cycle, capital-intensive development of jet engines. But no one had ever checked. When Mr Hayes did, he discovered it was an “old wives’ tale”; each business made enough cash to sustain itself and the dividend. That helped clinch it with the board.

Yet even then, a chief executive’s natural inclination to preserve the legacy of his forebears runs against the logic of focus. As he puts it, “It’s hard for me emotionally to go from a \$75bn [sales] business in 2019 to a \$50bn aerospace business.” But Mr Hayes says that, ultimately, he knew that it was the right thing to do.

Had he not broken up the company, others might have done it for him. That is because the resistance to change inside companies is increasingly overwhelmed by external forces, particularly from active investors anxious to boost returns. Shortly before Mr Hayes announced the break up of UTC, two hedge funds, Third Point and Pershing Square, started breathing down his neck. They may have come late to the process, but they are a symptom of a bigger change in the world of investment. As low-cost, index-tracking funds grow, active asset managers are under pressure to justify their fees, which makes them more likely to support break-ups. Hence the recent surge in activist campaigns. Lazard, a bank, says their number soared to a record 247 globally last year, up by 17% from 2017.

Even in developing countries, where conglomerates have long maintained their superiority, the tide may be turning. Bain, a consultancy, has studied such “dinosaurs” in India and South-East Asia and found that for years they outperformed more focused “pure-play” firms, because of better access to raw materials, regulatory favours and brains. But as local capital markets have developed, the advantages have eroded. Last year Bain reported that in 2007-16 a sample of 102 conglomerates underperformed a group of 287 more single-minded firms.

Such developments make it tempting to think that it is curtains for the cockroaches. Yet new forms are evolving. In another report, Bain noted that last year was the first time global M&A activity was dominated by deals taking firms into new lines of business, rather than ones to build scale, which generate synergies. Examples were Amazon buying PillPack, an online pharmacy, and Alibaba buying ele.me, a Chinese food-delivery business. Amazon’s move into logistics, which has recently rattled incumbents such as XPO Logistics, FedEx and UPS, reinforces the trend.

For the time being, investors are tolerating these fashionable firms in a way that they no longer do the sprawling metal bashers. Perhaps, says Jerry Davis

of the University of Michigan, that is because shareholders have mastered the art of valuing conglomerates that own traditional hard assets but still struggle with those holding nascent digital ones. Hence they give bosses like Mr Bezos the benefit of the doubt. But once markets evolve further and businesses mature, firms like Amazon will discover the drawbacks of probing into every nook and cranny. By then the activists will probably be crawling over the digital cockroaches, who will resist break-ups—just like their industrial forebears. ■



熊彼特

小强集团

企业集团永不会消亡。但它们的形态正在演变

工业集团一直被视作企业界的巨兽。上世纪80年代，这些乳齿象般的庞然大物被挥舞着长矛的“企业掠夺者”宣告灭绝。但还是将它们比作蟑螂更恰当，因为尽管困难重重，它们拒绝消亡。它们在大多数环境中都能繁盛成长，适应性很强。而且，长期以来它们一直被视为害虫，至少在股东和商学院教授眼中是这样，虽然它们的众多员工未必认同。

今天的工业界全面启动了“灭蟑”模式。近期有许多拆解和剥离计划被提出，其中最引人注目的计划涉及美国的通用电气、联合技术公司（UTC）、陶氏杜邦、霍尼韦尔，以及它们的欧洲同行蒂森克虏伯（ThyssenKrupp）、ABB和西门子。高大魁梧的UTC首席执行官贺国瑞（Greg Hayes）开着一辆皮卡，有一说一。他说，就连巴菲特的伯克希尔·哈撒韦公司和贝佐斯的亚马逊也大到难以管理。尽管投资者目前能容忍伯克希尔和各家数字企业集团，但这种双重标准不会持续太久。

虽然股东们通常都厌恶那种尾大不掉的结构，但工业企业的高管们却对它情有独钟，这里有几点原因。最主要的一点是他们权欲爆棚：老板们都相信自己是管理帝国的最佳人选。高管们还过分强调公司历史、传统观念和情感纽带。要拆分一个企业集团，往往得将这些因素悉数破除。

UTC的历程很说明问题。去年，该公司以300亿美元收购了罗克韦尔柯林斯公司（Rockwell Collins），并将之与旗下航空部门普惠（Pratt & Whitney）合并。随后，UTC表示将剥离电梯、环境控制与安防这两个部门，而保留航空航天作为主营业务。身为公司资深员工的贺国瑞费尽心力说服自己和董事会旧有扩张模式已不再可行，这才使得公司决定分拆。所有的借口都得一一驳斥。

首先是公司历史。这家公司的历史可以追溯到上世纪20年代，当时的普

惠、波音和后来成为联合航空的公司等企业组成了一家大公司，是航空垄断企业的鼻祖。到了30年代，这家大公司被分拆，普惠成为联合飞行器公司（United Aircraft），1975年更名为UTC，之后收购了电梯公司奥的斯（Otis）和空调的发明者创建的开利（Carrier）。

在过去的82年里，UTC从未停止派发股息，而且它的市值如今已超过处境不佳的竞争对手通用电气——它曾长期处于通用电气的阴影之下。所以它并非显而易见地需要摆脱苦难。当贺国瑞首次向董事会提出分拆建议时，有半数董事表示反对，一些股东也持同样立场。

然后是传统观念。多年来，大家都认为有一件事是不言自明的，那就是UTC需要从奥的斯和开利利润丰厚的服务合同中获得现金，以支持开发喷气发动机这一周期长、资本密集的业务。但从来没有人核实过这一点。贺国瑞做了，并发现这是“无稽之谈”。实际上每块业务都能赚得足够的现金来维持自身运营和分红。这一点有助于最终在董事会敲定分拆计划。

即便如此，身为首席执行官，贺国瑞自然而然地倾向于保留前人的遗产，而这和保持业务专注度的逻辑相悖。他说：“从情感上讲，我很难接受从2019年的750亿美元[销售额]的公司转为一家500亿美元的航空航天企业。”但他表示，自己最终明白这么做是正确的。

即便他不分拆公司，说不定也会有人替他做了这件事。这是因为企业内部对变革的抗拒正日渐被外部力量压倒，尤其是来自急于提高回报的积极投资者的压力。就在贺国瑞宣布分拆UTC前不久，两家对冲基金Third Point和Pershing Square开始紧盯他。它们或许来晚了，但它们的到来是投资界内更大变化的一个征兆。随着低收费指数跟踪基金的增长，积极的资产管理公司面临着证明其收费合理性的压力，这让它们更有可能支持分拆。因此，近期维权活动激增。Lazard银行表示，去年全球维权活动创历史新高，共有247起，比2017年增加了17%。

即使在企业集团长期保持优势的发展中国家，形势可能也在逆转。贝恩咨询公司研究了印度和东南亚的这类“恐龙”，发现多年来它们的表现优于专

注单一业务的公司，因为它们更易获得原材料、监管优待和人才。但随着本地资本市场的发展，这些优势逐渐消失。根据贝恩去年的报告，2007年至2016年，102家样本企业集团的表现逊于287家更专注某项业务的企业。

这些新动态不禁让人觉得蟑螂的末日到了。但新的形态正在进化出来。贝恩在另一份报告中指出，去年的全球并购活动首次以将企业引入新业务领域的交易为主，而不是扩大规模的交易，这可以实现协同效应。例如，亚马逊收购了在线药店PillPack，阿里巴巴收购了外卖公司饿了么。亚马逊进军物流业的举动强化了这一趋势，近来让XPO物流、联邦快递和UPS等一众老牌快递公司深感不安。

就目前而言，投资者还在容忍这些时髦的公司，却不会同样容忍那些四处扩张的传统工业公司。密歇根大学的杰里·戴维斯（Jerry Davis）认为，这或许是因为股东们已经熟练掌握了评估拥有传统硬资产的企业集团的技巧，但还难以对付拥有新生数字资产的这类企业集团。因此，他们虽有疑虑，但还是选择姑且相信贝佐斯这样的老板。但是，一旦市场进一步发展、企业变得成熟，亚马逊之类的公司会发现让自身业务无孔不入的弊端。到那时，维权分子可能就会盯上这些“数字蟑螂”，而这些蟑螂会努力抗拒分拆，就像它们的“工业蟑螂”前辈们一样。 ■



The American Association for the Advancement of Science

Voyages to strange new worlds

This year's meeting of the AAAS looked at crop biology, the origin of heavy elements, how species raft around oceans and the problems of flying to Mars

Sending people to Mars is a daunting prospect. It would take astronauts at least nine months to get there, they might spend a year on the planet itself, and they would then spend another nine months on the journey home. During that time they would be exposed both to high radiation levels and to the increasingly irritating tics and habits of their fellow crew. It is hard to say which of these would be more likely to result in someone's death.

But though the scientific value of such a mission is questionable, as a propaganda stunt it would be unequalled. America's space agency, NASA, is therefore looking into ways of preserving both the physical and the mental health of putative Martian voyagers. And, at this year's meeting of the American Association for the Advancement of Science (AAAS), held in Washington, DC, several presentations described work towards that end.

One such effort is the NASA Twin Study, full results of which are to be published in the next few months. The AAAS meeting was, however, given a taster.

The NASA Twin Study took advantage of identical-twin astronauts Mark and Scott Kelly. Scott was launched to the International Space Station in 2015 for a 12-month tour as station commander. Mark remained on Earth for the same period. Both men gave regular samples of blood, urine and so on for scientific analysis. Both also undertook batteries of physical and mental tests. Not knowing exactly what might change in the men's bodies, ten teams of researchers spread across America combed through the samples and results to track as many molecular, cognitive and physical changes as

possible.

As Chris Mason of Weill Cornell Medical College told the meeting, these teams found lots of surprises. For example, Scott's telomeres got longer during his sojourn in space. Telomeres are strands of DNA that cap the end of chromosomes in a cell's nucleus. They normally get shorter as that cell divides and ages.

Dr Mason then compared the operation of Scott's genes with those of his brother back on Earth. Genes in Scott's body associated with the immune system, he found, became highly active. This was also true of the cellular machinery associated with repairing DNA. "It's almost as if the body is in high alert," he said, which would not be surprising given the stresses of space flight. Another surprising observation was the presence of a lot of mitochondrial fragments in Scott's blood. Mitochondria are tiny structures within a cell which release energy from sugar. They tend to get into the bloodstream only when cells are damaged or dying of stress.

From Scott's point of view, the good news is that almost all of the thousands of changes catalogued in his body reverted to normal soon after he returned to Earth. This suggests that, for the most part, a healthy human body recovers well from the stress of space flight. But however detailed the Twin Study has been (and it was in fact the most detailed scientific portrait of human beings ever made) a sample size of two is still rather limited. In the coming years NASA is planning dozens more long-duration tests on people, including tracking astronauts heading to the moon in preparation for future trips to Mars.

When Scott returned from the space station, he said that "teamwork makes the dream work" when it comes to a successful mission in space. Cutesy. But it was an apt statement. Understanding how teams function, how they go wrong and how to prevent social problems will be a critical element of any

successful mission to Mars.

Such a mission might involve half a dozen people, perhaps from different cultures, cooped up together for some three years in a space no bigger than a typical family home. There would be no emergency-escape strategy. One of the attempts being made to model these conditions is that of Noshir Contractor, a behavioural scientist at Northwestern University, in Illinois. As he told the meeting, he has been studying the dynamics of groups of people isolated for long periods in the Human Exploration Research Analogue, a facility at the Johnson Space Centre in Houston, Texas. Here, volunteers are locked away for up to 45 days at a time on mock space missions. They are poked and prodded, physiologically and psychologically, and monitored day and night.

Something researchers have already learned from these experiments is that certain personality characteristics are essential to helping groups work well together. A good group needs a leader, a social secretary, a storyteller and a mixture of introverts and extroverts. Intriguingly, by far the most important role seems to be that of the clown. According to Jeffrey Johnson, an anthropologist at the University of Florida who has spent years examining relations between people in Antarctic crews overwintering at the South Pole, the clown is not only funny, he is also smart and knows each member of the group well enough to defuse most of the tensions that might arise during long periods of close contact. This sounds rather like the role of a jester in a royal court. The clown also acts as a bridge between different groups of people—in Antarctica the clowns linked scientists on the base with the tradesmen who also worked there. In groups that tended to fight most or to lose coherence, Dr Johnson found, there was usually no clown.

Even if a perfect, balanced group of astronauts is assembled for a Mars mission, however, things could still go awry. On December 28th 1973, for example, the three crew members of *Skylab*, an early American space

station, decided to cut off contact with ground control and refused to do any of their assigned tasks—something they called a “work slowdown”. Newspapers at the time referred to this incident as the first strike in space.

Dr Contractor’s group wanted to understand what happened on *Skylab* and whether or not the crew’s reaction could have been averted. They took transcripts of conversations that had occurred on *Skylab* over the many years it had hosted astronauts, and applied textual and network analysis to them to try to understand the nature of relations between the people who had been on the station.

The cause of the strike, they found, was that the crew’s close ties with one another had become detrimental to their relationship with the team back on Earth. Crew members had started using a lot of negative words about their daily tasks. They complained bitterly to each other about their workload, but never shared these thoughts with those in ground control. The signal of problems was so clear in this analysis that Dr Contractor’s team reckon they would have been able to see the strike coming a week before it happened.

On a future mission to Mars, ground control would thus be well advised to have transcripts of conversations showing details of who talks to whom, how quickly people respond to each other and what the sentiment of each conversation is. Dr Contractor and his colleagues are creating algorithms that can crawl through these data and predict when there could be problems between members of the crew, or between the crew and the ground.

Predicting problems is just the start. Ground-control teams monitoring the flight could help with crew conflict near to Earth, but on a mission to Mars the astronauts will need to operate autonomously, given the large communications delays. NASA’s engineers are therefore working on software that can be used to analyse data about a crew’s behaviour in real time and provide a sort of digital counselling service, helping them find

ways to mitigate any problems. “Good mental health on a mission is not the absence of conflict, but how you handle that conflict,” said Thomas Williams, a specialist in human factors at the Johnson Space Centre.

All this detailed understanding of teams will have uses far beyond lengthy space missions, the researchers hope. Behavioural scientists are already trying to apply such “people analytics” to the understanding of sentiments within companies. They might, perhaps, replace performance surveys, monitor inclusion and diversity, identify high potential or put together dream teams for certain tasks.

Building a perfect team for a long mission to Mars will not be easy, says Dr Contractor, and there is much to learn yet. But if human beings are ever to travel to other parts of the solar system, then understanding the behaviour of those who will be crewing the hardware should make a successful voyage far more likely. ■



美国科学促进会 驶向奇异新世界

美国科学促进会年会探讨了作物生物学、重元素的起源、物种如何在海洋各处漂流，以及飞向火星会面临怎样的问题

送人上火星的展望令人望而生畏。宇航员至少需要九个月才能到达那里，可能要在那个星球待上一年，然后再花九个月的时间返航。在此期间，他们要经受高辐射，还要忍受同事们越来越恼人的怪癖和习惯。很难说哪一点更有可能要了一个人的命。

但是，虽然这样一项任务究竟有多少科学价值还很难说，但它却会是一个无与伦比的宣传噱头。因此，美国国家航空航天局（NASA）正在研究如何保护未来的火星探险者的身心健康。在于华盛顿特区举行的美国科学促进会（AAAS）年会上，几名研究人员发言阐述了他们为此所做的工作。

其中一个是NASA的双胞胎研究项目，完整研究结果将在几个月后发表。不过，研究人员在年会上透漏了些许发现。

NASA正好有一对同卵双胞胎宇航员可作为研究对象：马克·凯利和斯科特·凯利（Mark and Scott Kelly）。斯科特于2015年进入国际空间站，在一次长达12个月的旅程中担任空间站指挥官。同一时期马克留在地球上。两人均定期提供血液、尿液等样本供科学分析，还会接受一系列身体和心理测试。由于不清楚他们的身体究竟可能产生怎样的变化，遍布美国的十个研究小组在这些样本和结果中仔细搜寻，尽可能详尽地追踪他们在分子、认知和身体上的变化。

威尔·康奈尔医学院（Weill Cornell Medical College）的克里斯·梅森（Chris Mason）在会上表示，这些小组已有很多惊人的发现。例如，斯科特在太空逗留期间端粒变长了。端粒是细胞核中染色体末端的DNA链，通常会随着细胞的分裂和老化而变短。

梅森随后将斯科特的基因状态与留在地球上的马克作比较。他发现，斯科特体内与免疫系统相关的基因变得非常活跃。与DNA修复相关的细胞机制也是如此。“他的身体简直就像处于高度警戒状态。”梅森说。考虑到太空飞行是项压力很大的工作，这可能就不足为奇了。另一个令人惊讶的观察结果是斯科特血液中存在大量线粒体碎片。线粒体是细胞内的微小结构，可从糖中释放能量，一般只有在细胞受损或因压力死亡时才会进入血液。

在斯科特看来，好消息是在他返回地球后不久，他体内发生并被记录下来的数千项变化几乎都恢复了正常。这表明健康的人体通常可以很好地从太空飞行的压力中恢复过来。但是，无论这项双胞胎研究有多详尽（事实上，这是有史以来为人类描绘的最细致的科学肖像），样本数量仅为两个还是相当有限。未来几年，NASA计划对人体开展数十次持续时间较长的测试，包括追踪前往月球的宇航员的情况，好为未来的火星之旅做准备。

当斯科特从空间站返回时，他说，在一项成功的太空任务中，“是团队合作让梦想成真”。太乖巧了。但在这项任务上它恰恰是有道理的。了解团队如何运作、团队何以会出状况，以及该怎样防止人际关系出现问题，将是决定一项火星任务成败的关键因素。

参与这项任务的或许是六七个来自不同文化的人，他们要在一个比普通家宅大不了多少的空间里一起被关上三年。没有紧急逃生策略。一些研究人员尝试模拟出这样的环境，位于伊利诺伊州的西北大学的行为科学家诺希爾·康特拉克特（Noshir Contractor）便是其中之一。他在AAAS年会上表示，他一直在研究那些较长时间内远离人群、参与人类探索研究模拟（Human Exploration Research Analogue）的群体的人员互动情况。开展该项目的设施位于德州休斯顿的约翰逊航天中心。与世隔绝的志愿者在那里执行模拟太空任务，一次最长持续45天。他们会在生理和心理上受到种种刺激，并日夜接受监测。

研究人员从这些实验中已得出的发现是，某些人格特征对于帮助团队成员很好地协作至关重要。一个良好的团队需要一个领导者、一个社交秘书、一个会讲故事的人，既有内向的人，也有外向的人。有趣的是，小丑似乎

比所有这些角色都重要得多。佛罗里达大学的人类学家杰弗里·约翰逊（Jeffrey Johnson）多年来一直在研究那些在南极越冬的团队成员之间的关系。在他看来，小丑不仅有趣，还很聪明，对小组的每个成员都有充分的了解，因而可以化解绝大部分因成员长期密切接触而产生的紧张气氛。这听起来十分像宫廷弄臣的角色。小丑还可充当不同人群之间的桥梁：在南极洲，小丑成为基地的科学家和同样在那里工作的生意人之间的纽带。约翰逊发现，那些最容易起冲突或失去凝聚力的团体中通常都没有小丑这号人物。

然而，即使为登陆火星而组建起了一个完美、均衡的宇航员团队，还是有可能出问题。例如，1973年12月28日，美国早期的空间站天空实验室（Skylab）的三名宇航员决定切断与地面控制台的联系，并拒绝执行分配给他们的任何任务——他们管这叫“放慢工作步调”。当时的报纸称这次事件为首起“太空罢工”。

康特拉克特的团队想知道天空实验室里发生了什么，以及宇航员们的反应是否原本可以避免。他们拿到了天空实验室在有宇航员进驻的年头里所发生的对话的文字稿，并对其进行文本和网络分析，试图了解站内宇航员之间的关系究竟如何。

他们发现，罢工的原因是宇航员彼此间的紧密联系损害了他们与地球团队的关系。宇航员们开始对他们的日常任务颇多微词。他们互相大倒苦水，抱怨自己的工作量，但从未将这些想法告知地面控制人员。分析显示，发生问题的信号是如此清晰，康特拉克特的团队估计他们可以提前一周预测到罢工的发生。

因此，未来如果要启动飞往火星的任务，最好向地面控制人员提供宇航员对话的文字稿，从中可以得到种种具体信息，如谁与谁发生了对话、人们彼此回应的速度，以及每次对话渗透出的情绪。康特拉克特和同事正在构建一种算法，可以浏览这些数据并预测宇航员之间或他们与地面之间何时可能会出现麻烦。

预测问题还仅仅是个开始。如果宇航员是在地球附近发生了冲突，监控飞行任务的地面控制小组还可以帮忙调解，但如果是执行火星任务，就会有很长时间的通讯延迟，这时宇航员就需要自主协调。因此，NASA的工程师正在开发软件用于实时分析宇航员的行为数据，并提供某种数字咨询服务，帮助他们设法减轻麻烦。约翰逊航天中心的人为因素专家托马斯·威廉姆斯（Thomas Williams）说：“在执行任务时保持良好的心理健康状态并不意味着没有人际冲突，而是如何处理冲突。”

研究人员希望，像这样细致了解团队的做法在长时间的太空任务之外的领域也能派上用场。行为科学家已经在尝试利用这种“人物分析”来理解企业内部的情绪。人物分析或许还可用来替代绩效调查、监督企业推进包容性和多样性、识别高潜力员工或组建理想的团队来完成某些任务。

康特拉克特说，要组建一个完美的团队来完成耗时漫长的火星任务不容易，还有很多事物需要了解。但是，倘若人类要前往太阳系的其他地方，那么理解那些操纵宇航器的人的行为应该会大大增加成功完成任务的可能性。 ■



Bartleby

Conscious decoupling

A new book explains how managers struggle with changing customer behaviour

THINK ABOUT the companies like Uber and Airbnb that have burst through into public consciousness in the past ten years. While many of them depend on the internet, their success is not down to any particular technological innovation of their own design. Instead, their secret lies in their business model.

Thales Teixeira of the Harvard Business School argues that the principle that underlies a lot of these models is called decoupling. In his book “Unlocking the Customer Value Chain”*, he explains how this concept applies across a wide range of industries.

Buying a product will involve at least four stages. First, customers will evaluate the items available; then they will choose one or two; then they will buy them; finally they will consume them. In the traditional model, the first three took place inside a single retail store. Customers would look at the TVs or dishwashers on offer, pick one they liked with a price they could afford, pay at the till and then take the item home or arrange for the retailer to deliver it.

These steps are all part of what Mr Teixeira calls the “customer value chain”. Disrupters have muscled in on some parts of this chain. One example is the practice of “showrooming”. Shoppers enter an electrical store like Best Buy and examine what’s on offer. But instead of purchasing the item in the store, they buy it online. Amazon has even created an app allowing customers to scan a product’s bar code, or take its picture, and discover its online price. The selection of products has been decoupled from their purchase.

Other examples of the decoupling process cited by Mr Teixeira include Zipcar, where driving a car is separated from purchasing and maintaining it; TiVo, where watching TV is delinked from sitting through ads; and Birchbox, where customers are sent samples of beauty products, eliminating the need to visit a store to try them.

This is not, as the author points out, a particularly new idea. Budget airlines like Ryanair have long since decoupled flying from the services and amenities that usually accompanied it. Passengers have to pay separately for the extras, like seat selection and the carrying of baggage. Other airlines have followed suit.

Customer services have for some time been disrupted by a trend with the ugly name of disintermediation, the cutting out of middlemen. Most holidays are now purchased directly, rather than via travel agents; shares are bought via low-commission services, rather than through advisory stockbrokers. New entrants can gain market share if they can offer customers a lower cost or greater convenience. Decoupling doesn't subtract middlemen but still results in lower costs to the consumer.

The beauty of the decoupling approach is that the only limit to innovation is imagination, rather than technical brilliance. For example, Mr Teixeira cites Trov, a company which allows customers to buy insurance solely for specific items for specific periods of time. If you want to insure your latest smartphone for a two-week holiday, you can do so; and then insure it again for a weekend trip later in the year. The need for insurance is decoupled from the hassle of buying an annual policy.

Suppose that you like a restaurant's ambience, but not its food. In theory, you could book a table but order the food from elsewhere, paying separately for the service and the cooking. If 3D printers become ubiquitous, design and manufacture could be decoupled, with consumers paying for the digital

blueprint.

Mr Teixeira argues that decoupling is a customer-driven phenomenon—bottom-up rather than top-down. Successful businesses will spot how consumer tastes are shifting, and that may involve looking at other industries as well as their own. For example, they can look at the success of Netflix's subscription-based model; what works for TV programmes may also work for other goods and services. Already, there are companies that will deliver socks or perfume on a regular basis, decoupling this from a trip to the mall.

The challenge for existing managers is that they must worry about more than whether their overall costs are lower than those of their immediate rivals. If a part of their process is inefficient, or inconvenient for consumers, the decouplers may well grab hold of it.

* subtitled How Decoupling Drives Consumer Disruption, published by Currency Books ■



巴托比

自觉脱钩

一本新书分析管理者如何努力应对不断变化的客户行为

优步和爱彼迎等公司在过去十年里异军突起，闯入公众视野。虽然它们当中有许多都依赖互联网，但其成功却并非源自任何自己创造的特定的技术创新。相反，它们的秘诀是商业模式。

哈佛商学院的塔莱斯·特谢拉（Thales Teixeira）认为，这许多商业模式的背后是同一个原理——“脱钩”。在《解锁客户价值链》*（Unlocking the Customer Value Chain）一书中，他解释了这一概念如何适用于众多行业。

购买一件产品至少涉及四个阶段。首先顾客会评估市面上的产品，从中选择一两件，然后掏钱购买，最后是使用。在传统模式中，前三阶段发生在同一家零售店内。顾客会查看在售的电视机或洗碗机，选出自己心仪的、价格又合适的产品，到收银台付款，然后将商品带回家或由零售商安排送货上门。

这些步骤都是特谢拉所说的“客户价值链”的一部分。现在，颠覆者已强势介入这一链条的某些环节。“展厅”现象的出现便是个例子。购物者走进百思买（Best Buy）这样的电器商店，研究出售的货品。但他们不在店内购买，而是会网购。亚马逊甚至设计了一个应用，让客户扫描产品条形码或拍个照就能了解产品的网上售价。产品的挑选和购买环节脱钩了。

特谢拉举出的其他“脱钩”例子还有：美国汽车共享公司Zipcar让开车和买车及养车脱钩，数字录像机TiVo让人们在看电视时不必再看插播的广告，还有提供美容产品在线订阅服务的Birchbox，顾客会收到其寄送的美容产品小样，无需去某家商店试用。

正如特谢拉所指出的，这不是什么特别新潮的概念。像瑞安航空这样的廉

价航空公司早已让飞行和通常与之捆绑在一起的服务与便利设施脱钩。乘客必须为选座位和行李托运等额外服务另行付费。其他航空公司已纷纷效仿。

客户服务环节被去中介化（即去除中间商）这一趋势颠覆已有一段时日。如今人们大多直接购买度假产品，而不是通过旅行社；从低收费的服务商购入股票，而不是通过提供咨询服务的股票经纪商。新进入的商家如果能为客户提供更低的成本或更大的便利，就能获得市场份额。脱钩并不去除中间商，却仍为消费者降低了成本。

有了脱钩这种方式，想象力而非技术水平就成了创新的唯一限制。这就是脱钩的妙处。特谢拉举了保险公司Trov的例子，它允许客户仅在特定时间段为特定项目购买保险。想在度假时为新买的智能手机投保两周？完全可以。还想等到今年晚些时候某次周末旅行时再为手机投保？也没问题。保险需求与麻烦的按年投保脱钩了。

假设你喜欢某家餐厅的环境氛围，但不中意它的食物。理论上讲，你可以预订餐桌，再从别家餐厅点菜，为餐厅服务和菜品分别付费。假如3D打印机得到普及，设计和制造就可能脱钩，消费者可以单独为数字设计图付费。

特谢拉认为，脱钩是一种由客户驱动的现象，自下而上、而非自上而下地进行。成功的企业会察觉消费者的口味如何变化，为此，它们除了要审视自己所在的行业，还可能需要观察其他行业的发展。例如，它们可借鉴Netflix订阅模式的成功经验，因为适用于电视节目的模式也许同样适用于其他商品和服务。已经有公司定期给顾客递送袜子或香水，使购买这些商品的行为与逛商场脱钩。

在位管理者面临的挑战是，他们不能单单关心自己的整体成本是否低于直接竞争对手。只要他们的某个经营环节效率低下，或者令消费者感到不便，“脱钩分子”就可能乘虚而入，夺取市场份额。

*副标题为“脱钩如何推动消费颠覆”，Currency Books出版 ■



Free exchange

A familiar cycle

Why a global manufacturing recession is a recurring threat

THE GLOBAL economy had an inauspicious start to 2019. Markets went into a tailspin and America's government was locked in a seemingly interminable shutdown. But matters have not played out as dismally as they might have. The government in Washington is open again. America and China appear close to a trade deal which, although modest in its achievements, would nonetheless reflect a welcome easing of tension between the world's two biggest economies. Markets have smiled on these developments: the MSCI index of global shares has risen by 10% so far this year.

Good news notwithstanding, many economic indicators have undergone a remarkable downward shift since early 2018. Back then economists were celebrating the emergence of a broad-based expansion. When it assessed the world economy in January last year, the IMF hailed the "broadest synchronised global growth upsurge since 2010". Now the progress on trade talks is occurring against a darker economic backdrop.

Global manufacturing activity has slowed (see chart). Economies that are especially reliant on trade, such as Germany and Japan, have suffered. Industrial production in the euro area has fallen over the past year. Both Japan and South Korea reported tumbling exports in January. The World Trade Organisation's global trade outlook index has been falling for the past year. In February it dipped to its lowest level since 2010. America's economy, which is less trade-dependent, has been relatively less harmed, though industrial production contracted in January. Why does the world's manufacturing upswing appear to have flopped?

It is tempting to blame President Donald Trump for the reversal. America has spent the past year ratcheting up its confrontation with China. The deceleration in manufacturing activity began around the time Mr Trump raised tariffs on washing machines and solar panels. It continued as America slapped tariffs first on steel imports and then on a range of Chinese goods, and as it restricted the involvement of Chinese technology firms in its economic affairs. A clash between the world's two largest economies could not help but undermine global economic confidence.

But there is more to the manufacturing swoon than Mr Trump's trade war. The downturn bears a striking resemblance to the bout of economic trouble that began in 2015. Then, too, global manufacturing activity faltered. That was partly due to the bust that followed America's extraordinary shale-oil boom. But China was also a big influence on exporters' fortunes. Germany, for instance, has come to rely on China's voracious appetite for its capital goods.

Once they had hauled the economy through the global financial crisis of 2007-08, on the back of massive stimulus, China's leaders pivoted towards economic reform in 2015. They sought to wean the economy off credit, which had grown at mind-boggling rates in 2009-14. They also took steps to open up China's financial markets. The measures turned out to be premature: as constraints on capital movement were loosened, money fled the country and stock prices crashed. Financial turmoil radiated outwards, threatening to tip large swathes of the world economy into recession.

The downward spiral was quickly halted. China put its plans to lift capital controls on ice; the stimulus taps were turned back on. The government eased monetary policy and began spending with gusto. Officially, China's fiscal deficit expanded only modestly in 2015 and 2016, to just under 4% of GDP. But the government is adept at using special financing vehicles, primarily at the local-government level, to borrow and to direct funds to

projects; these do not affect the official deficit figures. Researchers at Goldman Sachs, an investment bank, estimate that China's "augmented" budget deficit, which includes such tactics, rose to around 15% of GDP in early 2017. The explosion of borrowing did the trick. By the end of 2017, the world was on the road to a synchronised upsurge.

Having survived that close call, China's leaders focused again on the economy's dismaying reservoirs of red ink. They restricted lending to over-indebted firms and embarked on a bout of fiscal belt-tightening that would make even the prudent Germans blush. China's augmented budget deficit has narrowed by about six percentage points of GDP since the beginning of 2017. Domestic demand has consequently weakened. As Brad Setser, an economist at the Council on Foreign Relations, a think-tank, has recently pointed out, China's imports of manufactures for domestic use have fallen by more than its "processing imports", or inputs into the products that China makes and exports. Its purchases of American goods have tumbled; imports from the rest of the world have fallen too. Although the trade war has played a role, the world economy's recent ups and downs are more closely related to China's on-and-off struggle to reform its economy and curb unruly borrowing.

China should not matter so much. Its tight capital controls ensure that its financial links with the rest of the world remain modest. It is not yet the engine of global demand in the way that America is: Mr Setser notes that China's manufacturing imports for its own consumption are only about a third as large as America's (though recent growth in Chinese imports has been an important driver of manufacturing demand for some countries, such as Germany). The problem is not so much that the headwinds from China are powerful, but that the rest of the world is so poorly prepared to lean against them. Interest rates remain extraordinarily low. If the global manufacturing malaise worsens, America will have precious little room to cut rates in response; Europe and Japan will have none. Fiscal policy could

pick up the slack. Advanced economies could badly use a dose of deficit-financed public investment. But neither the euro area nor America seem keen to build.

Such policy debates may be inconsequential this time. In the last few weeks China has begun turning on the stimulus taps yet again, propping up sentiment there. The world's manufacturing slowdown may well prove as fleeting as that of 2015. Both episodes show that the rich world has chosen to put itself at the mercy of the fiscal management of the Chinese Communist Party. That is a curious decision—but not an unprecedented one. ■



自由交流

熟悉的循环

为什么全球制造业衰退这一威胁反复出现

今年，全球经济开局不利。市场一蹶不振，美国政府的停摆似乎无休无止。但情况并没有一路恶化下去。联邦政府重新开门，美国和中国似乎也即将达成贸易协议，虽然成果有限，但仍显示世界最大的两个经济体之间的紧张关系有所缓和，为世人所乐见。市场对这些进展做出了积极反应：MSCI全球指数今年迄今已上涨了10%。

尽管有好消息，但自2018年初以来，许多经济指标还是录得显著下滑。当时，经济学家庆贺全球经济显现广泛的扩张。国际货币基金组织去年1月评估世界经济时，盛赞“全球实现了2010年以来最广泛的同步大幅增长”。然而如今贸易谈判的进展却是在更黯淡的经济形势下取得的。

全球制造业活动已经放缓（见图表）。德国和日本等特别依赖贸易的经济体深受影响。欧元区的工业生产水平在过去一年里出现下降。日本和韩国均报告1月出口下滑。过去一年，世贸组织的全球贸易展望指数一直在下降，2月跌至2010年以来的最低水平。美国经济对贸易的依赖程度较低，受到的影响相对较小，不过1月工业生产也出现萎缩。为什么全球制造业的上升趋势似乎已经急转直下？

人们很容易将这种逆转归咎于特朗普。过去一年里，美国一直在令美中对峙升级。制造业活动减速就是从特朗普对洗衣机和太阳能电池板加征关税那会儿开始的。自那以后美国又先后对进口钢铁和一系列中国商品加征关税，并限制中国科技公司参与美国经济，以致制造业持续放缓。世界最大的两个经济体之间的冲突不可避免地破坏了全球经济的信心。

但是，制造业不振不仅仅是因为特朗普发动的贸易战。此次衰退与2015年开始的经济问题有着惊人的相似之处。那时全球制造业同样出现下滑，部

分原因是美国页岩油极度繁荣之后泡沫爆裂。但中国对出口国的命运也有很大的影响。例如，德国已经开始依赖中国对其资本货物的极大胃口。

在大规模刺激措施的支持下，中国熬过了2007至2008年的全球金融危机。之后，中国领导人在2015年将重心转向经济改革。在2009至2014年间经历了速度令人难以置信的信贷增长后，他们试图让经济摆脱对信贷的依赖。他们还采取措施开放中国金融市场，但结果证明这些措施实施过早：随着对资本流动的限制放松，资金大量逃离，股票价格崩溃。金融动荡向外辐射，险些拖累世界经济的大部分陷入衰退。

但螺旋式下降很快被收住。中国搁置了解除资本管制的计划，并恢复了刺激措施。政府放松了货币政策并启动大笔开支。据官方数字，中国的财政赤字在2015年和2016年仅小幅扩张，占GDP的近4%。但政府（主要是地方政府）善于利用特殊融资工具来借贷并将资金投入项目，而这部分不会影响官方的赤字数字。投行高盛的研究人员估计，中国包括此类贷款在内的“扩增”预算赤字在2017年初上升至GDP的15%左右。呈爆炸式增长的借贷发挥了作用。到2017年底，世界经济开始同步大幅增长。

躲过一劫后，中国领导人再次开始关注大到令人惊惶的赤字。他们限制向过度举债的企业提供贷款，并开始了一轮让稳健的德国人都会汗颜的财政紧缩政策。2017年初以来，中国的扩增预算赤字占GDP的比重已经缩小了约6个百分点。国内需求随之减弱。正如智库外交关系委员会（Council on Foreign Relations）的经济学家布拉德·塞瑟（Brad Setser）近期指出的那样，中国供国内消费的制成品进口的下降幅度超过了“加工进口”（即中国用于生产出口产品的进口品）。中国的美国商品进口量已大幅下跌，从世界其他地区的进口量也有所下降。虽然贸易战有一定影响，但世界经济近期的起伏与中国断断续续的经济改革和抑制贷款乱象的努力关系更为密切。

中国的影响不应该这么大。严格的资本管制确保了它与世界其他地区的金融联系仍旧不密切。它也还不像美国那样已是全球需求的引擎。塞瑟指出，中国供自己消费的制成品进口量仅为美国的三分之一左右（尽管近期

中国进口增长对德国等国而言是制造业的重要推动力）。问题不在于来自中国的不利因素有多强大，而是世界其他地方对这些不利因素没有做好准备。利率仍然非常低。如果全球制造业萎靡加剧，美国已经几乎没什么空间再降低利率，而欧洲和日本已经完全没有。财政政策可以弥补这一不足。发达经济体可以大量启动由赤字融资的公共投资，但欧元区和美国似乎对此都没什么兴趣。

这一次，这样的政策辩论可能已经无关紧要。因为在过去的几周里，中国又开始重启刺激措施，以提振国内情绪。全球制造业的放缓可能会像2015年那样转瞬即逝。这两次都表明，富裕国家已经选择仰仗中国共产党的财政管理。这是一个奇怪的决定，但并非前所未有。 ■



Food companies

An accident with the ketchup

The food industry's woes stretch beyond 3G and Kraft Heinz

THIS WAS supposed to be the quarter that Kraft Heinz showed America's huge, struggling food companies a new model for success. A merger in 2015 had joined two of the world's most iconic food makers. Backed by 3G Capital, a private-equity firm, the new group slashed costs at a pace that made rivals shudder and investors swoon. After a failed bid in 2017 for Unilever, an Anglo-Dutch giant, Kraft Heinz set out to prove it could not just cut fat but boost sales on its own. Bernardo Hees, the company's boss, pointed cheerfully to new products, including Heinz Mayochup and something called Just Crack an Egg. The company was on the path to "sustainable, profitable growth", he declared in November. Unfortunately, it wasn't.

On February 21st Kraft Heinz announced a staggering \$15bn impairment, a dividend cut of more than 30% and an inquiry into its procurement by the Securities and Exchange Commission (SEC). Earnings calls are often sleepy affairs. This one was a nightmare. Some of 3G's long-time critics are now clucking with satisfaction. Others fear 3G is tarnishing American treasures such as Kraft Macaroni and Cheese and Warren Buffett, who partnered with 3G to combine Heinz and Kraft and last year lost nearly \$3bn on the deal. Yet dramatic as Kraft Heinz's decline may seem, 3G's impact and the food industry's problems extend far beyond it.

While its founders are Brazilian, 3G's buyout business is based in Manhattan. (Its most famous founder, Jorge Paulo Lemann, lives in Switzerland.) Unlike many big private-equity firms, 3G's main investors are not pension funds but family offices and individuals, including its partners.

It does not have a wide portfolio, but backs just two companies: Kraft Heinz and Restaurant Brands International (RBI). Blackstone, a private-equity firm based a few blocks away, has nearly 2,500 staff. 3G's New York office has fewer than two dozen. Yet 3G's leaders have rocked the consumer industry like few investors in history.

All buyout firms are thirsty for deals, but 3G is uniquely parched. Before starting 3G, the firm's founders went on a beer-buying spree that culminated in 2016 with Anheuser-Busch InBev's purchase of SAB Miller for more than \$100bn. AB InBev, in which 3G's partners have a large stake, now brews more than one in four of the world's beers. Kraft Heinz counts Kraft cheese, Heinz Ketchup, Jell-O, Philadelphia Cream Cheese and Oscar Mayer among its holdings. RBI includes Burger King, Popeyes, a fried-chicken restaurant, and Tim Hortons, a popular Canadian chain.

The way 3G runs companies is as notable as its appetite for buying them. In a practice called zero-based budgeting, managers must justify their expenses anew each year. The idea is to expand margins continuously. Overseeing this are managers chosen for their talent and work ethic, rather than mere experience. Daniel Schwartz, a 3G partner, became the chief executive of Burger King at 32. Mr Hees, a 3G partner who spent more than a decade working for a Latin American railroad, became Kraft Heinz's boss at 45. David Knopf, its chief financial officer, assumed his position in 2017 at 29.

To 3G's detractors, this all seems a bit mad. The company's strategy can be caricatured as follows: buy a big business, cut costs, repeat. This is not entirely fair. RBI has invested in marketing Burger King, winning prizes for its ads. AB InBev is working to boost its sales, for instance by pushing higher-priced beers and deploying best practices across its vast geography.

But buying big companies and slashing costs remain 3G's speciality. The risks of that strategy have become clear. RBI struggled to integrate

franchisees at Tim Hortons. AB InBev last year said it would slash its dividend by half.

Nowhere has 3G's approach played out more tumultuously than at Kraft Heinz. America's food industry seemed the perfect target, with flabby companies and powerful brands. Rare is the American who has not slurped Kool-Aid or downed an Oscar Mayer hot dog smothered in Heinz Ketchup. 3G reckoned the brands were strong enough to withstand large cuts. As it turns out, they were not.

This was not the same for AB InBev, which despite abysmal results in America, has little beer competition from in-store brands, is rarely sold online and faces ample growth abroad. Kraft Heinz's business, by comparison, is concentrated in America, where the food industry is being turned on its head. Its brands may be familiar, but that does not make them popular. Small firms are offering healthier options, taking advantage of cheap digital marketing and nimble contract manufacturers. The smallest 20,000 packaged goods players account for about half the industry's growth, according to Nielsen, a research firm.

Meanwhile, the rise of e-commerce and European discount grocers has put pressure on food retailers, which are in turn squeezing food companies. Stores led by Walmart are using extensive data to launch their own, increasingly sophisticated, low-cost private label goods, all the while pushing companies to lower their prices.

Things started well for Kraft Heinz. Its operating profit margin surged from 15% in 2014 to 24% in 2017. The first big setback came that year when Paul Polman, then Unilever's boss, rebuffed the company's \$143bn courtship. (Unilever, wisely, has devoted growing attention not to food but to beauty and household products.) Without his megadeal, Mr Hees turned to the basic work of lifting sales by pouring more money into advertising, product

innovation and Kraft Heinz's sales force, but that ate into profits.

Equally striking is the company's new \$15bn impairment, a recognition that the value of giant brands has shrivelled. Mr Buffett says that he misjudged the worth of Kraft's stable of products. "The management team entered into this merger with the assumption they could cut the spending needed to maintain brands, let alone help them grow," says Robert Moskow of Credit Suisse, a bank. "The world changed on them—retailers changed and consumers changed."

Flawed though 3G's approach may seem, few food companies offer a successful alternative. Companies have tried to evolve by buying smaller firms, often at lofty prices and with mixed results. For instance Campbell Soup bought Bolthouse Farms, a maker of fruity drinks, in 2012, but is now trying to sell it. Last year it bought Snyder's-Lance, a pretzel and popcorn company, to boost its snacks business. Its debt level has risen accordingly. Indeed, shopping sprees at Campbell, ConAgra and General Mills have made those companies more levered than Kraft Heinz, according to Sanford C Bernstein, a research firm.

Kraft Heinz now wants to shrink to grow: it plans divestments over the next 18 months to improve its balance sheet so it can make other, big deals. But the SEC's subpoena suggests that some internal processes might be unravelling as managers struggle to meet bold goals. The notion that big deals will save American food firms looks increasingly dubious. In 2014, before Heinz bought Kraft, the combined gross operating profits of the companies were about \$6.5bn. Now, due in part to some problems beyond its control, Kraft Heinz expects its 2019 profits to be about the same. ■



食品公司

打翻番茄酱

食品行业的困境远不限于3G资本和卡夫亨氏

卡夫亨氏（Kraft Heinz）本应在这个季度向美国规模巨大但陷入困境的食品公司展示一种通往成功的新模式。2015年，两家全球最具标志性的食品制造商合二为一。在私募股权公司3G资本的支持下，新集团以令竞争对手战栗、令投资者狂喜的速度削减成本。2017年收购英荷巨头联合利华失败后，卡夫亨氏开始想办法证明自己不但会减肥，还能凭自身提高销售额。公司老板贝尔纳多·希斯（Bernardo Hees）兴高采烈地搬出新产品作例证，包括亨氏的蛋黄番茄酱（Mayochup）和一种叫“打个蛋”（Just Crack an Egg）的食品。去年11月他宣布公司正走在通往“可持续、有盈利的增长”的道路上。遗憾的是，并没有。

上月21日，卡夫亨氏披露了150亿美元的巨额减记、削减超过30%的股息，以及美国证券交易委员会（SEC）调查其采购部门的事宜。财报电话会议通常让人昏昏欲睡，这一次却是一场噩梦。一些长期批评3G资本的人现在难掩得意之情。另一些人则担心，3G资本正在玷污像卡夫芝士通心粉和巴菲特这样的美国瑰宝。之前正是巴菲特与3G资本联手促成了亨氏和卡夫的合并，去年他因这笔交易亏损近30亿美元。不过，尽管卡夫亨氏的业绩下滑看起来很惊人，3G资本的影响和食品行业的问题却远不止于此。

3G资本的几位创始人都是巴西人，但收购业务的总部设在曼哈顿。（公司最知名的创始人豪尔赫·保罗·雷曼[Jorge Paulo Lemann]住在瑞士。）与许多大型私募股权公司不同，3G资本的主要投资者不是养老基金，而是家族办公室和个人，包括它的合伙人。它的投资组合并不广泛，只支持两家公司：卡夫亨氏和国际餐饮品牌公司（Restaurant Brands International，RBI）。私募股权公司黑石（Blackstone）的总部离3G资本只有几个街区，有近2500名员工，而3G资本纽约办事处的员工还不到24人。不过，3G资本的领导者却震撼了整个消费行业，极少有投资者曾做到这一点。

所有的投资收购公司都渴望达成交易，但3G资本在这方面的热望独一无二。在成立3G资本之前，该公司的创始人掀起了一场啤酒业收购狂潮，在2016年百威英博（Anheuser-Busch InBev）以逾1000亿美元收购SAB米勒（SAB Miller）时达到顶峰。如今，由3G资本的合伙人大量持股的百威英博酿造了超过全球四分之一的啤酒。卡夫亨氏的产品包括卡夫奶酪、亨氏番茄酱、Jell-O果冻、菲力奶油奶酪和Oscar Mayer肉制品。RBI旗下有汉堡王、炸鸡店Popeyes和颇受欢迎的加拿大连锁店Tim Hortons。

3G资本运营所持有公司的方式和收购它们的劲头一样引人注目。它采用一种叫“零基预算法”的做法，经理们每年都要重新证明他们的支出是合理的。此举是为了持续扩大利润率。而监督这一操作的管理层是因他们的才能和职业道德而不仅仅是经验被选定的。3G资本的合伙人之一丹尼尔·施瓦茨（Daniel Schwartz）出任汉堡王的首席执行官时才32岁。另一位合伙人希斯在一家拉美铁路公司工作了十多年，45岁时成为卡夫亨氏的老板。首席财务官戴维·克诺夫（David Knopf）2017年上任时才29岁。

对于3G资本的抨击者来说，这一切似乎有点疯狂。夸张一点说，该公司的战略就是：收购一家大企业，削减成本，然后再重复。但这么说并不完全公平。RBI在汉堡王的营销上投资，赢得了广告大奖。百威英博正努力提振销售，比如推销价格更高的啤酒，并在公司广阔的版图上应用最佳实践。

但收购大公司和削减成本仍是3G资本的专长。这种策略的风险已经变得很明显。整合Tim Hortons的加盟商让RBI不堪重负。百威英博去年表示将把股息削减一半。

3G资本的这套做法用在卡夫亨氏上时表现得最为混乱。美国的食品产业看起来是个完美的目标，因为该行业里企业臃肿但品牌强大。很少有美国人没喝过速溶饮料Kool-Aid，或是没吃过涂满亨氏番茄酱的Oscar Mayer热狗。3G资本认为这些品牌足够强大，能承受大幅成本削减。事实证明它们并不能。

百威英博的情况就不一样了。尽管在美国的业绩糟糕透顶，但百威英博几乎没有遇到过来自商店自有品牌啤酒的竞争，很少在网上销售，而且海外增长强劲。相比之下，卡夫亨氏的业务集中在美国，而美国的食品行业正在发生翻天覆地的变化。它的各个品牌可能为人熟知，但这并不能让它们大卖。小公司正利用便宜的数字营销和灵活的承包生产商带来的优势，提供给消费者更健康的选择。根据研究公司尼尔森的数据，规模最小的两万家包装食品公司占了整个行业增长的一半左右。

与此同时，电子商务和欧洲折扣杂货商的崛起给食品零售商带来了压力，它们继而又向食品公司施压。以沃尔玛为首的商店正在利用大量数据推出越来越精致且价格低廉的自有品牌商品，并始终在促使食品公司降价。

卡夫亨氏的开局不错。营业利润率从2014年的15%飙升至2017年的24%。2017年，卡夫亨氏遭遇了第一次重大挫折，时任联合利华老板的保罗·波尔曼（Paul Polman）拒绝了该公司1430亿美元的求购。（联合利华明智地将注意力越来越多地放在美容和家用品而非食品上。）巨额收购计划落空，希斯转而专注于提高销售额这项基础工作，将更多资金投在广告、产品创新和卡夫亨氏的销售队伍上，但这侵蚀了利润。

同样惹人注目的是该公司150亿美元的新一轮减记，这等于承认公司各大品牌价值缩水。巴菲特表示他错误地判断了卡夫众多产品的价值。“管理团队设想的是，合并之后他们可以削减品牌维护所必需的开支，更不用说帮助品牌成长了，”瑞信银行的罗伯特·莫斯可（Robert Moskow）说道，“世界在他们那里发生了变化——零售商变了，消费者也变了。”

3G资本的方法似乎存在缺陷，但极少有食品公司能拿出一个成功的替代方案。各大公司尝试通过收购规模较小的公司来自我进化，这些收购交易的价格往往很高，而收效不一。例如，金宝汤（Campbell Soup）于2012年收购了果汁饮料生产商Bolthouse Farms，但现在又想把它卖掉。去年它收购了一家椒盐脆饼和爆米花公司Snyder's-Lance，以扩大零食业务。它的债务水平也相应上升。研究公司盛博称，实际上，金宝汤、康尼格拉（ConAgra）和通用磨坊（General Mills）的疯狂收购使得这些公司的杠

杆率比卡夫亨氏还高。

卡夫亨氏现在希望通过收缩规模来实现增长：它计划在未来18个月剥离资产以改善资产负债表，以便能实现其他大规模交易。但美国证交会的传票显示，由于管理层难以达到大胆的目标，一些内部流程可能正在瓦解。大型交易能拯救美国食品公司的想法看起来越来越不可靠了。2014年在亨氏收购卡夫之前，两家公司的总营业利润约为65亿美元。现在，一定程度上由于公司自身无法控制的一些问题，卡夫亨氏预计2019年的利润将与合并前大致相同。 ■



The Oscars

No longer a tastemaker

The Academy's influence peaked half a century ago

“GREEN BOOK”? Critics sneered when Academy Award voters named this saccharine tale of a friendship between a black pianist and his white, tough-guy chauffeur the Best Picture of 2018. Yet rather than being a rare injustice, the award reinforced a trend. The top Oscar has increasingly gone to films that are soon forgotten.

A film’s quality is in the eye of the beholder. Its influence, however, can be measured more objectively. IMDb, a crowd-sourced online database, contains a list of references to every film in subsequent films and TV shows. For example, “Casablanca” has over 1,600 references, including a discussion in “When Harry Met Sally” and a poster in “True Romance”.

The data are spotty: films from the 1980s get four times as many references as those from the 1940s. However, the same bias presumably applies to all films made in a given year. So a rough proxy for a movie’s cultural influence is to count how many times it was referred to in subsequent years, and then compare its tally with those of all other films made in the same year.

Decades ago, Best Picture nominees were regularly among the most influential films. Fully 68% of references to films made in 1939 are to “Gone with the Wind” (a winner) and “The Wizard of Oz” (nominated). A statistical model shows that in the 1950s, Best Picture winners had a 20% chance of being the most-referred-to film.

That changed with the advent of “Star Wars”, summer blockbusters and sequels. Since the 1970s the films most referred to have been commercial

flicks. Oscar voters usually spurn such movies; the ones they do like have become commercially less successful, and thus less culturally relevant. Best Picture winners today have just a 2% chance of leading the references table. By snubbing “Black Panther” (which already has 151 references) and the art film “Roma”, this year’s voters scoffed at both cultural influence and critical acclaim. ■



奥斯卡奖

不再引领潮流

奥斯卡金像奖的影响力在半个世纪前见顶

《绿皮书》？当奥斯卡评委将2018年最佳影片颁给它（讲述一位黑人钢琴家和他那个我行我素的白人司机之间的友谊的煽情故事）时，引来了影评人的讥笑。不过，这一评选结果并非某种罕见的不公正，反而是在强化一种已有的趋势：奥斯卡最佳影片奖被越来越多地颁给了那些很快就会被遗忘的影片。

对于一部影片的质量好坏，观众见仁见智，但其影响力却可以有较为客观的衡量方式。众包的在线数据库IMDb罗列出每部电影被后来的影视作品引用的情况。例如，《卡萨布兰卡》被引用1600多次，像是《当哈利遇到莎莉》中就有一段关于它的讨论，《真实罗曼史》中出现了它的一张海报。

这种数据有其缺陷：上世纪80年代的电影被引用的次数是40年代电影的四倍。不过，这种偏颇想来对同一年里所有电影的影响程度是一样的。因此可以用一个粗略的指标来衡量一部电影的文化影响力，那就是统计它在出品之后的年份里被引用的次数，然后将其得分与同年出品的其他所有电影做比较。

几十年前，获得最佳影片提名的电影通常也都在最具影响力的影片之列。在对1939年出品的影片的引用中，足足有68%指向《乱世佳人》（获奖影片）和《绿野仙踪》（提名影片）。统计模型显示，在上世纪50年代，最佳影片有20%的概率成为被引用次数最多的影片。

随着《星球大战》、各种暑期大片和续集的出现，情况发生了变化。自上世纪70年代以来，被引用次数最多的影片已经是商业片了。奥斯卡评委们通常对这类影片不屑一顾，他们青睐的电影在商业上变得愈发不成功，因

而在文化上的影响力也已下降。如今的最佳影片只有2%的机会成为被引用最多的电影。从《黑豹》（已有151次引用）和艺术片《罗马》在奥斯卡上受到的冷落来看，本届评委对文化影响力和评论界的赞誉都嗤之以鼻。 ■



Berkshire Hathaway

Buffettology

What four decades of correspondence from the Oracle of Omaha reveal

WHEN FUTURE generations want to study today's capitalists, a good place to start would be Warren Buffett's annual letters to the shareholders of his firm, Berkshire Hathaway. Unfortunately, any economic insights from the world's most celebrated investor are woven in with lots of corny jokes about golf and fast food. Mindful that readers may not have the intestinal fortitude to stomach the Oracle of Omaha's unique sense of humour, *The Economist* has performed a textual analysis of 40 years' worth of Mr Buffett's letters to see what his language reveals about his thinking.

Berkshire has changed a lot. Having grown considerably in size, Mr Buffett now speaks of "businesses", rather than "business". He has also taken to using the adjective "huge" (see chart). The letters track how the firm used to focus on buying small stakes in listed companies; it now buys large, established firms outright.

This shifting strategy has made it tough for outsiders to value Berkshire properly. On the face of it last year was a pretty dismal one for the company. Berkshire's book value per share rose by just 0.4%, its worst showing since the financial crisis. Earnings were just \$4bn, a meagre 1.2% return on equity.

Mr Buffett contends these figures partly reflect arcane accounting standards which do not cope well with his varied investments. A change in accounting principles forces him to put mark-to-market swings in the value of his \$173bn equity portfolio through his earnings, resulting in a \$20.6bn loss in 2018. By contrast, the book value of companies Mr Buffett owns outright, an increasing share of his portfolio, are carried at "far below" their current

value, making it tough to assess Berkshire's performance by its annual change in book value. Mr Buffett has moaned about these dynamics a lot. References to America's Generally Accepted Accounting Principles (GAAP) have soared.

In other ways, though, Mr Buffett remains consistent. His philosophy has always been to look for cheap companies. He reckons that shares in firms with decent long-term prospects are too pricey at the moment. Instead, Berkshire will focus on buying back its own shares as well as investing in liquid stocks in 2019. Mentions of "repurchases" are on the rise but "acquisition" shows up just three times this year.

Historically, Mr Buffett has been loth to borrow vast sums of money, arguing that "rational people don't risk what they have and need for what they don't have and don't need". He made an exception in 2013, when he invested in Kraft Heinz. This was one of Mr Buffett's biggest mistakes. Shares in Kraft Heinz have plummeted. Berkshire has taken a hit of nearly \$3bn to its balance-sheet as a consequence. Mentions of "debt" spiked in this year's letter.

The biggest question facing investors in Berkshire is who might replace Mr Buffett, now 88, as leader of the company. His partner, Charlie Munger, turned 95 in January. The two most obvious candidates are Ajit Jain, who is 67, and Greg Abel, 56. They were both appointed to Berkshire's board last year and got 3 mentions each in Mr Buffett's letter this year. Mr Buffett claims Berkshire's blood flows in their veins. In years to come their letters might prove this to be the case—if so, Berkshire's investors are likely to be happy. Especially if they skip the jokes. ■



伯克希尔·哈撒韦公司

巴菲特法则

奥马哈先知四十年的致股东信揭示了什么

未来的人如果想研究今天的资本家，不妨先从沃伦·巴菲特每年致伯克希尔·哈撒韦公司股东的信入手。遗憾的是，这位世界上最负盛名的投资者在发表任何经济见解时总要掺杂许多关于高尔夫和快餐的老土玩笑。考虑到读者可能无法消受这位奥马哈先知独特的幽默感，本刊对巴菲特40年来的致股东信做了一番文本分析，以揭示他言语背后的想法。

伯克希尔已经发生了很大的变化。由于规模已大大扩张，巴菲特现在谈的都是“各项业务”，而不单是“业务”。他还开始用起“巨大”这个形容词来（见图表）。这些致股东信勾勒出这家公司投资重点的变化轨迹：过去专注于购买上市公司的少数股权，现在则是直接收购大型成熟企业。

这种策略的转变让外人很难对伯克希尔做出合理的估值。表面上看，该公司去年的业绩颇为惨淡。伯克希尔的每股账面价值仅上涨了0.4%，是金融危机以来最糟糕的表现。盈利仅为40亿美元，股本回报率仅为1.2%。

巴菲特认为，出现这样的数字一定程度上是复杂难懂的会计准则使然，这些准则不能很好地反映他多样化投资的表现。会计准则的变化迫使他将1730亿美元股票投资组合的市值波动记入盈利，在2018年因而产生了206亿美元的亏损。相比之下，那些巴菲特完全拥有的公司（它们在其投资组合中所占份额越来越大）的账面价值却“远低于”当前市价，使得外界很难通过账面价值的年度变化来评估伯克希尔的业绩。巴菲特对这些变化的牢骚很多，提及美国公认会计准则（GAAP）的次数飙升。

不过在其他方面巴菲特倒没什么变化。他的理念一直是寻找廉价的公司。他认为目前具有良好长期前景的公司的股票价格过高，所以伯克希尔在2019年将专注于回购自己的股票以及投资流动性股票。信件中提及“回购”

的次数正在上升，而“收购”一词今年只出现了三次。

从历史上看，巴菲特一直不愿意借入巨额资金，主张“理智的人不会拿自己拥有和需要的资金冒险，去追寻他们没有而不需要的东西”。他在2013年投资卡夫亨氏（Kraft Heinz）时破了一次例。这是巴菲特最大的失误之一。卡夫亨氏的股价暴跌。伯克希尔也因此承受了近30亿美元的账面损失。在今年的信中，“债务”一词出现的次数激增。

伯克希尔的投资者面临的最大问题是，谁有可能接替现年88岁的巴菲特成为公司领导者。他的搭档查理·芒格在1月满95岁。两位最显而易见的候选人是67岁的阿吉特·贾因（Ajit Jain）和56岁的格莱格·阿贝尔（Greg Abel）。两人都在去年被任命为伯克希尔的董事，今年在巴菲特的致股东信中分别被提及三次。巴菲特称这两人的血管中流动着伯克希尔的血液。这一点日后也许会在他们的致股东信中得到印证——如果是这样，伯克希尔的投资者应该会感到高兴。特别是如果他们不开老土玩笑的话。■



Alternative data

Under the hood

Ways to cross-check Elon Musk's tweets

“GO STRAIGHT to the source” is a useful rule for anyone seeking accurate information. It suggests that equity investors can best glean insight into a firm by quizzing its chief executive. But bosses are not always reliable narrators. Their position encourages them to be overly optimistic about their company’s outlook. Sometimes they are clueless. And occasionally they are careless about what they tweet.

On February 25th the Securities and Exchange Commission (SEC), America’s financial-market regulator, asked a federal judge to hold Elon Musk, the chief executive of Tesla, a carmaker, in contempt. Mr Musk’s troubles with the SEC began in August when his tweet claiming that he had secured funding to take Tesla private caused the firm’s share price to soar. When the claim proved false, the SEC sued him for securities fraud. They settled in October, when Mr Musk stood down as Tesla’s chairman (he remains chief executive), paid a \$20m fine and agreed to have his tweets approved by Tesla’s lawyers. He violated that last condition on February 20th by tweeting that Tesla would produce 500,000 vehicles this year—a claim he later had to clarify—without consulting the firm.

Regulators are not the only ones frustrated by Mr Musk’s antics. Investors have long clamoured for more insight into Tesla’s operations. Happily for investors, new methods of data-gathering present a solution. A growing number of providers now sell “alternative data”—a catch-all term for measures found beyond financial statements and other typical sources. J.P. Morgan, a bank, reckons that asset managers spend up to \$3bn a year on such data.

An investor keen to know how many cars Tesla is selling need no longer ask Mr Musk. “When you buy a car, you also buy insurance,” says Tammer Kamel of Quandl, a data provider. His firm asks insurance companies for access to (anonymous versions of) their policy databases. Once Quandl knows how many policies on Tesla cars are being taken out, it can work out how many are hitting the road.

Faced with competition from firms like Quandl, incumbents are doing more. Bloomberg, a data provider, for example, now offers a Tesla-production tracker. This looks at the issuance of Vehicle Identification Numbers (VINs), which every car made in America must have. Output is estimated based on how many VINs Tesla registers.

Investment banks, which often offer research to their clients, are also branching out. In 2014 UBS, a bank, set up Evidence Lab, a research team. It has taken apart a Tesla Model 3, a Chevy Bolt and a BMW i3 to compare their component parts. “If you don’t know what these vehicles cost,” says Barry Hurewitz of Evidence Lab, “you can’t know when they become profitable.” The team found that Tesla’s battery was superior, but its production quality was poorer, and build costs higher, than expected.

Alternative data’s early consumers were mostly quantitative hedge funds, which could easily process the extra information. But as more measures have become available, other investors have become interested. This shifts the power dynamic between companies and their shareholders. If a firm refuses to disclose information, alternative data might fill the gap. Instead of gauging an executive’s tone during an earnings call, investors can assess data on the firm’s job postings. Its hiring plans might better reflect management’s sentiment.

Misleading statements, too, might be caught more quickly. Investors surprised by Mr Musk’s tweet that Tesla would build 500,000 cars can check

with other sources. The SEC may struggle to stop Mr Musk making misleading comments, but investors can more easily see through them. ■



另类数据

引擎盖之下

核查伊隆·马斯克推文的方法

对于任何想获得准确信息的人来说，“直接找源头”是个有用的法则。据此，股权投资者应该可以通过询问CEO来深入了解一家公司的情况。但老板们并不总是可靠的叙述者。他们的位置决定了他们对所在企业的前景过分乐观。有时他们自己也毫无头绪，偶尔还会不注意自己在推特上的言辞。

上月25日，美国的金融市场监管机构美国证券交易委员会（SEC）要求一名联邦法官裁定汽车制造商特斯拉的CEO伊隆·马斯克藐视法庭。马斯克与SEC的龃龉始于去年8月，当时他发推称已获得用以使特斯拉私有化的资金，引发该公司股价飙升。当这一说法被证明为虚假后，SEC起诉他涉嫌证券欺诈。10月，双方达成和解，马斯克辞去特斯拉董事长职位（仍担任CEO），支付了2000万美元的罚款，并同意发推前要经过特斯拉律师的审批。上月20日，他违反了最后一个条件，在没和公司商议的情况下发推称，特斯拉今年将生产50万辆汽车。后来他又不得不发推澄清这一说法。

因马斯克的荒唐行径而为难的并不只有监管机构。长期以来，投资者一直在呼吁能更多地了解特斯拉的业务。值得他们高兴的是，数据收集的新方法提供了一种解决方案。现在有越来越多的数据供应商在出售“另类数据”——那些在财务报表和其他常规来源之外觅得的衡量指标的统称。摩根大通估计，资产管理公司每年在这些数据上的支出最多达30亿美元。

渴望了解特斯拉汽车销售数字的投资者再也不需要向马斯克本人打听了。“你买车的时候也会买保险嘛。”数据供应商Quandl的泰默·卡梅尔（Tammer Kamel）说。他的公司向保险公司申请访问其（匿名版本的）保单数据库。一旦Quandl知道了有多少特斯拉汽车被上了保险，就可以算出已有多少辆新车上路。

面对Quandl这类公司的竞争，老企业正在下更大的功夫。例如，数据供应商彭博现在推出了一个程序，可追踪特斯拉的生产情况。每辆在美国制造的汽车都必须有一个车辆识别码（VIN），这个程序就是根据特斯拉注册的VIN号码的数量来估算其产量。

常向客户提供调研服务的投资银行也开始向另类数据领域挺进。2014年，瑞银成立了研究团队“证据实验室”（Evidence Lab），拆解了一辆特斯拉Model 3、一辆雪佛兰Bolt和一辆宝马i3，比较它们的组件。“如果你不知道这些车成本多少，”实验室的巴里·赫雷维茨（Barry Hurewitz）说，“就不知道它们何时能盈利。”该团队发现特斯拉的电池性能更优越，但生产质量不如预期，成本也高于预期。

另类数据的早期客户主要是量化对冲基金，它们可以轻松地消化这类额外的信息。但随着更多衡量指标的出现，其他投资者也产生了兴趣。这改变了企业与股东之间的力量对比。如果公司拒绝披露信息，那么或许就可以靠这些数据来填补空白。投资者不用琢磨高管在电话财报会议上的语气。他们可以转而评估公司职位发布的数据。公司的招聘计划也许更能反映管理层的情绪。

误导性的陈述或许也能更快被发现。投资者若对马斯克“特斯拉今年将生产50万辆汽车”的推文感到意外，可以从其他渠道核实真伪。SEC可能很难阻止马斯克发表误导性评论，但投资者如今更容易看穿它们了。■



Buttonwood

The Shanghai open

The trading day in China is starting to influence global capital markets

In his book “The Death of Gentlemanly Capitalism”, Philip Augar described a shift in the culture of London’s financial industry during the 1980s and 1990s. The old City of public-school amateurism, late starts, early finishes and long, boozy lunches disappeared. In its place, a new City emerged under the sway of American investment banks. The morning meeting started two hours earlier. Lunch was a sandwich at your desk. And instead of port and cigars, try mineral water.

It was time to sober up, too, because America’s influence on the London market went well beyond the acquisition by its banks of a few old-school stockbrokers. America was home to much of the world’s capital. As more buying and selling of assets took place across borders and time zones, the New York trading day set the tone for markets everywhere else. A City broker had to be at his desk, and with his wits about him, when the New York market opened just after lunchtime in London.

The global trading day still only truly begins when New York clears its throat. Markets in the rest of the world then take note of what has been said. But listen closely, and you hear the beginnings of a dialogue. China has barely opened its capital markets to foreign investors and the yuan is still a managed currency. Yet its say in how global markets rise and fall is already apparent. And China’s influence will only increase as more foreign capital flows into the financial markets on its mainland.

China’s voice is most audible in currency markets. For a long time, the yuan hugged the dollar closely, taking its cue from America. But since August

2015 it has been allowed to fluctuate more in response to market forces. In theory, its value is set by reference to a basket of currencies. In practice, this means a wider trading range against the dollar—not so weak as to spark capital flight, but not so strong as to hurt exports. Within this range, the yuan exerts a sizeable pull. Other important currencies, notably the euro, have tracked its ups and downs against the dollar.

Stockmarkets are next. China has led this year's sharp bounce-back in share prices worldwide. True, the change in mood is not only about China. The Federal Reserve no longer seems hellbent on tighter monetary policy. General Electric, one of the largest issuers of corporate bonds, has so far averted a downgrade to junk. Italy's clash with the European Union over fiscal policy has fizzled. But the anxieties about China that troubled investors in the final months of 2018 have also faded. There is now a real prospect of a truce with America over trade. And a host of tax cuts and other measures are in train to pep up China's slowing economy.

That is, in part, why buying A-shares (yuan-denominated stocks listed in Shanghai and Shenzhen) is a favoured trade of bulls. After falling hard last year stocks in China had headroom. Although America's economy looks fairly robust, its stockmarket is expensive. Foreigners looking at China's stockmarket felt it was awfully cheap by comparison. And it is telling that the way to play renewed optimism is to buy stocks on the mainland. In the past, investors might have turned to Hong Kong-listed shares or proxies for China's economy, such as the Australian dollar.

There is more to foreign buying of Chinese stocks than a revival in risk appetite. Global investors own just 2-3% of Chinese stocks and bonds, well below the country's weight in world GDP. For foreigners to buy financial assets on the mainland is far from frictionless, but it has become a lot easier. The compilers of the stock and bond indices, benchmarks for trillions of dollars of investments, have taken note. MSCI is speeding up the inclusion

of A-shares in its emerging-market index and will quadruple their weighting this year. Next month Bloomberg Barclays is adding China to its main bond index. Other providers of bond indices are likely to follow suit. Analysts at Morgan Stanley expect a marked acceleration of foreign capital flows into Chinese shares and government bonds this year in response.

It is not too fanciful to imagine a time in the future when the start of the trading day in Shanghai is an important moment for global capital markets. Would London, eight hours west of Shanghai and five east of New York, then regain some of its lost relevance? Maybe not. Perhaps Los Angeles would be a better bridge. An early riser could be up before New York opens and still awake when Shanghai closes. What would the rheumy brokers of the old City make of that? ■



梧桐

上海开市

中国的交易日开始影响全球资本市场

在《绅士资本主义之死》（The Death of Gentlemanly Capitalism）一书中，菲利普·奥格尔（Philip Augar）描述了上世纪八九十年代伦敦金融圈文化的转变。老派的金融城消失了一—那种公学范儿的非逐利业余主义、开工晚、收工早，以及无酒不欢的悠长午餐统统不见了。取而代之的是因美国投资银行的影响而出现的新派金融城。晨会比过去早两小时开。午餐就是在办公桌边吃个三明治。没有波特酒和雪茄，只有矿泉水。

当时他们确实也该清醒些了，因为美国对伦敦市场的影响已经远不止一些老牌股票经纪商被美资银行收购而已。美国成了全世界大部分资本的集中地。随着资产买卖越来越多地跨越边境和时区，纽约交易日就为各地市场定下了基调。纽约的开市时间就在伦敦的午餐时间之后，此时伦敦金融城的经纪人必须守在办公室，进入工作状态。

全球交易日仍旧要等纽约开嗓后才真正启动。世界其他地区的市场要消化纽约发出的各种消息。但仔细听，你会听到一段对话的开始。中国基本没有向外国投资者开放资本市场，人民币依然是受管制的货币。然而，人民币对全球市场走势的影响力已显而易见。随着越来越多外国资本涌入中国内地的金融市场，中国的影响力只会有增无减。

在货币市场上，中国的声音最为响亮。在很长一段时间里，人民币与美元紧密挂钩，紧随美国的步调变化。但自2015年8月起，人民币可以在更大程度上随市场因素波动。理论上，人民币的价值是参考一篮子货币而定的。而实际上，这意味着人民币兑美元的成交价有了更大的变化空间——不至于走弱到引发资本外逃，也不会走强到影响出口。在这个范围内，人民币产生了相当的影响力。其他重要货币，特别是欧元，一直在跟踪人民币兑美元的涨跌。

股票市场是下一个影响力所在。今年以来中国领跑全球股市大反弹。诚然，市场氛围的变化并非只与中国有关。美联储似乎不再执着于收紧货币政策。作为最大的企业债券发行人之一，通用电气目前成功避免了自家债券被降为垃圾级。意大利与欧盟在财政政策方面的冲突已平息。但是，投资者在2018年后几个月里因中国而起的忧虑也已逐渐消退。中美贸易战休战在望。此外中国还将陆续推出减税等一系列措施，刺激正在放缓的经济。

一定程度上，这也解释了为什么看好后市的人现在偏向购买A股（在上海和深圳上市的人民币计价股票）。去年经历重挫后，中国股市有上升空间。虽然美国经济看起来相当强健，但其股市处于高位。相比之下，在外国人眼中，中国股市处于非常低的价位。而通过购买内地股票来表达乐观情绪的重燃本身具有重要意义。在过去，投资者可能已经在购买香港上市的股票或那些可充当中国经济指标的对象，例如澳元。

外国投资者之所以购入中国股票，原因不止是风险投资意愿的复苏。由全球投资者持有的中国股票和债券的占比仅为2%到3%，远低于中国在世界GDP中的比重。对于外国人来说，在中国内地购买金融资产远谈不上毫无障碍，但已经容易很多了。作为全球万亿美元投资的基准的各种股票和债券指数的编制者已经注意到了这一点。MSCI正加速将A股纳入其新兴市场指数，且会在今年将其权重翻两番。下个月，彭博巴克莱（Bloomberg Barclays）将把中国纳入其主要债券指数。其他债券指数供应商很可能会效仿。摩根士丹利的分析师预计，这继而会促使今年外国资本流入中国股票和政府债券的速度显著提升。

有朝一日，上海交易日开市之时可能成为全球资本市场的重要时刻，这并非太过天马行空的想象。到那时，比上海晚八小时、比纽约早五小时的伦敦能否重拾一些失去的影响力？也许不能。洛杉矶可能会是更好的桥梁。洛杉矶早起的人可能正好赶上纽约开市，到上海收市时还没睡下。对此，伦敦老金融城那些睡眼惺忪的经纪人怎么看？■



China's tech freeze

Unicorns in winter

A formerly white-hot sector is finding it harder to attract venture capital and is shedding employees

“Only when the year grows cold do we see the qualities of the pine and the cypress,” wrote Robin Li, the boss of Baidu, in a new year’s letter to staff at China’s main online-search firm. It was yet another recognition of a chill sweeping through the country’s technology industry. The lavish financing that promising startups have come to expect has dried up. Job cuts have multiplied. Even China’s tech giants have not been spared and are slashing bonuses and travel expenses.

This wintry spell is a remarkable reversal for a batch of firms, such as Meituan-Dianping, an online-services super-app, that are among China’s most vivacious. Early last year they appeared to be in rude health and were drawing in vast dollops of investment. More money was raised for venture-capital funds in China in the first half of 2018 than in America, the first time that had ever happened: \$56bn compared with \$42bn, according to Preqin, a data provider. By the autumn no fewer than 86 new “unicorns”—private, billion-dollar startups—had emerged.

Then the “capital winter” set in. One trigger was a selloff in tech stocks globally that included China’s biggest stars, Alibaba and Tencent. Worries have multiplied about the pace of revenue growth in a slowing economy, as well as the time it is taking for highly valued private startups to approach profitability. Even giants are seeing sales growth slow. In the third quarter of 2018 JD.com, an e-commerce group, reported its slowest quarterly revenue increase since 2014 and its first decline in new users.

During the last three months of 2018, deals to commit venture capital to

young firms slumped in number by two-fifths, and private-equity financing dropped by more than a quarter, to under \$10bn, compared with the previous three months, according to CB Insights, a research firm (see chart). Unable to raise money, a slew of small funds have even disappeared.

Part of the downturn has more to do with supply of financing for VC funds than disillusion with unicorns. The government has cracked down on informal sources of financing from which much VC funding has flowed, for example. But larger investors have also grown cautious about tech companies. The woes of Ofo, a bike-sharing unicorn, exemplified the sort of hubris that many reckon had spread too far in tech. Ofo raised seven rounds of financing within 18 months, earning a \$2bn valuation. It is now almost bankrupt.

Startups looking for early-stage investment have felt the capital winter most keenly. Yuqing Guo, a partner at PwC, a consultancy, says investors are advising them to expect as little as half the valuation they might have won a year ago. Where once investors brandished term sheets before a startup had launched, now they wait. Deals are taking longer: a round of funding once raised within a month is taking six, says Nisa Leung of Qiming Venture Partners, a big investor in Chinese tech.

As private cash has grown harder to come by, more established companies have been looking to public markets. But this has turned into another reckoning for the tech industry, as some anticipated blockbusters fall flat. Shares in Meituan-Dianping and Ping An Good Doctor, China's largest online health-care app, have dropped by a tenth from their offering price.

Among Chinese bosses, meanwhile, business confidence in the three months to December was at its lowest in six quarters, according to a survey by the central bank. The country lost around 160 billionaires to last year's

stockmarket slump, reports Hurun, a consultancy which tracks the country's super rich. The fortune of Tencent's Ma Huateng fell by as much as 43% in 2018, to \$27bn in October, as his social-media and gaming titan was hobbled by a regulatory hold-up. For the three months to June 2018 the company posted its first quarterly profit decline since 2005.

Other peppy online businesses have been hurt by tighter censorship, as the Communist Party intrudes ever more noticeably into China's technology sector—whether by requiring the shutting down of a popular jokes app, or by announcing that Jack Ma of Alibaba, its best entrepreneur, is a party member. Meanwhile, internet firms are having to look for new ways to attract users and sources of revenue. Karen Chan of Jefferies, a bank, expects growth in China's online ad budget to slow from the 30% of the past two years to 17% this year.

Baidu, Alibaba and Tencent, as well as Meituan-Dianping and Xiaomi, have announced restructuring plans involving a workforce trim or a reduction in new hires. Didi Chuxing, a ride-hailing giant, halved year-end bonuses for staff. Rumours of large lay-offs have circulated on social media: Zhihu, a Quora-like question-and-answer website, was reported to have fired 300 workers in December (it denied this). Job openings for the internet industry fell by 40% in the first quarter of 2018 on the previous year, according to data from Zhaopin, a jobs website.

How long will such problems persist? For the capital winter, investors say a thaw could be near. China's stockmarket has bounced in 2019. A new innovation board in Shanghai, modelled on Nasdaq, should encourage local tech offerings, with rules that allow even some money-losing startups to go public. The first flotations may begin in the summer.

Still, China's unicorns will need to grow differently in future. Many are expanding not in their usual bases of Beijing, Shanghai and Shenzhen, but

in second-tier cities, including Wuhan, Chengdu and Xi'an, driven by a need to reduce operating costs. These inland cities are luring talented young Chinese and the startups they want to work for. They offer housing subsidies and relaxed rules on household registrations, a system that ties Chinese to where their family came from.

Xiaohongshu (meaning "Little Red Book"), a popular social network for fashion and beauty products, made the move to Wuhan in 2017 from its base in Shanghai. Its largest office is now there. Lower costs have allowed it to grow quickly, and it entices the best to relocate by paying them rich-city salaries. It was valued at over \$3bn in a funding round in June led by Alibaba. Tao Yun, who runs Xiaohongshu in Wuhan, says that the capital winter marks a threshold: startups will need not just "a good story and barbaric growth", says Ms Tao, but solid numbers to back them up.

In a widely circulated post in December, Wang Xing, the founder of Meituan-Dianping, made a grim prediction that "2019 might be the worst year of the past decade, but it will be the best of that to come". If firms and investors learn the hard lessons of the capital winter—when it comes to adapting, Chinese startups, after all, have strong form—such dark thoughts may be set aside come spring. ■



中国的科技寒潮

寒冬中的独角兽

一个曾经炙手可热的行业如今吸引风投的难度增加，正在裁员

“岁寒方知松柏之后凋。”中国搜索引擎大鳄百度的老板李彦宏在给员工的新年信中这样写道。这是又一次有人承认一股寒流正在席卷中国的科技行业。那些本被看好的创业公司期待的慷慨融资已经枯竭。裁员人数成倍增加。就连科技巨头们也未能幸免，纷纷削减奖金和差旅费。

对于中国最生机勃勃的一批公司来说——包括超级在线服务应用美团点评在内，这段寒冬期是一次意外而显著的逆转。去年早些时候它们似乎还十分健康，并吸引了大量投资。数据供应商Preqin的数字显示，2018年上半年，中国为风险投资基金筹集的资金达560亿美元，超过美国的420亿美元，是有史以来第一次。到同年秋季，中国至少新涌现出86家“独角兽”（估值10亿美元以上的私营企业）。

接着，“资本寒冬”来了。导火索之一是全球科技股抛售潮，中国最大的明星企业阿里巴巴和腾讯也未能幸免。经济逐渐放缓，人们对营收的增速以及高估值私营创业公司何时能盈利的担忧也大为增加。就连巨头们的销售增长也在减缓。2018年第三季度，电商集团京东公布了自2014年以来最慢的季度营收增速，且新用户数量首次出现下降。

根据研究公司CB Insights的数据，2018年最后三个月与之前三个月相比，对年轻公司的风险投资交易数量下降了五分之二，私募股权融资下降了四分之一以上，跌破100亿美元（见图表）。由于无法筹集到资金，许多小型基金甚至消失了。

一定程度上，这一衰退更多是源于风投基金的融资问题，而非围绕独角兽公司的幻想破灭。比如，政府打击了非正式融资来源，而大量风投资金正是从这些渠道而来。但规模较大的投资者对科技公司的态度也变得谨慎起

来。很多人认为狂妄自大的风气已经在科技业内盛行，共享单车独角兽Ofo遭遇的危机是一个典型例证。Ofo在18个月内开展了七轮融资，估值达20亿美元。现在它几近破产。

寻求早期投资的创业公司对资本寒冬的感受最为强烈。咨询公司普华永道的合伙人郭誉清表示，投资者建议这些公司要有心理准备，公司估值可能仅能达到一年前可达到水平的一半。以前，投资者在创业公司成立之前就挥舞着投资意向书，现在他们都在观望。中国科技业的大型投资者启明创投的梁颖宇表示，交易耗时更长了，曾经一个月内就可筹集到的一轮资金现在需要六个月。

私人资金越来越难获得，更成熟些的企业已将目光投向公开市场。但随着一些预期会大热的公司表现惨淡，这已成了对科技业的又一次清算。美团点评和中国最大的在线医疗应用平安好医生的股价较发行价下跌了十分之一。

与此同时，中国央行的一项调查显示，去年第四季度中国企业家的信心指数降至六个季度以来的最低水平。据追踪研究中国超级富豪的咨询公司胡润报道，去年股市暴跌导致中国少了约160名亿万富翁。去年，腾通庞大的社交媒体和游戏业务受到监管收紧的影响，造成CEO马化腾的财富缩水43%，在10月份为270亿美元。2018年第二季度，腾讯公布了自2005年以来的首次单季利润下滑。

随着共产党对中国科技业的干预越来越明显，其他充满活力的网络公司也因更严格的审查制度受损：无论是让流行的搞笑段子应用下架，还是宣布阿里巴巴的马云这位中国最优秀的企业家是一名中共党员。与此同时，互联网公司也不得不寻找新途径来吸引用户和收入来源。投行杰富瑞的陈翠珊预计，中国在线广告预算的增速将从前两年的30%减缓到今年的17%。

百度、阿里巴巴、腾讯、美团点评和小米都宣布了包含裁员或减少招聘的重组计划。网约车巨头滴滴出行将员工的年终奖减半。社交媒体上满是关于大批裁员的传言；问答网站知乎据称去年12月解雇了300名员工（该公

司否认了这一消息）。招聘网站智联招聘的数据显示，2018年第一季度，互联网行业的招聘职位比去年同期减少了40%。

这些问题会持续多久？投资者说，资本寒冬可能快要解冻了。中国股市在2019年已经反弹。上海新推出了一个仿效纳斯达克的科技创新板，应该能鼓励本土科技企业上市，其规则甚至允许一些亏损的创业公司上市。首批上市可能在今夏启动。

不过，中国的独角兽未来需要改变成长方式。出于降低运营成本的需要，许多公司不再像以往那样以北京、上海和深圳为基地扩张，而是选择武汉、成都和西安等二线城市。这些内陆城市正在吸引有才华的中国年轻人和他们想要去工作的创业公司。它们提供住房补贴，放宽户口登记这一将中国人和他们的家庭所在地绑定在一起的制度。

走红的时尚和美妆类社交网络小红书的总部位于上海，2017年又踏足武汉。现在武汉办公室的规模已是最大。较低的成本让它得以快速发展，并且通过提供一线城市的工资吸引优秀人才移居武汉。在去年6月阿里巴巴领投的一轮融资中，该公司估值超过30亿美元。小红书武汉总部的负责人陶芸表示，资本寒冬划出了一个门槛：创业公司“不仅需要一个好故事和野蛮生长”，还需要切实的数据来支撑。

去年12月，美团点评的创始人王兴在网上发布的一段话广为流传。他悲观地预测道：“2019年可能会是过去十年里最差的一年，但却是未来十年里最好的一年。”如果企业和投资者在资本寒冬里吸取了惨痛的教训，可能春天到来时这些忧思就会被抛诸脑后。毕竟，论适应性，中国的创业公司可是很强大的。 ■



Chinese data

Slower but steadier?

The economy may be nearly one-seventh smaller than officially reported

For a country that is regularly accused of manipulating its statistics, China is remarkably diligent about collecting them. The government has dispatched two million boffins to visit companies, stores and even street stalls in the first few months of this year, as part of a new national economic census. Ads plastered on billboards implore people to co-operate. In a flashy promotional video on its website, the national statistics bureau warns that any fabrication of data is against the law.

But these laudable efforts do not appear to be solving the basic problems with Chinese statistics. A new paper, by Chang-Tai Hsieh of the University of Chicago and three co-authors from the Chinese University of Hong Kong, finds that industrial output and investment have been consistently embellished. As a result, they argue that China overstated real GDP growth by two percentage points on average every year from 2008 to 2016 (see chart). Over time that adds up: official figures for 2016 would have exaggerated the size of the economy by 16%, or more than \$1.5trn.

These economists are certainly not the first to question Chinese numbers. But their paper, published by the Brookings Institution in Washington on March 7th, deserves attention because they had better access to the statistics bureau than most. Though they worked only with public data, they knew where to shine a light. They looked at how revenues from value-added tax on industrial firms compared with reported growth of industrial output. Until 2007 the two lined up well. But after 2008 gaps opened up, although they have narrowed a bit in recent years. The authors also built an alternative model for measuring growth using indicators that cannot be

easily manipulated, including satellite imagery of night lights, railway cargo and imports, and came to the same conclusion.

Those sceptical of China's data sometimes assert that its statisticians have the power to fiddle with numbers to present their desired outcome. The authors argue that the problem is the opposite: that at the central level they lack the power to correct for the misdeeds of other officials. It has long been noted that provincial GDP totals, when added up, exceed national GDP. The national bureau is alert to this and so adjusts provincial figures by, for example, collecting data through separate channels.

Yet from 2008, when the global financial crisis struck, the adjustments failed to keep up with the distortions, the paper says. For provincial leaders the incentives are clear: their chances of promotion depend on reported economic performance, which they can embellish. Since they rank above the statistics bureau politically, only the bravest beancounter would dare stand in their way. Tellingly, only after crackdowns on corruption in provinces such as Liaoning and Inner Mongolia did authorities admit that their data had been inflated. If the authors are right, these cases are a small sample of a wider epidemic.

There is, however, a silver lining. Local and national figures for consumption are closely aligned. It is mainly industrial output and investment that are exaggerated. The downward revisions therefore result in a substantially different picture of the shape of China's economy. The authors find that investment, properly measured, was 36% of GDP in 2016, not 43%, as the government says. Debt as a share of GDP is higher than officially reported, but the return to capital is not as low as feared and consumption is more prominent as an engine of growth. Looked at this way, the Chinese economy is smaller but better balanced and thus, perhaps, more resilient. ■



中国数据

更慢，但更稳定？

中国经济规模可能比官方公布的低近七分之一

虽然常被指责操纵本国统计数据，中国却十分勤于收集数据。作为新一次国家经济普查的一部分，中国政府已在今年头几个月派出两百万名普查员走访企业、商店甚至街边小摊。户外广告牌上的广告言辞恳切地敦促人们配合普查。在国家统计局的官网上，一段华丽的宣传视频警告说，任何捏造数据的行为都是违法的。

但这些值得称道的努力似乎未能解决中国统计数据存在的根本问题。芝加哥大学的谢长泰和香港中文大学的三位学者共同撰写的一篇新论文发现，工业产出和投资数据一直被篡改润色。他们认为，其结果就是从2008年到2016年，中国GDP增速平均每年被夸大了两个百分点（见图表）。如此不断积累，到2016年，中国经济规模的官方数据就夸大了16%，即虚高了超过1.5万亿美元。

这些经济学家当然不是最先质疑中国官方数据的人。但他们的论文（由布鲁金斯学会于3月7日在华盛顿发表）尤其值得关注，因为他们比大多数人拿到了更多的统计局数据。虽然他们使用的只是公开数据，但他们知道从哪里发现问题。他们比较了工业企业增值税收入与官方公布的工业产出增长数据。直到2007年，两者都是非常匹配的。但2008年后，差距开始出现，尽管近年来幅度略有缩小。论文作者还建立了一个替代模型，使用不易操纵的指标来衡量增长，包括反映夜间照明的卫星图像、铁路货运量以及进口数据，并得出了相同的结论。

怀疑中国官方数据的人有时认定，中国的统计官员有权力篡改数字以呈现自己想要的结果。该论文的作者认为问题恰恰相反：在中央层面，统计官员无力纠正其他官员的不端行为。人们早就注意到，中国各省GDP的总和超过了全国GDP数据。国家统计局对此有所警觉，因而通过从独立渠道收

集数据等方式来调整各省数据。

然而该论文称，2008年全球金融危机爆发以来，调整的力度赶不上扭曲的程度。对于省级领导来说，扭曲数据的动力显而易见：晋升机会取决于上报的经济成绩，而他们可以对此加以美化。他们的政治地位高于统计局，所以只有最勇敢的统计官员才敢挺身挡道。难怪，只有在辽宁和内蒙古等省经历一轮反腐行动后，地方政府才承认夸大了经济数据。如果论文作者所言不差，它们只是一场大范围流行病中的一小部分病例。

然而仍有好消息。地方和全国的消费数据相当匹配。被夸大的主要是工业产出和投资数字。因此，向下修正数据会呈现一个大不相同的中国经济形势。论文作者发现，按正确方式衡量，2016年投资占全国GDP的比重应为36%，而非政府公布的43%。债务占GDP比重则高于官方数字，但资本回报不像人们担心的那么低。而消费作为增长引擎的实际表现更为突出。从这个角度来看，中国经济的规模是缩小了，但也更均衡，因而也可能更加强韧。■



Free exchange

Shocked

America has found the “China shock” harder to shrug off than past import waves. Why?

The people of Des Moines, Iowa, are no strangers to economic upheaval. When a wave of Japanese imports arrived in America in the 1980s, their city was one of the places most vulnerable to the new competition. In 1974, 4,500 of them worked at making farm machinery and equipment. As many again made tyres and inner tubes. By 1990 only a little over half of those jobs were left. Yet in the intervening 16 years thousands of new jobs had sprouted, in life insurance, building materials and the restaurant trade. In 1990 Des Moines’ unemployment rate was below 4%, less than the national average of 5.6%.

Not everyone fared as well. Mary Kate Batitsch and Timothy Bond, of Purdue University, have recently estimated that the “Japan shock” explains about one-fifth of the fall in African-Americans’ labour-force participation between 1970 and 1990. But Des Moines’ experience was typical. Kerwin Kofi Charles, Erik Hurst and Mariel Schwartz, of the University of Chicago, found that local declines in manufacturing employment in the 1980s were not associated with increases in local unemployment rates.

That may surprise someone familiar with research on the impact on America of trade with China in the 1990s and 2000s. Mr Charles and his colleagues also concluded that in the 2000s jobless rates tended to rise when manufacturing employment fell. In a well-known paper in 2016, David Autor, David Dorn and Gordon Hanson found that a wave of Chinese imports kicked exposed workers out of their jobs and left some on the disability rolls. Even their marriage prospects suffered.

Why did competition from China hurt so much more than that from Japan a generation before? In another new study Katherine Eriksson, Katheryn Russ and Minfei Xu, of the University of California, Davis, and Jay Shambaugh, of George Washington University, sift the evidence and conclude that vulnerability to trade shocks depends on when and where they strike. Whereas earlier shocks—first from Japan, then from the “tiger” economies of East Asia—affected areas that were at that time relatively resilient to change, the China shock hit places that were less able to adapt.

The thesis rests on the idea of production cycles, and the journey from the frontiers of innovation to the backwaters of standardisation. Whizzy gadgets are at the cutting edge when they first appear, but eventually become humdrum. As processes settle down and become standardised, and once-novel gizmos become commodities, the location of production shifts too, away from innovation hotspots with better-educated populations towards communities that might not cope so well if jobs disappear.

Manufacturing employment blossomed at the beginning of the 20th century in places where people tended to be better educated and which produced more patents per person than the average. But as the decades passed and manufacturing employment spread, the correlation with patenting and education weakened. Ms Eriksson and her co-authors find that the import shocks from Japan and East Asia of the 1970s and 1980s hit products that were relatively early in their innovation cycles, such as video and audio equipment. They were made in places that boasted above average numbers of patents per person. Places making products exposed to Japan seemed to have been doing particularly well. They enjoyed above-average levels of income and education levels and below-average rates of unemployment.

The China shock was different. Production in affected industries—this time, for example, toys and shoes—had indeed started out in places with

relatively well-off, well-educated workers where patenting was relatively concentrated. Had the shock hit in 1960, 40-50 years before it did, it would have landed on fairly rosy-looking towns. But by 1990 production had already shifted to districts with above-average unemployment, below-average education and no greater propensity for patenting than the country as a whole.

The authors argue that the China shock hurt so much because it whacked people who were already struggling. Areas with fewer college-educated workers suffered bigger dents in labour-force participation. And workers in places where industries were already moving out proved the least nimble. Employment fell by more in places where jobs in exposed industries had declined between 1960 and 1980.

Other studies have delved into why the China shock hurt so much. Messrs Autor, Dorn and Hanson describe how the places hit hardest took their suppliers down with them, hurting whole communities. Nicholas Bloom of Stanford University and three co-authors found that, although imports from China did support some new jobs (eg, by providing cheaper inputs), they did not grow in the areas where vulnerable jobs were lost. While places like Des Moines dodged the China shock and some towns gained from the cheaper inputs, others were left to flounder.

As negotiators try to rewrite the terms of Sino-American trade, it may be tempting to conclude that America has paid too high a price for China's entry into the global trading system. Japan was much richer in the 1980s than China was in the early 2000s; America should have protected its exposed industries. A more helpful conclusion is that politicians should take more care to equip workers labouring far from the innovation frontier to adapt to shocks to their industries—from import competition or anywhere else.

Politicians might learn another lesson, too. Their response to shocks can usually only speed up or slow down broader structural trends. Even without the China shock, toymaking would have moved somewhere else, some time. Cranking tariffs up or down may offer politicians the temporary sense that they can control foreign competition, but the costs of protection will be borne elsewhere in the economy, largely unseen. And the world will meanwhile move on regardless. ■



自由交流

大受冲击

比起过去的进口浪潮，美国更难摆脱“中国冲击”的影响。原因何在？

对于经济动荡，爱荷华州得梅因（Des Moines）的市民并不陌生。上世纪80年代日本的进口浪潮抵达美国时，他们的城市是最易受新竞争冲击的地方之一。1974年，当地有4500人从事农业机械设备制造。还有同样数量的人从事轮胎和内胎制造。到1990年，这些岗位就只剩下一半多一点。然而在这16年间，人寿保险、建材和餐饮业又创造出了数以千计的工作岗位。1990年当地的失业率不到4%，低于全国5.6%的平均水平。

不是所有人都那么好运。普渡大学的玛丽·凯特·巴蒂施（Mary Kate Batitsch）和蒂莫西·邦德（Timothy Bond）近期估计，1970年至1990年间，非裔美国人的劳动力参与率下降约有五分之一缘于“日本冲击”。但得梅因的经历很典型。芝加哥大学的科尔文·科菲·查尔斯（Kerwin Kofi Charles）、埃里克·赫斯特（Erik Hurst）和玛丽埃尔·施瓦茨（Mariel Schwartz）发现，上世纪80年代当地制造业就业人数下降并没有引发当地失业率上升。

对于熟悉上世纪90年代和本世纪初美中贸易对美影响相关研究的人来说，这个发现可能会令他们意外。查尔斯及其同事还得出结论：在本世纪初，制造业就业人数下降时，失业率趋于上升。在一篇发表于2016年的著名论文中，大卫·奥托尔（David Autor）、大卫·多恩（David Dorn）和戈登·汉森（Gordon Hanson）发现，一波中国进口产品的到来让那些易受冲击的人群丢了饭碗，导致一些人只能靠残障福利金过活。甚至他们的婚姻前景也受到了影响。

和上一代人经历的来自日本的竞争相比，中国竞争带来的伤害为什么要严重得多？在另一项新研究中，加州大学戴维斯分校的凯瑟琳·埃里克森（Katherine Eriksson）、凯瑟琳·拉斯（Katheryn Russ）和徐曼菲以及乔

治·华盛顿大学的杰伊·尚博 (Jay Shambaugh) 细查证据，得出结论：对贸易冲击的承受力取决于冲击发生的时间和地点。较早的冲击发生时（先是来自日本，随后是东亚的“四小龙”），受影响的地方在当时对变化的适应力较强。相较之下，受中国冲击影响的地方当时的适应能力较弱。

这一论点是依据生产周期的概念，以及产品从创新前沿走向标准化大后方的历程。利用先进技术打造而成的小设备刚面世时处于前沿，但最终会沦为寻常之物。随着制作工艺稳定下来并实现标准化，曾经新颖的小玩意成为了大众商品，生产的地点也会转移——从拥有受过良好教育人口的创新热点区域迁往其他社区。在这些社区里，如果工作岗位消失，它们可能难以很好地应对。

上世纪初，在那些人们往往受过更好的教育、人均专利数量也超过平均水平的地方，制造业蓬勃发展。但几十年过去，随着制造业就业的扩散，这个行业的就业与专利及教育的相关性减弱了。埃里克森与合著者发现，上世纪七八十年代，日本和东亚进口冲击的是那些尚处于创新周期较早阶段的产品，如视频和音频设备。这些产品都是在人均专利数量高于平均的地方生产的。那时，在那些所生产的产品易受日本进口竞争影响的地方，形势似乎一直都特别好，居民收入和受教育程度都在平均水平之上，失业率则低于平均水平。

中国冲击潮却不同。受影响的行业——这一次是玩具和鞋类等——最初确实在劳动者相对富裕且受过良好教育、专利也相对集中的地方发端的。假如中国冲击是发生在四五十年前的1960年，那么首当其冲受影响的会是那些前景看起来相当光明的城镇。但在1990年，这些行业已经将生产转移到那些失业率高于平均、居民受教育程度低于平均、专利数量并不优于全国一般水平的地区。

作者们认为，中国冲击带来的伤痛如此深重，是因为它重创了那些本就在苦苦挣扎的人。在那些大学程度劳动力较少的地区，劳动力参与率的跌幅更大。而在那些各个产业已经在往外撤离的地区，当地劳动者的适应力是最弱的。有些地方的易受冲击行业在1960年至1980年间就已出现职位减少

的情况，它们在中国冲击中职位减少的幅度比别处更大。

其他一些研究深入探究了中国冲击何以带来如此大的伤害。奥托尔、多恩和汉森描述了遭受重创的地方如何拖累了它们的供应商，从而伤害了整个社区。斯坦福大学的尼古拉斯·布鲁姆（Nicholas Bloom）和三位合著者发现，尽管来自中国的进口品确实支撑起了一些新工作（例如通过提供更便宜的组件或原材料），但在那些工作岗位本就岌岌可危进而流失的地区，并没有实现新增就业增长。虽然得梅因之类的地方避开了中国冲击，一些城镇也因更廉价的原材料而获益，其他地区却陷入了困境。

在谈判代表试图改写中美贸易条款之时，外界可能很容易得出结论，认为美国为使中国加入全球贸易体系付出了过高的代价。上世纪80年代的日本比本世纪初的中国富裕得多，美国本应保护本国易受冲击的产业。一个更有帮助的结论是，政客们应该花更多的心思武装那些远离创新前沿的劳动者，好让他们在所在行业遭受冲击之时能更好地调整适应——不管是因为进口竞争还是因为其他任何地方带来的冲击。

政客们或许还可以吸取另一个教训。面对冲击，他们的应对措施通常都只是加速或减缓了广泛的结构性趋势而已。即便没有中国冲击，玩具制造业也会在某个时候转移到其他地方。加高或下调关税的做法可能会让政客们暂时觉得自己可以控制外国竞争，但贸易保护的成本将会由一国经济中人们多半看不到的其他地方来承担。而与此同时，世界还是会照常运转。■



Tech and privacy

Facebook's third act

A new business model could make the company harder to break up

The first big overhaul for Facebook came in 2012-14. Internet users were carrying out ever more tasks on smartphones rather than desktop or laptop computers. Mark Zuckerberg opted to follow them, concentrating on Facebook's mobile app ahead of its website, and buying up two fast-growing communication apps, WhatsApp and Instagram. It worked. Facebook increased its market valuation from around \$60bn at the end of 2012 to—for a brief period in 2018—more than \$600bn.

On March 6th Mr Zuckerberg announced Facebook's next pivot. As well as its existing moneymaking enterprise, selling targeted ads on its public social networks, it is building a “privacy-focused platform” around WhatsApp, Instagram and Messenger. The apps will be integrated, he said, and messages sent through them encrypted end-to-end, so that even Facebook cannot read them. While it was not made explicit, it is clear what the business model will be. Mr Zuckerberg wants all manner of businesses to use its messaging networks to provide services and accept payments. Facebook will take a cut.

A big shift was overdue at Facebook given the privacy and political scandals that have battered the firm. Even Mr Zuckerberg, who often appears incapable of seeing the gravity of Facebook's situation, seemed to grasp the irony of it putting privacy first. “Frankly we don't currently have a strong reputation for building privacy protective services,” he noted.

Still, he intends to do it. Mr Zuckerberg claims that users will benefit from his plan to integrate its messaging apps into a single, encrypted network.

The content of messages will be safe from prying eyes of authoritarian snoops and criminals, as well as from Facebook itself. It will make messaging more convenient, and make profitable new services possible. But caution is warranted for three reasons.

The first is that Facebook has long been accused of misleading the public on privacy and security, so the potential benefits Mr Zuckerberg touts deserve to be treated sceptically. He is also probably underselling the benefits that running integrated messaging networks brings to his firm, even if they are encrypted so that Facebook cannot see the content. The metadata alone, ie, who is talking to whom, when and for how long, will still allow Facebook to target advertisements precisely, meaning its ad model will still function.

End-to-end encryption will also make Facebook's business cheaper to run. Because it will be mathematically impossible to moderate encrypted communications, the firm will have an excuse to take less responsibility for content running through its apps, limiting its moderation costs.

If it can make the changes, Facebook's dominance over messaging would probably increase. The newfound user-benefits of a more integrated Facebook might make it harder for regulators to argue that Mr Zuckerberg's firm should be broken up.

Facebook's plans in India provide some insight into the new model. It has built a payment system into WhatsApp, the country's most-used messaging app. The system is waiting for regulatory approval. The market is huge. In the rest of the world, too, users are likely to be drawn in by the convenience of Facebook's new networks. Mr Zuckerberg's latest strategy is ingenious but may contain twists. ■



技术和隐私

Facebook的第三幕

一种新的商业模式可能会使这家公司更难被分拆

Facebook的第一次重大变革发生在2012至2014年间。那时互联网用户越来越多地在智能手机上执行任务，而不是在台式机或笔记本电脑上。马克·扎克伯格选择顺势而动，把注意力从网站转移到手机应用上，并收购了两个快速发展的通信应用WhatsApp和Instagram。这种做法成功了。

Facebook的市值从2012年底的约600亿美元增加到2018年的6000多亿美元（尽管只维持了很短一段时间）。

本月6日，扎克伯格宣布了Facebook的下一个发展重点。除了在其公共社交网络上销售定向广告这项现有的盈利业务之外，公司正在围绕WhatsApp、Instagram和Messenger建立一个“专注隐私安全的平台”。扎克伯格说，Facebook将整合这三个应用，并为三方之间发送的消息提供端到端加密，就连Facebook自己也无法读取。虽然没有明确说明，但这个大平台将采用的商业模式显而易见。扎克伯格希望各类企业都能利用Facebook的消息传递网络来提供服务并接受付款，Facebook则从中抽成。

鉴于隐私和政治丑闻的沉重打击，Facebook早就该推动一场重大的转变了。即使是看似常常无法认识到Facebook严峻处境的扎克伯格，似乎也领会到公司将隐私放在第一位透出的讽刺意味。“坦率地说，目前我们在建立保护隐私的服务方面声望不高。”他指出。

不过，他还是打算做出改变。扎克伯格称，把多个消息应用整合成单一加密网络的计划将让用户受益。威权政府的密探、犯罪分子以及Facebook本身都将无法窥探消息的内容。消息发送会变得更加方便，有利可图的新服务也将成为可能。但对此需持谨慎态度，理由有三。

首先，鉴于Facebook长期被指斥在隐私和安全方面误导公众，对于扎克伯格大力宣扬的潜在益处我们理应抱持怀疑观望的态度。扎克伯格也有可能

在淡化运营集成消息网络给他的公司带来的好处，即使Facebook无法看到加密的内容。单是谁和谁在何时交流了多久的元数据就能让Facebook精准地投放广告，这意味着其广告业务模式仍能正常运作。

端到端加密还会降低Facebook的业务运营成本。确切来讲加密信息是无法审核的，公司也就会有借口对通过其应用发出的内容负更少的责任，从而控制其审核成本。

如果计划中的改变能够落实，Facebook在消息应用领域的主导地位可能会增强。一个更集成的Facebook新带来的用户利益可能会让监管机构更难主张将Facebook分拆。

从Facebook在印度的计划可以一窥其新模式。它已在印度最流行的消息应用WhatsApp中创建了支付系统，正在等待监管部门批准。这个市场非常庞大。在世界其他地方，用户也可能被Facebook的新网络带来的便利所吸引。扎克伯格最新的策略很有创意，但也可能隐藏了花招。■



Autonomous systems

The computer in the cockpit

Why partial automation can be more dangerous than none at all

ONE WAY to tell who made the aircraft you are boarding is to steal a glimpse of the cockpit. A traditional control yoke in front of the pilots suggests a Boeing; a joystick beside each seat, an Airbus. Pilots argue about which system is better; neither is considered safer than the other. Each exemplifies a different approach to a problem that manufacturers of not just aircraft but also cars, trains and ships must grapple with as long as human operators handle increasingly automated machines.

The challenge of what engineers call the “human-machine interface” has tragically gained attention after the crash of an Ethiopian Airlines Boeing 737 MAX 8 on March 10th. Eyewitnesses reported that shortly after departing Addis Ababa, the aircraft climbed and dived repeatedly. Similarities were drawn with a fatal crash in Indonesia in October last year. That time, the pilots of a Lion Air MAX 8 struggled, also soon after take-off, with an automated safety system that erroneously tried to prevent the aircraft from stalling by lowering its nose.

Although authorities around the world have grounded the model, Boeing insists that it is airworthy. The company is updating the MAX’s automated flight-control software to make it easier for pilots to assume manual control. Boeing and Airbus both pack their planes with computers that do most of the flying. Each, though, espouses a different philosophy on how a pilot reacts to them, says Mudassir Lone of Cranfield University in Britain. Boeings are designed to make the pilot feel like the aviator in charge. Although the control yoke looks and feels like something from the analogue era, the way it behaves—including shaking when approaching a stall—is

created digitally by a computer. Airbus's joystick is seldom used besides take-off and landing. A sound alerts the pilot to trouble; in an Airbus, he is more supervisor than airman.

The big worry is what happens if a sensor feeds the flight-control system the wrong data. This might have happened in the Lion Air crash, according to a preliminary report. Something similar downed an Air France Airbus A330 over the Atlantic in 2009: an airspeed sensor iced over and the ensuing loss of data caused the autopilot to disengage. Unable to work out what was happening, the pilots lost control.

Switching from automatic to manual is not straightforward. Flight-control systems may not disengage entirely. Instead, they might continue to assist the pilot in an attempt to prevent a dangerous manoeuvre. When things do go wrong, it is critical that pilots follow the correct procedures, which are different for each model of aircraft. Pilots learn these and carry checklists spelling them out. Proliferation of systems necessitates frequent retraining. To make life easier for pilots, the MAX 8 employs a system that makes it feel to them like older, more familiar versions of the 737. But this adds another layer of complexity.

Incidents are not confined to aviation. In Washington, DC, automated trains have largely been out of service since 2009, when a faulty circuit made a stationary train invisible to the safety system on the one behind it. The driver was unable to brake in time; the resulting crash killed nine people. Ships may soon face similar problems. Some ferries and offshore support vessels have already replaced ship's wheels with computer-assisted joysticks. A series of accidents involving self-driving cars may have been caused by sensors' failure to recognise objects in the road, and drivers failing to respond fast enough.

Studies have shown that when people have to wrest control from an

automated system, it can take them around five seconds to grasp what is happening. The monotony of monitoring a semi-automated vehicle may reduce vigilance by provoking what psychologists refer to as “passive” fatigue. Such concerns have led some carmakers, Ford among them, to consider skipping semi-automation and go straight to something closer to full autonomy, cutting people out of the loop. That would remove the human-machine interface—but not humans’ machine-induced fears. ■



自主系统

驾驶舱里的电脑

为何半自动可能比手动更危险

要想知道自己乘坐的飞机是哪家公司出品，一个办法是偷瞄一眼驾驶舱。操纵杆按传统方式放在驾驶员座位前方的是波音，放在驾驶员侧方的是空客。至于哪个系统更好，驾驶员们看法不一，他们也不认为哪个就更安全些。随着驾驶员需要操作越来越自动化的机器，无论是飞机，还是汽车、火车和轮船的制造商都必须处理同一个难题。波音和空客展现了不同的解决方案。

本月10日埃塞俄比亚航空公司的一架波音737 MAX 8坠毁后，工程师们所说的“人机界面”难题以悲剧性的方式受到了关注。目击者报告称，飞机离开亚的斯亚贝巴后不久反复爬升又俯冲，与印尼去年10月发生的致命事故相似。当时，也是在起飞后不久，狮航一架波音737 MAX 8客机的驾驶员无法控制自动安全系统，该系统错误地试图压低机头来防止飞机失速。

虽然各国政府已禁飞MAX 8客机，但波音公司仍坚称该型号客机是适航的。波音正在升级MAX的自动飞行控制软件，方便驾驶员手动接管飞行。波音和空客的飞机都安装了自动驾驶系统，控制着大部分的飞行操作。但英国克兰菲尔德大学（Cranfield University）的穆达希尔·隆内（Mudassir Lone）认为，两者在处理驾驶员如何对自动驾驶系统做出反应上有着不同的理念。波音的设计令驾驶者感觉自己是操控飞机的飞行员。虽然操纵杆的外观和感觉都像是模拟信号时代的产物，但其动作方式（包括在接近失速时的抖动）是由计算机以数字方式生成的。而在空客的飞机上，除了在起飞和降落时，驾驶员很少需要用到操纵杆。出现问题时，系统会发出警报声通知驾驶员。在空客飞机上，驾驶员更像指挥官，而不是飞行员。

人们最担心的是，万一传感器向飞控系统提供了错误数据会有什么后果。一份初步调查报告显示，狮航坠机事件中可能就出现了这种情况。2009

年法航的一架空客A330客机也因类似问题坠落大西洋：空速传感器结冰，系统无法读取数据，导致自动驾驶仪解除控制。驾驶员搞不清楚发生了什么情况，没能控制住飞机。

从自动驾驶切换到手动操作不是一件简单的事情。飞控系统可能没有完全解除控制。相反，它可能会继续协助驾驶员以防出现危险操作。一旦真出现了问题，驾驶员按正确步骤处理是至关重要的。但每种机型的应对步骤各不相同，驾驶员必须一一学习并带上列明步骤的操作清单。新系统层出不穷，使得驾驶员需要频繁再培训。为方便驾驶员操作，MAX 8采用的系统在操作感受上沿袭了驾驶员们更熟悉的波音737旧机型。但这又增添了一层复杂性。

事故不仅限于航空领域。2009年，美国华盛顿特区的一辆地铁列车因电路故障造成安全系统失灵，撞上了前方停着的列车。自那以后，该地区的自动驾驶列车已基本停运。当时列车司机无法及时刹车，事故造成九人死亡。船舶也许很快会遇到类似问题。一些渡轮和近海辅助船已经用计算机辅助操纵杆取代舵轮。一系列涉及自动驾驶汽车的事故可能是由于传感器未能识别道路中的物体造成的，而驾驶员来不及反应。

研究表明，当人们必须要从自动化系统手上夺回控制权时，可能需要约五秒的反应时间来弄清楚状况。监控半自动驾驶交通工具的那种单调乏味可能会造成心理学家所说的“被动”疲劳，导致驾驶者的警觉性下降。出于这方面的担忧，福特等部分汽车制造商考虑跳过半自动化，直接采用更接近全自动的方式，将人类完全排除在外。人机界面的问题可能会就此消除，但人们因机器引发的恐惧依然存在。 ■



China's future

The global centre

A giant microcosm reveals the Chinese economy's struggle with itself

THE WORLD'S biggest building got off to a bad start. On the eve of its opening, Deng Hong, the man who built the mall-and-office complex, disappeared.

For years Mr Deng had received tributes in local media for turning farmland into glistening conference centres and hotels. The billionaire “conference king” walked with a swagger, chomped on cigars and knew how to please officials. Hefty contracts rolled his way, including one to develop a landmark in the suburbs of Chengdu, a city of 14m in south-western China. This, the New Century Global Centre, was to be his crowning accomplishment, the world’s largest structure by floor space, the size of 246 football fields, or nearly three Pentagons or eight Louvres.

But then he was gone, swept up in a corruption investigation just before the building’s doors opened in 2013. The media focus shifted to his hubris and his wasteful, pharaonic venture. Inside, it had a massive waterpark with an artificial beach, an ice rink, a 15-screen cinema, a 1,000-room hotel, offices galore, two supersized malls and its own fire brigade, but just a smattering of businesses and shoppers. It became a parable for the economy’s excesses and over-reliance on debt.

Today, more than five years on, the story has taken a series of surprising turns. For one, the building is not a disaster. During the summer, the waterpark is crowded. The mall has come to life, a testament to the rise of the middle class. The offices are a cauldron of activity: 30,000 people work there in every industry imaginable, from app design to veterinary care. Mr

Deng has been released and is back in business, declaring last summer that he had a clean slate.

A triumphant return? Not quite. Mr Deng's freedom is marred by the fact that he no longer owns the centre but is now an employee. It was bought by an arm of the state—a transaction that regulators are probing for financial irregularities. From one angle the world's biggest building seems to be thriving; from another it is once again under a cloud.

Discussions on China's economic future also tend to swing between two extremes. At one end of the spectrum, it is seen as an unstoppable juggernaut, destined to dominate the 21st century. At the other end is the conviction that a crash is inevitable. The trade war with America has achieved the improbable feat of bringing these views together, reflecting both a fear that China must be confronted before it is too strong and a desire to hasten its collapse.

The Global Centre—the tale of its construction, its occupants and its evolution—hints at a different future. It is neither a spectacular success nor a catastrophic failure but a long economic struggle, a contest between China's tremendous potential and the cracks in its foundations. America is only a secondary player in the drama. China, for better and for worse, is writing its own story.

The centre is now surrounded by broad roads and tall buildings. But for years the land it sits on was home to the fields of Huang Fenyu, a stout woman in her 50s, and the few thousand residents of Yumin village. Many lived by timeless rural rhythms, sowing rice in the spring and harvesting green stalks in the autumn.

In 2005 those rhythms came to a halt. Chengdu officials ordered the people of Yumin to relocate to high-rise housing a short drive away. It offered each

one 35 square metres (377 square feet) of floor space and as much as 8,000 yuan (then \$1,000), or two years' income. Razed of the last vestiges of its former life—narrow lanes, rice paddies, cheap bungalows—Yumin village was renamed GX92 (211/252), an 80-hectare (200-acre) land parcel to the city's south. In September 2008, it was sold for 480m yuan to Mr Deng's company, the Exhibition and Travel Group.

Ms Huang now works as a janitor in a nearby bank. She knows the compensation she received was paltry. The one time she went to the Global Centre for dinner, it cost her two days' salary. "My heart ached," she says. Even so, she is not bitter. Her new home has better plumbing and sturdier walls. The younger generation will, she says, benefit from a stronger economy. It is a quiet optimism that remains typical of modern China. Though nearly 5km from where she lives, the Centre is so big that it looks as if it is just down the street, its wavy roof outlined with neon lights at night.

Yumin village's transformation—the conversion of farms into a construction site—has been replicated all over China. It provides the most basic answer to the question of how the economy has grown so fast. Officially, the government dates its "reform and opening" period to 1978. Yet for the first 15 years progress was uneven. Gradually unshackled from central planning, the Chinese people showed their entrepreneurial flair. But the Communist Party was divided on the critical issue of how to build the roads, homes and factories that it sorely needed—how, in the jargon of economists, to accumulate the physical capital that fuels growth.

It was only in the 1990s that China settled on a model that has, in many respects, persisted to this day. It started evaluating local officials by how quickly the economy grew under their watch. They, in turn, competed with each other to woo firms, offering them cheap land, tax breaks and low-cost labour. Transforming the bureaucracy into something more like a large startup business, hungry to expand, yielded dramatic results. China

accounted for 4% of the global economy in 1990; now that is close to 18%.

Three factors have underpinned this model. Each can be found in the origins of the Global Centre. The first is land, all of which is publicly owned. This puts a valuable asset at the disposal of local officials. They can offer cheap long-term rents to attract businesses or sell big leaseholds to developers. As long as growth continues, this is sound economic logic. Developers buy up land, assuming, mostly correctly, that they can sell what they build. For local governments it is a source of wealth. In Sichuan province, of which Chengdu is the capital, land sales bring in nearly as much as taxes.

A second feature of China's economy is cronyism. Mr Deng bought the land in 2008 at a steep discount, according to state media. The city government had supposedly attached strict conditions to the sale. He was to build an arts centre as well as a landscaped park. A mall-and-office complex was not part of the plan. Yet today the only building on the site is the Global Centre.

Officials must have known. The city government is across the street. At the time Chengdu's Communist Party chief was Li Chuncheng. His given name means "spring city", but locals dubbed him Chaicheng, or "demolish the city". Mr Deng got close to him: when Mr Li wanted a relative's remains moved somewhere with better *feng shui*, Mr Deng made the arrangements.

Mr Li's fortunes turned soon after Xi Jinping came to power in 2013. Jailed for graft related to construction, he is one of the dozens of high-flying local leaders cut down by Mr Xi's anti-corruption campaign. Mr Deng himself was detained but never publicly charged. The official line is that he was asked to "assist an investigation", a euphemism for helping the party net a bigger fish.

Still, Mr Li's downfall offers a window into the nexus between government

and business. Local officials can dole out contracts in exchange for benefits, like covering their children's tuition overseas or buying homes for their relatives. The path is then clear for projects that in other countries would be almost inconceivable.

The third feature in China's model is debt (see chart). Mr Deng bought the land in 2008 just as the country embarked on a manic phase of growth. Worried about drag from the global financial crisis, Beijing unleashed a huge stimulus. Local officials ran up debts, and seized lots of land for development. A building boom ensued.

The Global Centre is one of the many projects from that period that dot the country. Some are useful, such as China's high-speed rail network. Others, less so: scores of cities built big futuristic districts but are still struggling to attract residents. China's total debt soared from about 150% of GDP in 2008 to more than 250% today. Rapid increases of this magnitude have presaged financial trouble elsewhere, from the banking crises that ripped through the West a decade ago to Japan's stagnation in the 1990s.

Yet the striking thing about these three factors in China's economic system is that they were all useful until recently. The government's control of land gave it a lever to kick-start investment. Land also played an overlooked role in governance, says Michael Song, an economist at the Chinese University of Hong Kong. In a large country with a lack of accountability, it functioned as a disciplining tool. To raise the value of land, officials had to invest in infrastructure, from highways to power grids. If they did not, they would have a harder time selling land in the future.

Many economists also believe that corruption was, counterintuitively, a lubricant. Emerging from the Maoist era, a little graft gave officials an incentive to do what was needed to support growth, whether in selling state

assets or enticing firms to invest.

Debt also greased the wheels. Up to a point, the increase in borrowing is a sign that the financial system is operating as it should, channelling savings into investment. Virtually all developed economies have debt levels that are at least as high as China's, albeit mostly built up over longer periods.

The challenge now is to shift to a different economic model, because all three factors are hitting their limits. Land is a finite resource, and the government's appropriations have got ahead of market need. Gan Li of Chengdu's Southwestern University of Finance and Economics estimates that 65m homes—21% of urban housing stock—are vacant. Corruption has reached corrosive levels. Frailties from all the debt are showing. Corporate-bond defaults in 2018 reached \$18bn, more than triple the previous annual record.

But turning onto a new path is hard. Local governments cannot easily find revenue sources as bountiful as land. The anti-graft campaign has sapped the motivation of officials while leaving the rotten system around them intact. Efforts to tame debt have also hurt growth, forcing regulators to ease up in recent months. China's problems are simple enough to diagnose. Treatment, though, is painful, and the disease more chronic than acute. So instead of taking bitter medicine, officials hope time will be a balm. But China's ills are likely to get harder to cure.

IF THE LESSONS from the Global Centre's construction seem gloomy, counter that with some time inside it. Here, China's commercial promise is almost palpable. From the main entrance, visitors walk into a cavernous atrium which mixes high-end touches with a fairground atmosphere. The glossy marble floor is flanked by long gold-trimmed escalators. To the left is one large mall; to the right another. Straight ahead is the waterpark, under the glare of an ultra-long LED screen, projecting seaside scenes.

The park's main attraction is a wave pool (pictured), which generates huge artificial swells. On a summer's day, it is raucous. Hundreds of bathers are in the surf, many with mobile phones in plastic pouches hung around their necks. Pulsating music is blasted at top volume as dancers in bikinis take to elevated platforms.

One father, Zhang Meng, sits in the waterside food court, his belly spilling over his trunks as his four-year-old son licks chocolate sauce off a dessert plate. An ad salesman for a media company, Mr Zhang has money to spend but is far from rich. When the waterpark started selling annual passes at just 700 yuan (\$104) for an adult, he jumped at the offer. Twice a month in the summer he brings his wife and son. They stroll around the mall, go for a swim and dine on spicy dumplings. "We love the environment," he says. Squint a little, and it could be Coney Island or Blackpool in the 1950s, albeit with digital touches under a vaulted glass roof.

This scene underscores the long-awaited emergence of Chinese consumerism. China's economy is often described as unbalanced. Investment accounts for nearly half of GDP, more than double the level of developed economies. Consumption, meanwhile, accounts for about a third of GDP, half the level of developed economies. Yet a simple emphasis on these two ratios misses something important, argues Arthur Kroeber, founder of Dragonomics, a China-focused research firm. Consumption has such a low share of GDP in China not because people are staying away from shops but because its investment has been unusually large.

Looked at from a different vantage, consumption is already booming in China. Between 1990 and 2017, consumer spending per person rose nearly eightfold in inflation-adjusted terms, more than double the increase in India. China is the world's biggest market for passenger cars, smartphones, luxury goods and beer. This is not a country of repressed shoppers.

The pressing concern is, therefore, not whether China can rebalance towards consumption but whether its spending boom can be sustained. In recent months much ink has been spilled over the idea that China might be cutting back on consumption. Evidence is patchy at best. Car sales fell sharply in 2018, but that was partly because a tax benefit was eliminated. Retail sales, more broadly defined, remain strong.

Obviously Chinese consumers cannot defy the laws of gravity. If the economy were to slump into a recession, household spending power would, inevitably, suffer. Yet there is also reason to think that, short of that, consumption in China will be resilient.

Big trends work in its favour. Over the past few years the labour force has started shrinking, which has pushed up wages. Low-end factories are moving abroad. For consumption this is an unalloyed positive. When workers earn more, they can also spend more. Household consumption bottomed out with a 36% share of GDP in 2010, when construction of the Global Centre was in full swing. This year it is on track to reach 40%.

Income levels have reached about \$5,000 per person in cities, a level at which discretionary spending has taken off in other countries. The fact that the Global Centre was built in Chengdu, far inland, illustrates the strength of this trend. It is poorer than the coast, but big hubs of prosperity have nevertheless emerged. Chengdu's economy has quadrupled over the past decade.

Estimates of the size of China's middle class vary from 100m to 600m, depending on how it is measured. Precise estimates are beside the point. What matters is the direction of travel. Consumer numbers are destined only to grow. Even in an age of e-commerce, people flock to malls like the Global Centre. Along with the usual array of clothing stores and jewellery

shops, there are toddlers' play centres, virtual-reality arcades and cosplay cafés. On weekday evenings people queue outside restaurants on the top floor.

But there is a darker side to China's rise as a consumer society: its yawning inequality. Most countries that undergo rapid growth experience rising wealth gaps. In China this natural tendency has been exacerbated by the state's control over where people can live. The government gifted urban residents their homes in the late 1990s when property was privatised. Those in rural areas had no such luck. Moreover, the *hukou* residency system makes it difficult for rural citizens to settle in cities. They are barred from certain jobs and their children are sidelined in the schooling system.

When the post-Mao era began, Chinese were poor but equal. The income gap rose sharply from the 1990s. It is among the world's most unequal countries today, with the richest 1% holding one third of all household assets. China has more billionaires than America, even though its income per head is just one-fifth. For those on the bottom rungs of the Chinese income ladder, climbing up it has long been a motivation, but it is getting harder.

Yang Fanji and her family run a restaurant on a dusty street near the Global Centre. They deliver about 80 takeaway meals every day to its office workers. Ms Yang (not her real name) used to work at an electronics factory on the coast for better pay, but returned to Chengdu, just four hours from her home village, so that her eight-year-old son could live with her. She was able to get him into a local school by pulling some strings. But with a low wage and high living costs, she is unable to save much, making her part of a large and seemingly permanent urban underclass.

In fact there is much China could do for those like Ms Yang if it truly wanted to reduce inequality. For a start, it could make it easier for those born in rural areas to move to cities. It has, over the past decade, built up a social-

security system that gives almost all citizens health insurance and old-age pensions. But payments are meagre. As ageing accelerates, the burden will only increase.

Tax reforms would also help. The government does not tax the investment earnings and property of the rich, which are basic revenue sources in developed economies. Officials seem more fearful of angering rich urbanites than of neglecting poor farmers.

In a provocative article in 2017, Barry Naughton, an economist at the University of California, San Diego, asked whether China was a socialist country. In some respects, he ventured, it was: the government can exercise much more control than is normal in a capitalist system. But on the key question of what it does with that power, he concluded that China was decidedly non-socialist. Redistribution policies have been conspicuous failures.

The number of shoppers splashing in the Global Centre's waterpark or splurging in its restaurants will continue to rise. But the other part of the population, those on the outside looking in, scrubbing dishes late into the night after a long day serving its workers, also looks firmly entrenched. It is not a happy picture.

CROWDS START arriving at the Global Centre before nine in the morning every weekday, well before the shops open. They are the 30,000 people who work in the offices on its upper floors. These contain a motley mix of companies, 1,800 in all—a rough cross-section of China's business world.

Some, like Huodongjia, would be at home in Silicon Valley. Its main product is an app for conference listings. Wang Qing, its founder, clad in skateboarder shoes and shorts, is refreshingly frank about the headaches of tech entrepreneurs in China. There's too much short-termism, he says. "The

mentality for investors is, if I give you 10 yuan today, you've got to give me 11 back tomorrow."

Other offices are starkly different. At the Quanxing law firm, Fu Shaojie talks of China's progress in developing the rule of law. But he believes the law answers to the Communist Party, not the other way around. "We are making our system more democratic," he says, explaining that this means his firm works with the government to stop disputes reaching courts. His waiting room displays a book with the collected wisdom of Xi Jinping, China's president.

China is certainly not a fully free market. Yet it has come a long way since Chairman Mao. The structure of the economy looks very different depending on where you focus. There is an exuberant private sector, vital to China's success. Employment in state firms plummeted in the 1990s when the government closed thousands of loss-making companies. The private sector more than made up for them. These days, officials use a rough "56789" formula to describe its significance: it accounts for 50% of tax revenues, 60% of GDP, 70% of innovation, 80% of jobs and 90% of companies. The point is clear. China would be nowhere without its private firms.

In many industries, China's entrepreneurs face more cut-throat competition than their Western peers. Take property: the ten biggest developers account for 30% of sales in America but around 15% in China. The rush into new industries can be frenzied. China already has more than 1,000 robotics firms.

But at the same time, the government seems to be everywhere. China has 150,000 state companies. With preferential access to banks, they account for 70% of corporate debt. And in many industries, from finance to shipping, the government aims for what it calls "absolute controlling power", limiting competition and blocking entrants. This is a danger for

China when its economic priority is to increase productivity. State firms are much less efficient. Their return on assets is less than half that of their private peers (see chart).

These two parts of the Chinese business world are often described as separate, as if plucky private firms are battling clumsy state-owned rivals. In reality they are deeply intertwined. The challenge for private firms is not so much how to compete against state firms as how to coexist with them. Wanjiang Gangli, a water-monitoring company with headquarters in the Global Centre, has seen its business boom as the government has targeted pollution. “In this system when leaders focus on an issue, it’s highly effective,” says He Xin, its general manager. But that same power makes for frustrations. To get contracts, his firm must partner with state firms, which have little technology but lots of political clout.

The worry is that this coexistence, already fragile, is breaking down. Complaints about *guojin mintui* (the state advances, the private sector retreats) emerged a decade ago, when the government gave state firms lots of cash to help the economy through the global crisis. “Retreat” may at first have been an overstatement, but there is no doubt that the private sector stopped advancing: its shares of both investment and industrial output levelled off.

Now, under Mr Xi, it looks more like a full retreat. In the three years before he became president in 2013, private firms received roughly half of all bank loans. State firms got just a third. In the three following years, more than 70% flowed to state firms, according to Nicholas Lardy of the Peterson Institute for International Economics. The tone has also changed. The Communist Party has insisted that private companies, including foreign multinationals, establish party cells. A foreign manager at a car-parts company which cut staff last year says he had to discuss “social stability”

concerns with his firm's party secretary. It was a warning shot.

Some observers had thought Mr Xi would take China in the opposite direction. He initially pledged that market forces would play a "decisive role" in the economy. But he also vowed to strengthen state-owned firms. The latter pledge has been more potent. Over the past five years the government has merged steel mills, chemical companies and rolling-stock manufacturers, hoping to make them mightier. It has prodded private companies to invest in state firms, to make them more efficient. China Unicom, a state-owned telecoms giant, now counts three big private internet companies—Alibaba, Baidu and Tencent—as shareholders.

This risks dulling the edge of the private sector. Normally, companies get higher returns as they grow and reap economies of scale. In China the reverse happens, says Mark Williams of Capital Economics, a research firm. His hypothesis is that big companies draw more attention from officials. Political meddling hurts them.

Last year a little-known blogger published an article arguing that the private sector had fulfilled its "historic task" of enriching the country, and that it was time for it to fade away. The article went viral not because people agreed but because it encapsulated their fears. Since then officials have tried to reassure businesses that they are still wanted. Mr Xi has vowed "unwavering" support. Yet these protestations count for only so much. As long as the government remains determined to strengthen state-owned companies, there will be no level playing-field for private firms.

Even when officials craft sensible policies, this imbalance can knock them off course. A dispiriting case has been their attempt to defuse financial dangers. To do so they have clamped down on shadow banking, a lightly regulated universe that includes everything from banks' off-balance-sheet

books to investment vehicles for the wealthy. Peer-to-peer lending is at the extreme risky end. One P2P firm, Zhongke Loans, resides inside the Global Centre. Wu Jinjun, its founder, describes his work with missionary verve. P2P lenders, he says, serve small borrowers, whom banks ignore.

But many P2P firms have either been fraudulent or mismanaged. Of the 4,000 that existed, two-thirds have failed. For Zhongke, staying afloat will be hard. It offers investors sky-high annual returns of 14%, which few companies can sustain. A ticker on its website measures, with disconcerting precision, how long it has been in operation: four years, three months, three days. Mr Wu's immediate concern is the central bank's belated decision to vet all P2P platforms and bar those that do not meet its standards.

Restoring order to the financial system is the right idea. But in doing so, the government has inadvertently stifled the private sector. Private firms are by far the biggest recipients of shadow loans. Banks prefer to lend to state companies that carry implicit government guarantees, especially when the economy slows. They do not favour the state for ideological reasons but because it is the best bet for them to get their money back, plus interest.

Even Western investors fall prey to these incentives. The manager of a major European fund recently met a Chinese bank to ask about a regulatory order to lend more to small firms. The fund manager feared that this would force the bank to take on undue risks. Fear not, the bank's executive promised, it would reclassify subsidiaries of big state firms as smaller entities. This way it could satisfy regulators without imperilling its loan portfolio—a natural outcome in a system so heavily anchored by the state.

LOTTE MALL, a high-end South Korean department store in the Global Centre, normally wants to attract people. But on March 7th 2017, it was trying to keep them away. Despite a chill in the air, dozens had gathered on the plaza in front. They waved the Chinese flag, played the national anthem

and unfurled banners, one of which read: “We will not tolerate violations of our motherland’s safety!” It was, in short, not a typical day for staff more accustomed to selling face cream.

The trigger had been a decision by South Korea to install an American anti-missile system on its soil to defend itself against the threat of attack by North Korea. China perceived itself as the real target. State media lashed out at South Korea, and specifically at Lotte, because it had leased land in its home country for the anti-missile batteries. Protests hit some of Lotte’s 100-plus stores around China.

Sitting more than 1,000km inland, the Global Centre can seem remote from the rest of the world. But the global tensions surrounding China’s economic rise resonate in its corridors. The Lotte protests are a crude example of how China uses its biggest advantage—its huge market—to cow others into submission. Indeed, they were just the latest in a series of protests or boycotts freighted with political significance. Norway, the Philippines, Japan and Taiwan have all been on the receiving end.

China uses these outbursts of nationalism, whipped up by state media, to punish offending countries. The commercial pressure is hard to endure. Eventually South Korea promised China that it would refrain from additional deployments of the American defence system. But for Lotte it was too late. Its China business has not recovered. Having already sold dozens of stores, it is reportedly considering selling the rest, including its Global Centre branch.

There is an even bigger concern about the way that China wields its market power: as a lever to get companies to give up their technology. This is one of the core grievances behind America’s trade war with China. The American and European chambers of commerce estimate that a fifth of their members have faced such demands, and in high-tech sectors as many as two-fifths.

When China joined the World Trade Organisation in 2001, it pledged to stop requiring transfers of technology as a condition of market entry. The difficulty in building a case against China is that it has generally abided by the letter of its WTO commitments. Its methods are more subtle. From car manufacturing to cloud computing, foreign companies need local partners to operate in China. Regulators can also use product testing and approval procedures to compel them to disclose intellectual property. An unstated goal of these policies is to give Chinese firms access to foreign technology. But when challenged, China often replies that they are voluntary, commercial agreements.

Even more blatant is the outright theft of intellectual property. An IMAX theatre on the top floor of the Global Centre mall is an emblem of how brazen Chinese firms can be. The screen is one of 600 around China, IMAX's biggest market in the world—but also one of its thorniest. In 2014 it won a \$7m court judgment in Canada against a former employee, Gary Tsui, for copying its 3D technology and starting a rival in China.

It was a limited victory. Mr Tsui is still active in China, filing patents under his local name, Cui Xiaoyu. And he now works as chief engineer for China Film Digital Giant Screen (CGS), part of a state-owned company. No wonder foreign firms sometimes feel they are competing not against commercial rivals but against the state. In Chengdu, not far from the Global Centre, CGS opened its 100th screen in 2015. It now has more than 300.

There is no way to know exactly how much China has stolen. The American government estimates that its firms lose intellectual property worth up to \$60bn annually to foreign thieves, with China the leading culprit. Like any claimant in a dispute, though, it has reason to overstate the damage.

China is not the first country to steal intellectual property or demand tech transfers. Brazil, India and Mexico insist on joint ventures in various

industries. China, though, is unusual in its heft. If the behaviour of, say, Malaysia or Argentina seems unreasonable, foreign firms can leave. Forgoing China is tougher.

So the real question is whether China can get away with it. It is in this regard that Donald Trump's hard line has been most notable. From an economic perspective American tariffs make little sense; they are a blunderbuss that will hurt America's growth as well as China's. Yet, unlike more delicate negotiating tactics in the past, they have made China pay attention.

The fallout has reached the Global Centre. At the office of Anbang Logistics, an international shipping company, employees are attempting to get goods to and from Chengdu. Li Jing, its vice-president, is blunt about the impact of the trade war, a view that seldom comes through in China's state media. "Our business is exports, so we feel the pain directly," she says.

The tariffs are having big knock-on consequences. Her firm can charge more for delivering electronics, allowing it to defray the cost of moving heavier products. But with Chinese electronics now facing tariffs in America, the cost of shipping other products has gone up. And Ms Li expects 2019 to be even worse. Unless, that is, America and China reach some kind of deal. Already, China has watered down some of its joint-venture requirements for foreign carmakers and banks.

Nevertheless, it is also easy to exaggerate the threat. The portrayal of China as an efficient, commercially minded, strategically brilliant government that, at its leisure nabs technology from foreign companies, rarely accords with reality. Policies are often much more muddled than they appear to the outside world.

Take the joint ventures. Perhaps the most notable fact is how rarely they have been effective. Despite an array of aviation partnerships, China has

failed to create a decent passenger jet even after years of trying. A former industry minister famously described carmakers' joint ventures as opium: Chinese firms are hooked on them for profits and make little of value themselves. Even theft only gets China so far. IMAX, for instance, believes the 3D technology stolen by its former employee is now outdated and that its Chinese rival has failed to keep up with its latest advances.

China has done well at building first-rate ports, highways and railways. But promoting innovation is harder. Patents filed by Chinese companies, for instance, are not all they seem. In the Global Centre, Finchos Electronics, a company that produces fingerprint readers, proudly displays dozens of patent certificates on its wall. Yet more than half are for incremental changes. Overall, China generates more patents in a year than America, Europe and Japan combined, but less than a quarter are for genuine inventions, and few of its domestic patents are recognised abroad (see chart).

Government subsidies also have shortcomings. DoubleFlyer, an education-technology company in the Global Centre, was granted a rent-free office in an industrial park in the suburbs. Such support works well for manufacturers but less well in knowledge-based industries. After six months Luo Sai, the young founder, moved DoubleFlyer back to the centre, to be closer to its business partners. Ms Li of Anbang Logistics raises her eyebrows at the Belt and Road Initiative, China's mega-plan for investing abroad. Rail links between western China and Europe are the big accomplishment so far, an increasingly popular route for moving goods. But, without subsidies, she reckons that train costs would soar and exporters would go back to boats.

This is not to say that China is failing. Judging by growth or innovation, it has excelled compared with most other countries at its income level.

But it still has far to go. Despite the name of its plan to develop advanced industries—“Made in China 2025”—which has caused so much concern in America, the bureaucrats who drew up the plan did not think that China could rival foreign prowess until 2049. That is cold comfort for firms whose technology has been stolen. But it is an indication of where China stands: its rise will be measured in decades, not years.

An irony of the trade war is that many of America’s demands are ideas that would propel China’s ascent. Opening more industries to competition would boost the private sector and productivity. Curbing subsidies would ease pressure on the public purse and curtail excess production. Better protection of intellectual property would stimulate innovation.

But it is China’s call. That a tycoon built the world’s biggest building deep in the interior, and that his building has been filled up with a dizzying array of businesses, gets at an essential truth: this is an economy whose fate is being written domestically. It is not pressure from outside that will make or break China, but its own decisions.

The direction is far from certain. Soon after Mr Deng ran into legal troubles, he put his assets, including the Global Centre, on sale. A local fund manager who looked over the books proclaimed that maintenance was too expensive and returns too low. But a buyer did come forward: the Yunnan Metropolitan Construction Investment Group, a state-owned firm.

The deal throws up red flags. The Yunnan group’s finances are wobbly. It has razor-thin returns and debt more than ten times higher than its earnings. The group is supposed to focus on building infrastructure in Yunnan, one of China’s poorest provinces, not on snapping up property elsewhere. It is a case of how state firms often hurt rather than help China by squandering capital.

Meanwhile, as one part of the deal, Mr Deng is back. He is working for the Yunnan group, tasked with helping it make a success of his buildings, including the Global Centre. A little more than five years after it opened, he can take some pride in it. Millions of people have come through its doors.

But he still has a challenge on his hands. To retain a shareholding in his projects, he has promised to deliver nearly \$1bn in profits from 2018 to 2020, ten times more than over the previous three years—a nearly impossible task. Problems are also showing up. The waterpark now closes for half the year, because it is too costly to run in the winter when crowds are sparse. Doors have started to fail on some of the 200 lifts. Rainwater drips through the roof. This is one more way in which the Global Centre reflects the Chinese economy. Glittering from afar, the structure looks shabbier and less solid up close, and is sorely in need of renovation. ■



中国的未来

环球中心

一个巨大的缩影揭示了中国经济与自身的斗争

世界上最大的建筑出师不利。在开业前夕，这座商厦写字楼的开发商邓鸿失踪了。

这之前的很多年里，邓鸿因为将农田变成金碧辉煌的会议中心和酒店而备受当地媒体褒扬。这位“会展王”亿万富翁走起路来趾高气扬，爱抽雪茄，知道如何取悦官员。高额合同纷至沓来，其中包括在中国西南部1400万人口的城市成都的郊区建设一座地标。新世纪环球中心原本会成为他的最高成就。这是世界上建筑面积最大的楼宇，相当于246个足球场、近三个五角大楼，或八个卢浮宫那么大。

但随后他就消失了，在2013年大楼开业前夕卷入了反腐调查。媒体的焦点转移到了他的傲慢和如法老般铺张浪费的风险项目上。楼内有一个带有人工海滩的巨大的水上乐园、一个溜冰场、15块屏幕的电影院、1000间客房的酒店、大量办公室、两个超大型购物中心，以及自己的消防队，却只有零星的企业和购物者。它成了中国经济过剩和过度依赖债务的寓言。

五年多后的今天，故事已经发生了一系列令人惊讶的转折。首先，这座建筑并未成为灾难。水上乐园在夏天熙熙攘攘。商场也焕发活力，见证了中产阶级的崛起。办公区是个行业大杂烩：从应用设计到兽医护理，在那里工作的三万人遍布各行各业。邓鸿已经获释并再度出山，去年夏天宣布自己身家清白。

凯旋归来？也算不上。邓鸿没那么自由了，因为他不再是环球中心的主人，而成了一名员工。大楼被一个国家部门买了下来，监管机构正在调查这起交易是否涉及财务违规。从一个角度来看，这座世界上最大的建筑生意红火；从另一个角度来看，它又一次被阴云笼罩。

关于中国经济未来的讨论也往往在两个极端间摆荡。在光谱的一端，它被视为一股不可阻挡的强大力量，注定要主宰21世纪。另一端则是坚信其崩溃不可避免。美中贸易战实现了一个不可思议的壮举：把这两种观点融合在了一起。它既反映出一种恐惧，认为必须赶在中国变得太强大之前挑战它，又反映出一种要加速其崩溃的愿望。

环球中心——它的建设、它里头的人和企业以及它演变的故事——暗示了一个不同的未来。那既不是辉煌的成功，也不是灾难性的失败，而是一场漫长的经济挣扎，是中国的巨大潜力与其地基中的裂缝之间的较量。美国只是这出大戏中的配角。中国，无论结局好坏，正在编写它自己的故事。

环球中心现在被宽阔的道路和高大的建筑环绕。但在过去很多年里，它所在的土地是50多岁、身材壮实的黄芬玉以及裕民村几千名村民的田地。他们中的许多人都过着时间仿佛停滞的乡村生活，春天播种稻米，秋天收获绿色的稻秸。

2005年，这种节奏戛然而止。成都官员命令裕民村村民搬迁到车程不远的高层住宅内。政府为每个人提供了35平方米的建筑面积和近8000元（相当于两年的收入）。往昔生活最后的痕迹——狭窄的小道、稻田、廉价的平房——也被抹去，裕民村改名为GX92（211/252），成了成都南部的一个占地80公顷的地块。2008年9月，它以4.8亿元的价格卖给了邓鸿的公司会展旅游集团。

黄芬玉现在在附近一家银行看门。她知道自己收到的补偿微不足道。有一次她去环球中心吃晚饭，花了她两天的工资。“我心疼。”她说。即便如此，她并不愤恨。她的新家有更好的上下水和更坚固的墙壁。她说，经济好了，对年轻人有好处。这种静默的乐观主义在现代中国依然很典型。虽然距离她住的地方将近五公里远，但环球中心是如此之大，晚上的霓虹灯勾勒出它波浪形的屋顶，看起来就像在街的那头。

裕民村的改造——将农田变成建筑工地——已被复制到全中国。它为经济何以增长如此迅速提供了最基本的答案。政府在官方叙事中将其“改革开

放”时期追溯到1978年。不过，在最初的15年里，进展并不平衡。中央计划逐渐松绑后，中国人民展现出了企业家的风采。但是，共产党内部在如何建设急需的道路、房屋和工厂这一关键问题上存在分歧——用经济学家的术语来说就是如何积累促进增长的物质资本。

直到90年代，中国才确定了一种模式，这种模式的很多方面一直持续到今天。它开始根据地方经济的增速来评估地方官员。官员继而竞相招商，为企业提供廉价土地、减税和低成本劳动力。中国把官僚机构变得更像是一家渴望扩张的大型创业公司，这取得了惊人的成果。1990年时中国占全球经济的4%，现在接近18%。

这个模型背后有三个因素支撑。每个因素都可以在环球中心的起源中找到。第一个是土地。土地都是公家的。这为地方官员提供了可供处置的宝贵资产。他们可以提供廉价的长期租金来吸引企业，或把大型租赁权出售给开发商。只要增长持续，这是很合理的经济逻辑。开发商买地是认为（大多数时候是对的）他们能把自己盖的楼卖出去。对于地方政府来说这是个财源。四川省的土地销售收入几乎与税收持平。

中国经济的第二个特征是裙带关系。据官方媒体报道，邓鸿在2008年以极低的折扣价买下了这块地。据传市政府原本给这笔交易加上了严格的条件。他应该是要建造一个艺术中心和一个景观公园的。商厦写字楼倒不在计划里。然而今天这块地上唯一的建筑就是环球中心。

官员们肯定早知道了。市政府就在街对面。当时成都市委书记是李春城，但当地人叫他“李拆城”。邓鸿和他走得很近：李书记想把一个亲戚的遗体迁到某处风水更好的地点，邓鸿做了安排。

2013年习近平上台后不久，李春城的命运急转直下。他因涉嫌在建设工程中受贿被判入狱，是因习近平反腐运动下台的数十名当地高官之一。邓鸿被拘留，但从未被公开指控。官方的说法是他被要求“协助调查”。这是一种帮助共产党抓住大鱼的委婉说法。

不过，李春城的垮台让我们看到了政府与企业之间错综复杂的关系。地方

官员可以派发合同来换取利益，例如支付孩子在海外留学的学费或为亲戚买房。然后那些在其他国家几乎不可想象的项目就会一路绿灯。

中国模式的第三个特征是债务（见图表）。邓鸿2008年买下这块地时，国家正进入一段狂热的增长期。由于担心全球金融危机的拖累，北京启动了庞大的经济刺激。地方官员大举借债，并征用大片土地用于开发。建筑热潮随之而来。

环球中心是这一时期遍布中国的许多项目之一。有些项目是有用的，例如中国的高铁网络。其他则效果欠佳：很多城市建造了大型未来派小区，但仍在努力吸引居民。中国的债务总额从2008年约占GDP的150%飙升至今天的250%以上。在世界其他地方，从十年前席卷西方的银行业危机，到20世纪90年代日本的停滞，这种程度的快速增长预示了金融困境。

然而令人惊讶的是，中国经济体系的这三大因素一直到近期都还很有用。政府对土地的控制给了它撬动投资的杠杆。香港中文大学的经济学家宋铮表示，土地还在治理中扮演了被外界忽视的角色。在一个缺乏问责的大国里，它成为了一种约束工具。为了提高土地的价值，官员们不得不投资从高速公路到电网的各种基础设施。如果他们不这样做，将来土地就会更难卖。

许多经济学家还认为腐败是一种润滑剂，虽然这有点违背直觉。从毛泽东时代开始，一点点贿赂让官员们有动力去做支持增长所需要的东西，无论是出售国有资产还是吸引企业投资。

债务也帮了大忙。在某种程度上，借贷的增加表明金融体系运作良好，将储蓄转化成了投资。基本上所有发达经济体的债务水平至少和中国一样高，尽管大多数都是在较长的时期里慢慢积累起来的。

现在的挑战是要转向另一种经济模式，因为这三个因素都已达到自身极限。土地资源是有限的，而政府征用已经超出市场需求。成都西南财经大学的甘犁估计，空置房屋达6500万套，占城市住房存量的21%。腐败已达

到腐蚀性水平。所有债务带来的脆弱性开始显现。2018年，公司债券违约达到180亿美元，是之前年度纪录的三倍多。

但是，转到一条新道上并非易事。地方政府无法轻易找到像土地那样丰富的收入来源。反贪运动削弱了官员的干劲，腐烂的体制却完好无损。控制债务的努力也损害了经济增长，迫使监管机构在近几个月又放松管制。中国的问题很容易诊断，但治疗是痛苦的，而且它更像慢性病而非急症。因此，官员并不想咽下苦药，而是寄望时间能够疗伤。但中国的病症很可能变得愈发难治。

如果环球中心的建设带来的启示让人沮丧，那就进去待一阵子缓缓吧。在这里，中国美好的商业前景几乎触手可及。走进主入口，游客会进入一个又大又深的中庭，混合了高端风格与露天市场的气氛。光滑的大理石地板两侧是长长的金色镶边自动扶梯。左边是一个大型商场，右边是另一个。正前方是水上乐园，上方是发出刺眼光芒的超长LED屏幕，放映着海边的场景。

水上乐园的主要景点是一个冲浪池（如图），它能产生巨大的人造海浪。夏天时这里非常喧闹。几百人在这里做弄潮儿，许多人把手机装在塑料密封袋里挂在脖子上。穿着比基尼的舞者走向高空平台时，节奏强劲的音乐以最大音量奏响。

张盟（音译），一位父亲，坐在水边的美食广场里，肚子垂到泳裤上。他4岁的儿子正从甜点盘子上舔巧克力酱。在一家媒体公司做广告销售的张先生有些闲钱，但远非富裕。当水上乐园推出700元的成人年卡时，他迫不及待地买了。夏天时他每个月带妻儿来两次。逛商场、游泳、吃辣饺子。“我们很喜欢这个环境。”他说。稍微眯起眼睛，你仿佛置身于上世纪50年代的康尼岛（Coney Island）或布莱克浦（Blackpool），除了多了拱形玻璃屋顶下的一些数字化特征。

这一场景凸显了人们期待已久的中国消费主义的兴起。人们常说中国经济不平衡。投资占了GDP的近一半，这一水平是发达经济体的两倍多。与此

同时，消费占GDP的三分之一左右，仅为发达经济体的一半。然而，简单地强调这两个比率错过了一些重要的东西，专注中国的研究公司龙洲经讯的创始人亚瑟·克罗伯（Arthur Kroeber）认为。消费占中国的GDP比例如此之低并不是因为人们远离商店，而是因为投资异常庞大。

从另一个角度来看，中国的消费已经在蓬勃发展。从1990年到2017年，通货膨胀调整后的人均消费支出增长了近八倍，是印度增长的两倍多。中国是世界上乘用车、智能手机、奢侈品和啤酒的最大市场。这并不是一个购物欲望受压抑的国家。

因此，迫切需要关注的问题并不是中国能否实现侧重消费的再平衡，而是它的支出热潮能否持续。最近几个月，关于中国可能会削减消费的文章大量涌现，但用到的至多是一些零星的证据。2018年汽车销量骤降，但部分原因是税收优惠取消。定义更广泛的零售销售依然强劲。

中国的消费者当然也无法抵抗万有引力。如果经济陷入衰退，家庭消费能力将不可避免地受到影响。然而，也有理由认为，假如不出现这种情况，中国的消费将很顽强。

大趋势对它有利。在过去的几年里，劳动力开始萎缩，这推高了工资。低端工厂正在向国外迁移。就消费而言，这是纯粹的积极因素。如果工人赚得更多，他们也能花得更多。2010年环球中心建设全面展开时，家庭消费占GDP的比重触底，为36%。今年它有望达到40%。

城市的收入水平已经达到人均5000美元左右，这在其他国家已是非必需品消费大增的水平。环球中心建在深处内陆的成都，这个事实更说明了这一趋势的强劲。这里不如沿海地区富裕，但仍然出现了繁荣的大型枢纽。成都经济在过去十年中翻了两番。

对中国中产阶级的规模估计从1亿到6亿人不等，具体取决于测量方式。具体的数字并不重要。重要的是走向。消费者数量注定只会增长。即使在电子商务时代，人们也纷纷涌向环球中心等实体商场。除了商场通常都会有

的服装店和珠宝店外，这里还有幼儿游乐中心、虚拟现实游戏厅和角色扮演咖啡馆。工作日晚上，顶层的餐厅外还要排起长队。

但中国作为消费社会的崛起也有其阴暗面：不断扩大的不平等。经历快速增长的国家大多会出现财富差距拉大。在中国，这种自然倾向由于国家控制人们在哪里生活而进一步加剧。在上世纪90年代末房产私有化时，政府为城市居民提供了住房。农村里的人没有这样的好运。此外，户籍制度使得农村人口难以在城市定居。他们被禁止从事某些工作，他们的子女也处在教育系统的边缘。

后毛泽东时代开始时，中国人贫穷但平等。收入差距从上世纪90年代开始急剧上升。如今中国是世界上最不平等的国家之一，最富有的1%人群拥有所有家庭资产的三分之一。中国的亿万富翁多于美国，尽管人均收入只有后者的五分之一。对于那些处于中国收入底层的人来说，攀登收入阶梯一直是一种动力，但它变得越来越难。

杨凡姬（化名）和她的家人在环球中心附近一条尘土飞扬的街道上经营一家餐馆。他们每天向环球中心的办公室员工送出约80份外卖。杨女士曾经在沿海的一家电子器件厂工作，在那她可以挣得更高的工资。但她回到了距离家乡只有四个小时的成都，这样她可以和八岁的儿子生活在一起。她托了些关系把他送进了当地的学校。但由于工资低而生活成本高，她存不下多少钱，这让她成为庞大而看似永恒的城市底层的一员。

事实上，如果中国真的想减少不平等，它可以为像杨女士这样的人做很多事情。首先，它可以让出生在农村地区的人更容易搬到城市。在过去十年中，它建立了一个社会保障体系，几乎为所有公民提供医疗保险和养老金，但支付的款项十分微薄。随着老龄化加速，负担只会增加。

税制改革也会有所帮助。政府不对富人的投资收益和财产征税，而这是发达经济体的基本收入来源。官员似乎更怕激怒富裕的城里人，而不怕忽视贫穷的农民。

在2017年的一篇颇具争议性的文章中，加州大学圣地亚哥分校的经济学家

巴里·诺顿（Barry Naughton）质疑中国是否是一个社会主义国家。他谨慎地说，在某些方面，是的——中国政府可以实施的控制要比在资本主义制度中常见的多得多。但在政府用这种权力做什么的关键问题上，他得出结论称中国显然不是社会主义。再分配政策是最显眼的失败。

在环球中心的水上乐园里戏水或在餐厅里挥霍的人数还会继续增加。但另一部分人群，那些从商场外向里张望的人，那些在为这里的员工服务了漫长的一天后洗碗到深夜的人，他们的地位看起来同样牢不可破。这不是一幅幸福的画面。

每个工作日上午九点前，距商店开门尚早，已有大批人抵达环球中心。他们是在楼上办公室里工作的三万人。这里共进驻了1800家公司，它们来自各行各业，几乎可算是中国企业界的一个横截面。

有些公司就是硅谷的那类企业，比如“活动家”。它的主要产品是一款会议信息查询和票务应用。创始人王晴穿着滑板鞋和短裤，对令中国科技创业者头痛的问题十分坦率，让人耳目一新。他说，人们太急功近利了。“投资方的心态是，今天我给你10块钱，明天你就得还我11块。”

另一些公司是迥然不同的类型。在全兴律师事务所，付少杰谈到中国在法治建设上的进展。但他相信这里的法律为共产党服务，而不是反过来。“我们正把制度变得更民主。”他说，并解释说这意味着他的事务所和政府合作，以阻止纠纷闹到法院。他的等候室里摆放着一本书，是国家主席习近平的思想集锦。

中国当然不是一个完全自由的市场。不过自毛时代以来它已发生巨大的变化。从不同的角度去看，它的经济结构会呈现出完全不同的面貌。中国有一个欣欣向荣的私营部门，这对其经济成功至关重要。上世纪90年代，政府关闭了成千上万家亏损的国有企业，国有部门的雇佣人数骤跌。私营部门不只是填上了这个缺口。今天官员们惯用一个粗略的“56789”的说法来描述私营部门的重要性：它贡献了税收的50%、GDP的60%、创新的70%、就业的80%，占到企业总数的90%。传达出的信息很明确：如果没

有私营企业，中国不可能取得今天的成就。

在许多行业里，中国企业家面对的竞争要比西方同行所面对的更为惨烈。拿房地产来说，美国最大的十家开发商占到美国房地产销售额的30%，而中国的这个比例在15%左右。争相进入新兴产业的赛跑可能是白热化的。中国已有1000多家机器人公司。

但与此同时，政府似乎无处不在。中国有15万家国企。由于它们可以优先获得银行贷款，它们占到了公司债务的70%。而从金融到航运的众多行业中，政府的目标都是它所说的“绝对控制力”，要限制竞争并阻拦新进者。当中国经济的优先事项是提高生产率时，这对中国是危险的。国企的效率要低得多。它们的资产回报率还不到私营同业的一半（见图表）。

中国企业的这两个部分通常被描述成彼此独立，仿佛有胆魄的私营部门正在与笨拙的国有对手作战似的。而事实上它们是紧密交织的。私营企业面临的挑战主要不在于如何和国有企业竞争，而在于如何与之共存。总部设在环球中心的水监测公司万江港利因为政府的治污目标而蓬勃发展。“在这个体制里，如果领导看重某个问题，那它就非常高效。”总经理贺新说。但与此同时这种影响力又带来了麻烦。要拿到合同，他的公司必须与国有企业合作，后者没什么技术，政治影响力却很大。

人们担心的是这种业已脆弱的共存关系正在瓦解。十年前，政府向国有企业提供了大量现金，帮助经济捱过全球危机，这引发了对“国进民退”（意指国有部门前进而私营部门后撤）的不满声音。一开始“退”字可能是夸大其词，但私营部门无疑不再前进——它在投资和工业产出中所占份额均停止了增长。

现在，在习近平的领导下，它看起来更像全线撤退了。在他于2013年上任之前的三年里，私营企业拿到了所有银行贷款的一半左右。国企只拿到三分之一。但据彼得森国际经济研究所（Peterson Institute for International Economics）的尼古拉斯·拉迪（Nicholas Lardy）说，接下来的三年里，超过70%的贷款流向了国企。官方的口吻也发生了变化。共产党坚持要求

包括外国跨国公司在内的私营企业建立党组织。一家汽车零部件公司的外国经理表示，去年公司裁员时，他不得不与公司的党委书记讨论“社会稳定”问题。那是一种警告。

一些观察家原本以为习近平会把中国带向相反的方向。他起初承诺市场力量将在经济中发挥“决定性作用”。但他也发誓要发展壮大国有企业。后一项保证更有效力。过去五年里，政府已经合并了钢厂、化工企业和铁路机车厂商，以求它们变得更强。它敦促私营企业投资于国企以提高国企的效率。国有电信巨头中国联通已获得三大私营互联网公司——阿里巴巴、百度和腾讯——入股。

这可能会削弱私营部门锋利的势头。通常，企业在扩张后获得更高的回报，收获规模效应。在中国，情况却正相反，调研公司资本经济学（Capital Economics）的马克·威廉姆斯（Mark Williams）说。他的假设是大企业会引来更多的官方关注。政治干预损害了它们。

去年，网上一位不知名的博主发表文章说，私营部门已经完成了让国家富起来的“历史任务”，现在是时候逐渐退出舞台了。这篇文章被疯狂转发，倒不是因为人们认同它所说的，而是因为其中装载着他们的恐惧。自那以后，官员们努力向企业保证国家仍然需要它们。习近平发誓政府对它们的支持“毫不动摇”。但这样的声明作用有限。只要政府仍然决意做大国有企业，私营企业就不会拥有公平的竞争环境。

即使当官员们制订出明智的政策时，这种不平衡也会把他们拽离正轨。一个令人沮丧的案例是他们化解金融危险的努力。他们严打影子银行这个监管宽松的领域，包括银行的表外账目和为富人提供的投资工具等林林总总的问题。P2P贷款属于其中风险极高的一类。设在环球中心内的P2P公司“众可贷”的创始人吴进军用布道般的热忱描述自己的工作。他说，P2P贷款平台是服务那些被银行冷落的小借贷者的。

但许多P2P公司要么涉嫌欺诈，要么管理不善。在存在过的4000家公司中有三分之二倒闭了。对众可贷而言，维持经营并非易事。它为投资者提供

极高的年回报率：14%。很少有公司能维持这种水平的回报率。在它的网站上有一栏变化的数字以一种令人不安的精确度测量着自己运营的时限：四年三个月零三天。吴进军眼下担心的是央行迟来的决定：审查所有P2P平台，关停那些不符合其标准的。

要恢复金融体系的秩序的想法是正确。但在这么做的过程中，政府在无意中扼杀了私营部门。影子贷款的绝大多数都流向私营企业。银行喜欢放贷给有政府做隐性担保的国有企业，尤其在经济放缓时。它们并非出于意识形态方面的原因而偏袒国企，而是因为如果想要拿回借出去的钱外加利息的话，这是最有把握的选择。

即便是西方的投资者也被这样的诱因所左右。近日，一个欧洲大型基金的经理与中国一家银行会面，询问一项要求向小企业提供更多贷款的监管令。这位基金经理担心它会迫使这家银行承担过大的风险。不用担心，这家银行的高管承诺说，银行会把大型国企的子公司重新分类，归为较小实体。这样就可以满足监管部门的要求而又不会危及自己的贷款组合。在一个受国家重度影响的系统里，这是一个自然而然的结果。

环球中心里的乐天卖场是来自韩国的一家高端百货商店，通常它都会想要更多顾客光临。但2017年3月7日那天，它却想求个清静。尽管春寒料峭，商店门口的广场上聚集了几十个人。他们挥舞着中国国旗，放起国歌，拉开横幅。其中一条横幅写着：“我们绝不容许危害祖国安全的行为！”对于那些更习惯于卖面霜的乐天员工来说，这不是寻常的一天。

事情的导火索是韩国决定在其国土上安装一个美国反导弹系统以抵御朝鲜的袭击威胁。中国认为自己才是真正的目标。官方媒体猛烈抨击韩国，特别是乐天，因为它向政府转让了自己旗下的土地以部署反导弹系统。乐天在中国各地设有100多家门店，有多处发生了抗议活动。

环球中心坐落于中国内陆1000多公里处，似乎远离世界其他地方。但围绕中国经济崛起而来的全球紧张局势却在它的走廊中引发回响。抗议乐天的活动是中国利用自己最大的优势——巨大的市场——来威吓他方屈从的一

个粗糙的例子。实际上，这是一系列负载政治意义的抗议或抵制行动中最新的一次。挪威、菲律宾、日本和台湾都已经领受过。

中国利用这种民族主义情绪的爆发（受官方媒体煽动）来惩罚冒犯自己的国家。商业上的压力难以忍受。最终韩国向中国保证不会再进一步部署美国国防系统。但对乐天来说这为时已晚。它在中国的业务没能缓过来。它已经出售了几十家门店，且据报道正在考虑出售其余的门店，包括环球中心的这一家。

对于中国运用自身的市场影响力还有一个更大的担忧：它以此迫使企业交出自己的技术。这是美中贸易战背后核心的不满之一。美国和欧洲的商会估计，自己五分之一的成员都遭遇了这样的要求，在高科技领域则多达五分之二。

中国于2001年加入世贸组织时，曾承诺不再要求企业转让技术作为进入其市场的条件。投诉中国的难点在于，它总体上遵守了对世贸的字面承诺。它使用的方法更隐蔽微妙。从汽车制造到云计算，外国公司需要有本地合作伙伴才能在中国运营。监管机构还可以用产品测试和批准程序来迫使它们披露知识产权。这些政策的一个心照不宣的目标就是让中国企业拿到外国技术。但在受到质疑时，中国常常都会回应说这是自愿达成的商业协议。

更露骨的做法是直接公然地窃取知识产权。位于环球中心商场顶层的IMAX影厅就是中国企业可以肆无忌惮到何种地步的一个标志。中国有600块这样的IMAX屏幕，这里是IMAX全球最大的市场，却也是最麻烦的市场之一。2014年，IMAX在加拿大一场官司中胜诉。法庭裁定其前雇员盖里·崔（Gary Tsui）抄袭了公司的3D技术并在中国创办竞争性业务，须赔偿700万美元。

这是一场有限的胜利。盖里·崔目前仍活跃在中国，以他的中文本名崔晓宇提交专利。他目前担任一家国有企业下属中影数字巨幕公司（China Film Digital Giant Screen，简称CGS）的总工程师。难怪外国公司有时会

觉得自己不是在和商业对手竞争，而是和一国政府较量。2015年，在距环球中心不远的成都市区，CGS揭开了第100块巨幕。它现在已建成了300多块。

无从得知中国究竟窃取了多少。美国政府估计自己的企业每年被外国人窃取的知识产权价值达6000亿美元，而中国是其中的罪魁祸首。不过，与任何争议中的索赔方一样，它有理由夸大损失。

中国不是第一个窃取知识产权或要求转让技术的国家。巴西、印度和墨西哥坚持在各种各样的行业里建立合资企业。但中国的重要性不同寻常。比如说，如果马来西亚或阿根廷的操作看起来不合理，外国公司可以选择离开。放弃中国更难。

所以真正的问题是中国能否逃脱惩罚。正是在这一点上，特朗普的强硬路线才最值得关注。从经济角度来看，美国加征关税不合情理——这把老式的大口径火铳打击的不只是中国，还有美国自己的经济增长。但是，与过去更温和细致的谈判策略不同，它们真正提起了中国的注意。

贸易战的冲击波已经抵达环球中心。在国际航运公司安邦物流的办公室里，员工们正忙着安排货物进出成都。副总裁李静（音译）对贸易战的影响直言不讳。你很少会在中国的官方媒体上听到这种观点。“我们是做出口的，所以我们直接感受到疼痛。”她说。

关税引发了重大的连锁反应。她的公司对电子产品收费更高，以此补贴运送更笨重的产品的成本。但由于中国的电子产品现在面临美国的关税，其他商品的运输成本已经上升。李静预计2019年的状况还会更糟。除非中美达成某种协议。中国已经放宽了对外国汽车制造商和银行的部分合资要求。

不过，中国带来的威胁也很容易被夸大。你可能会把中国描绘成一个高效、具商业头脑、战略巧妙、能随心所欲地从外国公司那里拿到技术的政府，但这并不怎么符合现实。政策往往比外界看起来更加混乱。

以合资企业为例。也许最值得注意的事实是它们很少奏效。尽管拥有一系列航空合作伙伴关系，但经过多年努力以后，中国仍未能打造出一架体面的客机。一位前工业部长曾发表过一个著名的言论，把汽车合资企业比作鸦片：中国企业为了逐利而吸鸦片上瘾，自己却未曾创造出什么价值。即便是剽窃带来的好处也不过尔尔。例如，IMAX认为其前员工窃取的3D技术现在已经过时，其中国竞争对手没能跟上它最新的技术进步。

中国在建设一流的港口、高速公路和铁路方面表现优异。但推动创新这件事难度更大。比如，中国企业提交的专利并不全然像它们看上去那样光鲜。在环球中心，生产指纹读取器的方程式电子有限公司在办公室墙上展示了数十份专利证书，但其中超过半数都只是微小的改进。中国每年生成的专利总数超过美国、欧洲和日本的总和，但其中只有不到四分之一是名副其实的发明，而国内专利很少在国外受认可（见图表）。

政府补贴本身也有不足。设在环球中心的教育技术公司双扬科技曾经拿到一套位于郊外工业园区的免租金办公室。但这种支持对于知识型产业不像对制造商那么有用。六个月后，年轻的创始人罗赛又把办公室搬回了环球中心，好离自己的商业伙伴们近一些。安邦物流的李静对中国的大型海外投资计划“一带一路”倡议持有疑议。到目前为止，中国西部和欧洲之间的铁路连接是一项重大成就，这条货运路线越来越受欢迎。但假如没有政府补贴，她估计火车运输成本会飙升，出口商又会掉回头去走水路。

这并不是说中国正在败下阵来。以增长或创新来衡量，它超越了大多数同等收入水平国家。但它还有很长的路要走。尽管它发展先进产业的计划名叫“中国制造2025”，这在美国引发了极大的关注，但制订这项计划的官员认为中国要到2049年才能与外国的先进技术相抗衡。对于那些被窃取了技术的公司，这一点于事无补。但它提示了中国所处的位置——它的崛起还需要几十年而非几年。

贸易战的吊诡之处就在于，美国提出的许多要求实则会推动中国的崛起。开放更多行业引入竞争将提升私营部门及生产率。削减政府补贴将缓解公

共财政压力，抑制过量生产。加强知识产权保护将刺激创新。

但这最终是中国自己的决定。一个大亨在偏远的内陆地区建造了全球最大的建筑，而他的建筑已经被令人眼花缭乱的各种企业填满。从中我们可以看出一个基本事实：这个经济体的命运是在国内书写的。决定中国成败的并非来自外部的压力，而是它自己的决定。

方向还远不明确。在邓鸿陷入法律纠纷后不久，他开始出售自己的资产，包括环球中心。当地一位基金经理看了账目后表示维护费用过高而回报太低。不过还是来了一位买家：云南城投集团，一家国有企业。

这笔交易引发了危险信号。云南城投的财务状况并不稳定。它回报微薄，债务比收益高出十倍不止。该集团本应专心在云南这个中国最贫困的省份之一搞基建，而不是到别处抢购房产。这个案例显现了国有企业如何经常性地挥霍资本，给国家带来的是损害而非帮助。

同时，作为交易的一部分，邓鸿回来了。他为云南城投工作，任务是帮助他的那些建筑——包括环球中心——取得成功。环球中心开业刚过五年之际，他有理由感到自豪。已有数以百万计的人到访这里。

但他仍面临挑战。要保留他在这些项目中的股权，他承诺要在2018年到2020年间创造近10亿美元的利润，是之前三年的十倍——一个几乎不可能达成的任务。各种问题也已开始显现。水上乐园如今有长达半年是关闭的，因为冬天访客稀少，运营太过烧钱。200部电梯中有一些门已经坏了。雨水渗透了天花板。这是环球中心对中国经济的另一种映射。从远处看，它熠熠生辉。走近了看，它显出凋敝破败来，亟需翻新。■



Schumpeter

The end of the affair

How to prevent business break-ups—or end them amicably

IT HAS BEEN a week of romantic second-chances in the business world. On March 11th Barrick Gold, the world's most valuable gold producer, said it would no longer pursue its \$17.8bn hostile quest for Newmont Mining, its nearest rival. Instead both parties agreed to form a joint venture (JV) to create the world's largest gold-mining site, in north-eastern Nevada. The tie-up cemented the view that the state is the easiest place to get hitched in America.

A day later in Japan, the partners in what had become the business world's most spectacular falling-out announced a "new start" to their ménage-à-trois. Renault, Nissan and Mitsubishi launched a "consensus-based" board to replace the command-and-control structure imposed by Carlos Ghosn, who chaired all three companies until his arrest in Japan on charges of financial misconduct (which he denies). The aim is to rekindle the romance that began when Renault first rescued Nissan from near-bankruptcy in 1999.

Such JVs and strategic alliances, however schmaltzy, receive too little attention as business entities. They lack the swashbuckling allure of mergers and acquisitions (M&A). Investment bankers shun them because they generate few fees. Yet they are indispensable. They enable businesses to collaborate without entering the touchy terrain of changing who controls them. The RenaultNissan-Mitsubishi alliance is a car-producing powerhouse. But it is also a textbook example of why such structures often go wrong.

JVs and strategic alliances are structured differently but share some

characteristics. As PwC, an accountancy firm, describes it, a JV enables companies to pool resources in a separate business entity, like the Nevada gold company. An alliance is looser; it allows firms to share production platforms, for instance, which lets them preserve more autonomy, as in the car industry. In an era of globalisation, blurred lines between industries and technological disruption, such ad hoc relationships become more important. Firms want to keep their options open, rather than undergoing the Herculean task of buying and integrating a firm that may not provide the answers to the challenges of the age. By some estimates, the value of JVs and alliances is growing even faster than M&A.

The partnerships share some overlapping motivations. The most common is to enable cross-border transactions. In some countries (like China) and some industries (like airlines), they have been a key way to enter new markets. Call these long-distance relationships. A second is access to new products and technologies; pharmaceutical firms forming partnerships with biotech companies, for example. In other words, friends with benefits. The most traditional rationale is cost-savings, which underpins Barrick-Newmont's JV. This is a bit like civil unions: closely akin to marriage, but not quite. The most modern motivation is to avoid the threat of strategic disruption. In the car industry, for instance, electrification and autonomous driving are forcing companies to pool ideas. A study by the Boston Consulting Group says that a typical European carmaker has more than 30 partners across five different industries in a handful of countries. Call this constructive promiscuity: sleeping around to gain experience.

While hookups may be easier to pull off than a full-scale merger, they often end in tears. According to Water Street Partners, a consultancy, only around half succeed. Common reasons why they go wrong include partners' changing strategic objectives, new executives finding them tedious, and culture clashes. Under Mr Ghosn, the Renault-Nissan-Mitsubishi alliance eventually came to exemplify many of their worst traits. It and other tie-ups

could do with a corporate equivalent of a “prenup” clause—a legal contract stating how to terminate the relationship when the passion runs out.

The Franco-Japanese fling started out well, with a clear, limited aim: Mr Ghosn was parachuted in by Renault to rescue Nissan. Then the focus turned to preserving each firm’s independence and sharing costs such as purchasing. Though there were cross-shareholdings, their main objective was not control.

But as often happens in partnerships, control eventually became a problem. Mr Ghosn began to consider a full-scale merger, on terms the Japanese executives feared would be unequal—even though Nissan had become the stronger partner. The alliance had no governance structures in place for dealing with such questions; it was shaped largely by the force of Mr Ghosn’s personality. That may be why things only came to a head when the police arrested him in Tokyo last November.

It is a credit to the alliance that it has, at least for now, survived the bedroom brawl. On March 12th Jean-Dominique Senard, Renault’s chairman, took the helm of a new four-man board, that includes the bosses of the three car companies, and which aims to replace the patriarchal Mr Ghosn. To further mollify the Japanese, Mr Senard is likely to be vice-chairman of Nissan, not chairman.

Some of the Ghosn-era shortcomings remain, however. Strategic objectives are still ill-defined. The questions of ownership continue to be taboo, even as the alliance moves further to combine operations. There are no rules for resolving disputes; Mr Senard said only that he would use his diplomatic skills if they arose. The potential for clashes persists (as Japanese journalists noted, Renault provides two of the alliance’s board members, Nissan and Mitsubishi one each). And there is no hint of a prenup.

If partnerships want to adapt to new circumstances, taking evolving strategies and strong personalities in their stride, they should do what Renault-Nissan-Mitsubishi has failed to and establish clear rules of engagement—and disengagement, just as banks now have “living wills” to wind them down if disaster strikes. JVs and alliances are tricky to manage for a reason. The more successful they become, the more the question of control that they were set up to avoid will rear its ugly head. ■



熊彼特

缘分到头

商业联盟如何避免关系破裂——或者该怎么和平分手

近些天，商界不乏“再续前缘”的浪漫戏码。本月11日，全球市值最高的黄金生产商巴里克黄金公司（Barrick Gold）表示，将不再推进对其头号竞争对手纽蒙特矿业公司（Newmont Mining）价值178亿美元的恶意收购计划。相反，双方同意组建一家合资企业，在内华达州东北部打造全球最大的金矿。这项合作印证了一种说法——内华达是全美国结婚最方便的地方。

一天后，在日本，原本闹出商界最大失和事件的各方宣布启动三角关系“新起点”。雷诺、日产和三菱成立了一个“基于共识”的董事会，取代了卡洛斯·戈恩（Carlos Ghosn）施行的管控体系。戈恩之前兼任三家公司的董事长，直至因涉嫌财务违规在日本被捕（但他否认有罪）。此番调整的目标是要重燃始于1999年的旧情，那一年雷诺首次将日产从破产边缘解救出来。

如此组建的合资企业和战略联盟不管有多煽情，获得的关注都很少。它们缺乏并购的那种惊心动魄。投资银行家绕道而行，因为他们能从中收取的费用太少。但这样的交易不可或缺。它们让企业无需触及敏感的更换控制权问题就能建立协作。雷诺-日产-三菱联盟是一个强大的汽车生产集团，却也是示例说明这类结构为何往往会出现问题的教科书式典型。

合资企业和战略联盟虽然结构不同，但仍有一些共通之处。正如会计师事务所普华永道所说的，合资企业能把多家公司的资源集中到一个独立的商业实体中，就像内华达州的黄金公司那样。企业联盟在结构上更松散。比如，联盟的成员企业可以共享生产平台，从而保留更大的自主权，正如在汽车行业所见的那样。在一个全球化、行业间界限模糊、科技破旧立新的时代，企业联盟这类临时关系就变得更加重要。企业希望保留选择权，而

不想经历并购或是整合这种可能无法应对时代挑战的艰巨任务。据一些估计，合资企业和商业联盟的价值增长速度甚至超越了并购。

这类伙伴关系有一些共同的动机。最常见的是方便跨境交易。在一些国家（如中国）和一些行业（如航空业），这是打入新市场的主要途径。不妨称之为“异地恋”。第二常见的是为获取新产品和技术，例如制药公司与生物技术公司建立的合作。这可以叫做“床伴”关系。最传统的理由是为节省成本，巴里克-纽蒙特的合资就是出于这个原因。这有点像“民事结合”：非常近似于婚姻，又不完全是。最现代的动机是避免战略性颠覆的威胁。例如在汽车行业，电气化和自动驾驶正迫使汽车厂商联手谋划应对之计。波士顿咨询集团的研究表明，一般而言，一家欧洲汽车制造商拥有30多个分布在多个国家的五个不同行业里的合作伙伴。可称之为“建设性滥交”：为增长经验而到处留情。

虽然这类短暂随意的“勾搭”也许比全面合并更易实现，但也常常以眼泪收场。据咨询公司Water Street Partners称，这类合作的成功率只有约50%。失败往往是因为合作伙伴改变战略目标，或新主管认为这种关系索然无味，还有就是文化冲突。在戈恩的领导下，雷诺-日产-三菱联盟最终成为一个典型，体现了这种关系的诸多最糟糕的特征。该联盟及其他类似的合作关系可以订立“婚前协议”的企业版本，明确在激情褪去时如何终止关系。

雷诺-日产-三菱这段法日情缘一开始是好的，目标清晰而有限度：雷诺空降戈恩来拯救日产。之后，工作的焦点转向保持各家公司的独立性并分担采购等方面的成本。虽然存在交叉持股，但各方的主要目标不在于争夺控制权。

但正如婚恋关系中常见的那样，控制权最终还是成为了问题。戈恩开始考虑全面合并，而尽管日产已成为较强大一方，日方高管仍担心合并条款会不平等。该联盟并无适当的治理结构来处理这类问题，因为它主要是由戈恩个人的人格力量塑造的。也许正因如此，警方去年11月在东京逮捕他时，联盟才突然走到了紧急关头。

所幸该联盟总算是床头吵架床尾和，至少目前如此。12日，雷诺集团董事长让-多米尼克·塞纳德（Jean-Dominique Senard）执掌全新的四人董事会。该董事会由三家汽车公司的老板组成，取代以往专权的戈恩。为进一步安抚日本人，塞纳德很可能只担任日产的副董事长，而非董事长。

然而，戈恩时代的一些弊端仍然存在。战略目标依旧不明确。即使联盟进一步趋于整合运营，所有权问题仍是个禁忌。解决纠纷仍无章可依。塞纳德只是表示，如出现纠纷，他会运用自己的圆熟手腕来解决。发生冲突的可能性依旧存在（正如日本记者指出的，雷诺在董事会中占了两席，日产和三菱各占一席）。而且毫无订立“婚前协议”的迹象。

合作关系如果想适应新形势，从容应对战略变化和强势个人，就应该从雷诺-日产-三菱联盟的例子里汲取教训，能其所不能，制定明确的合作规则，以及分离方式——就像银行现在订立“生前遗嘱”明确在遭遇危机时如何有序倒闭那样。合资企业和联盟难以管理是有原因的。联盟发展越是成功，成立之初意图避免的控制权问题就越容易冒头。■



The Chinese economy

Package deal

A current-account deficit could remake China's financial system, if the government lets it

IN A CONTROL room at the headquarters of Ctrip, China's largest online travel agency, dozens of fluorescent lines flash every second across a big digital map of the world. Each line represents an international flight sold on Ctrip's platform. The top destinations on the morning of March 11th, when your correspondent visited, were Seoul, Bangkok and Manila. A live ranking for hotel reservations put Liverpool in first place among European cities, Merseyside's rough-hewn charms briefly trumping Venice and Barcelona (and apparently benefiting from a special offer).

In this century's first decade Chinese citizens averaged fewer than 30m trips abroad annually. Last year they made 150m, roughly one-quarter of which were booked via Ctrip. That is not just a boon for hotels and gift shops the world over. It is a factor behind a profound shift in the global financial system: the disappearance of China's current-account surplus.

As recently as 2007 that surplus equalled 10% of China's GDP, far above what economists normally regard as healthy. It epitomised what Ben Bernanke, then chairman of the Federal Reserve, called a "global saving glut", in which export powerhouses such as China earned cash from other countries and then did not spend it. China's giant surplus was the mirror image of America's deficit. It was the symbol of a world economy out of kilter.

No longer. Last year China's current-account surplus was just 0.4% of GDP. Analysts at Morgan Stanley predict that China could be in deficit in 2019—which would be the first annual gap since 1993—and for years to come. Others, such as the International Monetary Fund, forecast that China

will maintain a surplus, though only by the slimmest of margins. Either way, it would be a sign that the global economy is better balanced than a decade ago. It could also be an impetus for China to modernise its financial system.

The basic explanation for the change is that China is buying much more from abroad just as its exporters run into resistance (see chart). Its share of global exports peaked at 14% in 2015 and has since inched down. The trade war with America adds to the headwinds. At the same time, imports have soared. China's surplus in goods trade in 2018 was the lowest for five years.

The tale of trade in services, especially tourism, is even more striking. When Beijing hosted the Olympic games in 2008, foreign visitors splashed out a little more in China than Chinese did abroad. Since then the number of foreign arrivals in China has stagnated, while Chinese outbound trips have surged. Not only that: Chinese travellers have proved to be big spenders, as anyone who has queued for a VAT refund at London's Heathrow airport knows only too well. In 2018 China ran a \$240bn deficit in tourism, its biggest yet.

Some of the current-account fluctuations are cyclical. Chen Long of Gavekal Dragonomics, a research firm, notes that the price of oil and semiconductors, two of China's biggest imports, was high last year. If they come down, a current-account surplus could swell up again.

Yet deeper forces are also at work. At bottom, a country's current-account balance is simply the gap between its savings and its investment. China's investment rate has stayed at a lofty 40% or so of GDP. But its savings rate has fallen to about the same, from 50% of GDP a decade ago, as its people have learned to love opening their wallets (or rather, tapping their mobile payment apps). An ageing population should lead to a further drawdown of savings, because fewer workers will be supporting more retirees. The

disappearance of the surplus is, in this sense, a reflection of China growing richer and older.

There is, nevertheless, some concern about the implications. In emerging markets big current-account deficits can be a warning sign of financial instability, indicating that countries are living beyond their means and relying on fickle foreign investors to fund their spending. But China is in no such danger. Any deficit is expected to be small, as a fraction of GDP, in the coming years. What is more, the government still has a fat buffer of \$3trn in foreign-exchange reserves. That should buy it time.

The crucial question is how China uses this time. By definition any country that runs a current-account deficit needs to finance it with cash from abroad. In an economy with a wide-open capital account and a freely floating currency, inflows and outflows balance without the central bank giving it much thought. But in China the government keeps a tight grip on both its capital account and its exchange rate.

So now that it is facing the prospect of current-account deficits, it has little choice but to relax its grip, in order to bring in more foreign funding. It is moving in that direction. China has long controlled access to its capital markets by issuing strict quotas to foreign investors, with a preference for institutions such as pension funds. But in recent years it has opened more channels, notably through carefully managed links to the Hong Kong stock exchange.

These moves, though incremental, have been enough in aggregate to persuade compilers of leading stock and bond indices, important benchmarks for global investors, to bring Chinese assets into their fold. Last month MSCI said it would more than quadruple the weight of mainland-listed shares in its emerging-markets stocks index to 3.3%. Next month China will enter the Bloomberg Barclays bond index, which could fuel

roughly \$100bn of inflows into Chinese bonds within two years.

In a new book on China's bond market, the IMF argues that this could foster a virtuous cycle. More active investing in bonds would support the government's goal of using interest rates as a bigger weapon in its monetary-policy arsenal (instead of old-fashioned administrative guidance). With a more flexible exchange rate to boot, China would end up with a more modern, efficient financial system—proof that a current-account deficit can, handled well, be a welcome development.

But there are clear limits to how far China is willing to go. Efforts to lure in foreign investors have not been matched by moves to make it easier for its citizens to invest abroad. Yi Gang, the newish governor of the central bank, has repeatedly vowed to maintain the "basic stability" of the yuan. Louis Kuijs of Oxford Economics thinks the constraint is ultimately philosophical. The Chinese government is wary about ceding too much control to the market. "It implies a relatively slow opening up," he says.

Another element of China's approach to managing a deficit is therefore to stop it from getting too big in the first place. Guan Tao, a former central-bank official, says that China has to improve its competitiveness in services. With a better tourism industry, better universities and better hospitals, China would, he believes, attract more foreigners and keep more of its own spending at home.

Think of it as the second act for the Great Wall. It never much worked as a fortification for China: over the course of its two-plus millennia in existence, barbarian invaders repeatedly breached it. But now its role is to lure in tourist hordes. In this battle it has a better chance of success. ■



中国经济

一揽子计划

如果政府愿意，经常账户赤字可能会重塑中国的金融体系

在中国最大的在线旅行社携程的总部，一间控制室中的一幅大型数字世界地图上，每秒钟都有几十条荧光线闪过。每条线都代表携程平台售出了一张国际机票。3月11日上午，本刊记者造访了携程总部，当时显示的几大最热门目的地分别是首尔、曼谷和马尼拉。而在酒店预定实时排名中，利物浦位列欧洲城市榜首，暂时超越威尼斯和巴塞罗那。这既是默西塞德郡（Merseyside）粗犷的魅力使然，不过显然也得益于携程推出的特价线路。

本世纪头十年，中国公民出境游平均每年不到3000万人次。去年达到1.5亿人次，其中约四分之一是通过携程预订的。这不光给世界各地的旅馆和礼品店带去福祉，还是全球金融体系发生的一场深刻变迁背后的原因之一。这一变迁就是中国经常账户盈余的消失。

就在2007年，中国经常账户盈余还占其GDP的10%，远高于经济学家普遍认为的合理水平。时任美联储主席的本·伯南克口中的“全球储蓄过剩”指的正是这种情形——中国等出口大国从其他国家赚了钱却不花钱。中国经常账户的巨额盈余是美国经常账户赤字的镜像，是世界经济失衡的表现。

情况已经改变。去年，中国的经常账目盈余仅占GDP的0.4%。摩根士丹利的分析师预测，2019年中国可能将转为经常账户赤字，这将是自1993年以来的首个年度缺口，而在之后的多年里也将保持如此。国际货币基金组织等机构则预计，中国的经常账户将保持盈余，但数额微乎其微。不管怎样，这都表明全球经济相比十年前变得更加平衡。这也可能会是中国金融体系现代化的一个推动力。

产生这一变化的根本原因是，中国出口遭遇阻力之际，进口大幅增长（见图表）。2015年中国出口占全球的比例达到了14%的峰值，此后便开始逐

步小幅下滑。与美国的贸易战增大了出口的阻力。与此同时，进口却在猛增。2018年中国商品贸易顺差为五年来最低。

服务贸易更是引人注目，尤其旅游业。2008年北京举办奥运会时，外国游客在中国的消费还略高于中国人在境外的消费。此后，访华的外国游客数量陷于停滞，而中国的出境游人数大幅增长。不仅如此，中国游客出手阔绰，这一点每个在伦敦希思罗机场排队退税的人都再清楚不过了。2018年，中国旅游业出现迄今为止最大的逆差，达2400亿美元。

经常账户的某些波动是周期性的。研究公司龙洲经讯（Gavekal Dragonomics）的陈龙指出，中国最大的两类进口商品——石油和半导体——去年价格处于高位。如果它们的价格下跌，经常账户盈余可能会重新上升。

然而，还有更深层次的力量在起作用。从根本上说，一个国家的经常账户余额就是其储蓄和投资之间的差额。中国的投资率一直高达GDP的40%左右。但由于中国人已经学会了乐于打开钱袋子（或者更确切地说是点击移动支付应用），中国的储蓄率已经从十年前占GDP的50%下降到40%左右。人口老龄化将导致储蓄进一步减少，因为将由更少的劳动人口来供养更多的退休人员。从这个意义上说，经常账户盈余的消失反映出中国正在变富和走向老龄化。

尽管如此，人们对盈余消失带来的影响仍有一些担心。在新兴市场，经常账户的高额赤字可能是金融不稳定的警钟，表明这些国家正在寅吃卯粮，并依赖靠不住的外国投资者来支撑它们的支出。但中国不存在这样的风险。预计未来几年可能出现的赤字占GDP的比例都将很小。此外，政府还有高达3万亿美元的外汇储备作为缓冲。这应该能为中国赢得时间。

关键是中国如何利用这个时间。任何一个存在经常账户赤字的国家都必然需要从境外融资。在一个资本账户完全开放、货币汇率自由浮动的经济体中，无需央行过多费心，资本流入和流出便能保持平衡。但在中国，政府一直在严密控制资本账户和汇率。

因此，鉴于中国面对经常账户转为赤字的前景，它没有太多选择，只能放松控制，以引入更多国外资金。它正朝着这个方向发展。长期以来，中国一直通过向外国投资者严格发放配额来控制外资进入其资本市场，且往往偏好养老基金等机构。但近年来，中国开放了更多渠道，尤其是经过精心安排的与香港证券交易所的互通机制。

这些举措虽然是渐进的，但总合起来已足以让主要股票和债券指数（全球投资者的重要基准）的编制者们将中国的资产纳入其中。MSCI上个月表示，将把在中国大陆上市的股票在其新兴市场股票指数中的权重提高到现在的四倍多，至3.3%。下个月，中国债券将被纳入彭博巴克莱（Bloomberg Barclays）债券指数，这可能会在两年内给中国债券市场带来约1000亿美元的资金流入。

在一本有关中国债券市场的新书中，国际货币基金组织认为这可能会促成一个良性循环。对中国债市更活跃的投资将帮助政府实现目标，让利率成为货币政策武器库中更强大的武器，而不是使用老一套的行政指令。再加上更灵活的汇率机制，中国最终将拥有更为先进和高效的金融体系——这说明如果处理得当，经常账户赤字将是一种有益的变化。

但中国不愿走得太远的意图还是很明显的。在努力吸引外国投资者的同时，中国并没有采取相应的措施让本国公民的海外投资更加简单可行。新任央行行长易纲曾多次誓言要维持人民币“基本稳定”。牛津经济研究院（Oxford Economics）的高路易（Louis Kuijs）认为，这种限制归根到底关乎意识形态。对于将过多控制权交给市场，中国政府持谨慎态度。“这意味着放开会比较缓慢。”他表示。

因此，中国应对赤字的另一要点就是从一开始就要防止赤字过大。中国央行前官员管涛表示，中国必须提高本国服务业的竞争力。他相信，随着旅游业的发展、大学和医院水平的提升，中国将吸引更多的外国人，同时也将让国人更多地在国内消费。

不妨将这看作长城焕发的“第二春”。在建成后的两千多年里，长城屡次被

野蛮入侵者攻破，从未真正起到过防御工事的作用。但现在，长城的作用是吸引大批游客。在这个战场上，它的胜算更大。 ■



Psychology

Dinner diplomacy

Sharing food leads to more successful negotiations

SHRIMP COCKTAIL, grilled sirloin with pear kimchi and chocolate lava cake. Donald Trump and Kim Jong Un had the same food brought to them on individual plates during their summit on February 27th. Psychologists think a meal like this is a good first step towards improving relations. But new work suggests there might have been a more positive outcome with a different serving arrangement.

As Kaitlin Woolley of Cornell University and Ayelet Fishbach of the University of Chicago report in *Psychological Science*, a meal taken “family-style” from a central platter can greatly improve the outcome of subsequent negotiations.

Having conducted previous research in 2017 revealing that eating similar foods led to people feeling emotionally closer to one another, Dr Woolley and Dr Fishbach wondered whether the way in which food was served also had a psychological effect. They theorised that, on the one hand, sharing food with other people might indicate food scarcity and increase a notion of competition. However, they also reasoned that it could instead lead people to become more aware of others’ needs and drive co-operative behaviour as a result. Curious to find out, they set up a series of experiments.

For the first test they recruited 100 pairs of participants from a local café, none of whom knew each other. In return for a \$3 gift card and a chance to win \$50 based upon their performance during a negotiation game, the participants were sat at a table and fed tortilla chips with salsa. Half the pairs were given their own basket of 20 grams of chips and a bowl of 25

grams of salsa, and half were given 40 grams of chips and 50 grams of salsa to share. As a cover for the experiment, all participants were told this snack was to be consumed before the game began.

The game required the participants to negotiate an hourly wage rate during a fictional strike. Each person was randomly assigned to represent the union or management and follow a set of rules.

The researchers measured co-operation by noting the number of rounds it took to reach an agreement, and found that those who shared food resolved the strike significantly faster (in 8.7 rounds) than those who did not (13.2 rounds). A similar experiment was conducted with 104 participants and Goldfish crackers, this time negotiating an airline's route prices. The results were much the same, with the food-sharers negotiating successfully 63.3% of the time and those who did not share doing so 42.9% of the time.

To see if food-sharing among friends worked in the same way as it did among strangers, Dr Woolley and Dr Fishbach ran their strike experiment again with 240 people, partnering together two friends or two strangers. Regardless of whether the pairs were friends or strangers, those who shared food went into fewer rounds during the game, averaging 6.4 rounds, than those who did not share food, averaging 9.8. Friendship did have an effect, though. Whether they shared food or not, friends were generally more co-operative.

Mr Trump and Mr Kim might balk at having to take turns serving themselves from platters in the centre of a table. But these results suggest that such an arrangement really could help world diplomacy. ■



心理学

晚餐外交

分享食物让谈判更成功

鲜虾杯，烤西冷牛排配韩式梨泡菜，然后是巧克力熔岩蛋糕。2月27日，特朗普和金正恩在峰会期间分盘享用了相同的食物。心理学家认为这样的同桌进餐是改善关系的良好开端。但新研究表明，另一种用餐安排可能会产生更积极的结果。

康奈尔大学的凯特琳·伍利（Kaitlin Woolley）和芝加哥大学的阿耶莱特·费斯巴赫（Ayelet Fishbach）在《心理科学》（Psychological Science）杂志上发表的论文说，从同一个大盘中取食的“家庭式”进餐方式能大大改善后续谈判的结果。

伍利和费斯巴赫先前在2017年进行的研究发现，吃同样的食物会让人们在感情上更亲近。她们想知道上菜方式是否也会产生心理上的影响。她们推论，一方面，与其他人分享食物或许代表食物份量有限，进而会增强竞争意识。但她们也推测，或许分享会让人们留意到他人的需求，从而推动合作行为。她们很想知道事实到底如何，于是设计了一系列实验。

在第一次实验中，她们从地方上的一家咖啡馆招募了200名互不相识的参与者，每两人一组。参与实验可获得3美元的礼品卡，并有机会在谈判游戏中根据表现赢得50美元。他们两人一桌，享用墨西哥玉米片配莎莎酱。研究者给其中50组每人单独上了一份20克的玉米片和一碗25克的莎莎酱，给另50组一份40克的玉米片和50克的莎莎酱，让两人分着吃。为了不让参与者知道真实用意，研究人员告诉他们，吃完这些小食，谈判游戏才会真正开始。

游戏而后要求参与者在一次虚构的罢工事件中谈判时薪。每一组中都随机分配一人扮演工会代表，另一个人扮演企业主管，双方遵循一套规则开展谈判。

研究人员记录下每组参与者最终达成协议所经历的谈判轮数，作为衡量合作程度的指标。她们发现分享一份食物的小组解决罢工的速度（8.7轮）明显快过那些分餐的小组（13.2轮）。另一项类似的实验招募了104名参与者，食物换成了金鱼饼干，谈判内容是航空公司的票价。实验结果大致相同：分享食物的参与者谈判成功率为63.3%，各吃各的小组的成功率为42.9%。

伍利和费斯巴赫想知道朋友之间分享食物的效果是否与陌生人之间相同，于是再次组织了罢工实验，邀请了240人参加。这一次每组的两个参与者互为朋友或陌生人。结果发现，不管同组的两人是朋友还是陌生人，分享食物的小组在游戏中谈判的轮数更少，平均为6.4轮，没有分享食物的小组平均为9.8轮。但朋友关系确实有其影响。无论是否分享了食物，朋友之间的合作程度普遍更高。

特朗普和金正恩可能不大愿意轮流从桌子中间的大盘子里取食。但这些实验结果表明，这样的用餐方式很可能有助于世界外交。■



Global housing

Prime cuts

After a long boom, prices of the world's priciest properties are falling

One Blackfriars soars into the sky from the south bank of the River Thames, announcing its presence to central London. The new 50-storey tower contains 274 luxury flats that range in value from a merely expensive £1m (\$1.3m) to an eye-watering £15m. Thanks to its distinctive midriff the building has been nicknamed “The Tummy” by Robert Shiller, who won a Nobel economics prize for his work on spotting asset bubbles. The name might also apply to London’s bloated housing market. Prices have nearly doubled since 2009.

It is not only in London that property values bulged in the decade after a housing bust that nearly took down the world’s financial system: prices are near new highs in many places, according to *The Economist*’s latest roundup of global housing markets (see chart). In five of the world’s most desirable cities—Hong Kong, London, New York, Sydney and Vancouver—home prices climbed steadily for several years after 2009.

Now, though, particularly in the priciest, “prime” areas of such cities, excess is being shed. In Vancouver, where prime prices have fallen by 12% in the past year, agents bemoan hefty discounts on swanky properties. Michael Bublé, a chart-topping crooner, recently sold his West Vancouver pad for 28% less than the assessed value. Prices started falling in August in Hong Kong and have dropped by 9% since. Developers there were spooked when their bids for a vacant parcel of land in the world’s most expensive neighbourhood—aptly called “The Peak”—failed to meet the government’s reserve price in October. In Manhattan prices fell by 4.3% last year; StreetEasy, an online-listings firm, calculates that 60% of homes offered for

\$1m or more in 2018 failed to sell. In Sydney, prime prices have slipped by 16% since 2017.

In London Savills, a consultancy, estimates that prime-property prices have fallen by 20% from their 2014 peak. Sales of homes worth over £1m are 20% lower than in 2016. Although Brexit has not helped, there are broader reasons for the slowdown, says Lucian Cook, head of research at Savills: falling cross-border capital flows; government policy; the cost of money; and increased supply.

These factors are common to other global cities, too. Indeed, the IMF observes that house-price movements have become increasingly correlated across the world, and that the link is greater between big cities than between countries. That is because housing is becoming a more global asset class rather than a purely local one. The prevailing winds of the international marketplace affect prime residential property much as they do shares and bonds. The IMF notes that international correlation increases at the time of severe recessions and can help predict the risk of a downturn.

One factor underlying that correlation is wealth creation. Thanks to a tech boom and a rapidly rising China, the world has minted new millionaires at a rate of 250 per hour for the past eight years. According to Credit Suisse, millionaires held 45% of the world's household wealth in 2018, up from 36% in 2010. A good dollop of their money finds its way into posh properties, at home and abroad. But the Swiss bank reckons that the pace has been slowing: it forecasts that the rate of increase in the number of new millionaires will slow by a fifth in the five years to 2023.

In China, home to one-sixth of the world's new millionaires, it has become increasingly difficult to sneak money out of the country. In 2015-16, \$1.3trn flowed out of China (excluding foreign direct investment). But the authorities have since cracked down on corruption among the elite and

tightened enforcement of a limit of \$50,000 per person on access to dollars and other foreign currencies. That has affected residential markets far and wide. America's National Association of Realtors estimates that Chinese buyers spent \$30bn on homes in America in the year to March 2018, down by 4% from a year earlier. In Australia, where international buyers are restricted to new-builds, Chinese investment in new development fell by 36% to A\$1.3bn (\$970m) in 2018. Yet the Chinese still account for a quarter of international buyers, as they do in London.

Politicians have played their part, too. Egged on by disgruntled citizens who have found themselves priced out of urban markets, city and national governments have sought to cool market excesses. Vancouver raised its transaction tax on property purchases by non-residents from 15% to 20% in 2018. Britain's government has increased transaction taxes. It levies as much as £288,000 on a £2.5m home purchase, up from £100,000 in 2010. It has also imposed extra taxes on non-citizens. New Zealand has gone furthest, introducing a blanket ban on foreign purchases of existing homes last October.

The cost of money is also having a slimming effect. Monetary policy, loose for so long, is tightening. Liam Bailey of Knight Frank, another consultancy, notes that it now costs 65% more to service the mortgage on a \$1m home in America than it did three years ago. Granted, luxury-property buyers often pay cash; but their appetite may be dulled by falling yields. According to MSCIIPD, a research firm, the gross rental yield on investible residential property fell below 5% for the first time in 2016.

Yields have been forced down in part by the weight of supply. During the three years to 2016 investors would "throw money at anyone with personality, a pulse and a reasonable idea" for a new development in London, says Jonathan Vandermolen, a property consultant. Manhattan is similarly awash with luxury, largely thanks to the new fad for "super skinny"

apartments that rise from tiny footprints in Midtown. Some 8,600 luxury units are for sale—six years' inventory at current selling rates.

Taken together, these factors reflect a world in which “slowbalisation”—the unwinding of two decades of global economic integration—has taken hold. Although less well-heeled residents of those cities will be glad of a fall in prices, a cooling of foreign interest may have unwelcome consequences for the wider market. A report in 2017 by the London School of Economics, commissioned by London's mayor, found that, on balance, international investment in the city's residential property helped to create housing supply that would otherwise not have materialised.

Meanwhile, estate agents, whose duty it is to be eternally optimistic, contend that these markets cannot lie low for long. The theory goes that these cities are desirable for a reason and that land is limited; so prices will recover. This argument has a kernel of truth. Demand for property chronically outstrips supply in Hong Kong, for example, and investors from mainland China feel safer there. Yet any rebound is unlikely to be as strong as the last one: Savills reckons London's prime-property prices will be more measured in future.

Fortunately for estate agents, there will always be some who do not read the memo. Ken Griffin, a hedge-fund titan, recently bought 3 Carlton Gardens, near Pall Mall, for close to £100m, the most paid for a London home in over a decade. He went on to pay a record \$238m for a Manhattan pad. When a determined plutocrat is in the mood, it can be hard to stop him. ■



全球房市

黄金段割肉

经过长期繁荣后，世界最昂贵的房产的价格正在走低

布莱克法尔一号（One blackfriars）矗立在泰晤士河南岸，直耸云霄，傲视伦敦市中心。这座新建的50层高楼有274套豪华公寓，售价从不算太过昂贵的100万英镑（130万美元）到令人咋舌的1500万英镑不等。其造型独特，形似人体腹部，因而获名“大肚子”。给它取这个名字的罗伯特·席勒（Robert Shiller）因为在发现资产泡沫方面的研究获得诺贝尔经济学奖。这个名字或许还可以指代伦敦膨胀的住房市场——自2009年以来，伦敦房价几乎翻了一番。

在十年前那场几乎拖垮了世界金融体系的房市崩盘之后，不只伦敦的房地产价格暴涨——根据本刊对全球房产市场的最新概览（见图表），很多地方的房价创下新高。2009年之后，香港、伦敦、纽约、悉尼和温哥华等五个全球最受欢迎城市的房价曾连续数年稳步攀升。

然而，如今这些城市，特别是在它们最昂贵的“黄金”地段，高峰正在被削去。温哥华黄金地段的房价去年下降了12%，豪宅大幅降价让当地的房产经纪人哀叹不已。当红歌手迈克尔·巴布雷（Michael Bublé）近期以低于估价28%的价格出售了他位于西温哥华的公寓。香港房价自去年8月开始下跌，跌幅已达9%。去年10月，在对“太平山顶”这个可谓名副其实的世界最昂贵地段的一块空地的投标中，当地开发商的出价均未能达到政府的底价，让他们大跌眼镜。去年，曼哈顿房价下跌4.3%；据在线房产搜索公司StreetEasy的统计，2018年，开价100万美元及以上的房屋有60%未能售出。在悉尼，黄金地段的房价自2017年以来下降了16%。

咨询公司第一太平戴维斯（Savills）估计，伦敦黄金地段的房价已经从2014年的最高点跌落了20%。价值超过100万英镑的房屋销量比2016年下滑了20%。该公司研究部门主管卢西恩·库克（Lucian Cook）表示，尽管

英国脱欧与销量下滑脱不了干系，但还有更广泛层面的原因，如跨境资本流动减少、政府政策、资金成本以及供应增加等。

世界其他全球性城市同样存在这些因素。实际上，国际货币基金组织（IMF）注意到，全球各地房价走势的关联性已变得越来越强，而各大城市之间的关联性比各国之间更强。这是因为房产正成为一类更为全球性的、而非单纯地方性的资产。与股票和债券一样，黄金地段住宅也受国际市场普遍趋势的影响。IMF指出，国际间的关联性在经济严重衰退时会加大，有助于预测经济下滑的风险。

财富创造是产生这种关联性的一个因素。得益于科技业繁荣和中国的迅速崛起，过去八年里，全球每小时新增250名百万富翁。瑞信的数据显示，2018年，世界45%的家庭财富掌握在百万富翁手中，2010年这一数字为36%。这些财富中有相当一部分被用于购买国内外的豪宅。但据这家瑞士银行估计，新百万富翁的增速一直在放缓。它预测到2023年的五年内，其增速将放缓20%。

在拥有世界六分之一新百万富翁的中国，把资金偷偷转移到海外的难度越来越大。2015至2016年，不包括在海外的直接投资，中国外流资本达1.3万亿美元。但此后，政府各部门开始严厉打击上层集团的腐败行为，并加强了对每人五万美元（或等值其他外币）兑换上限的执行力度。这对住宅市场产生了广泛而深远的影响。美国全国房地产经纪人协会估计，在2018年3月之前的一年中，中国买家在美国的购房支出为300亿美元，同比下降4%。在外国买家只能购买新建房屋的澳大利亚，2018年中国对该国新建住宅的投资下降了36%，为13亿澳元（9.7亿美元）。不过，与在伦敦的情况一样，国际买家中仍有四分之一是中国人。

政客们也起到了作用。市民因无力购买城区高价房而心生不满，在他们的施压下，国家和地方政府试图为过热的房产市场降温。2018年，温哥华将非本国居民购买房屋的交易税从15%上调至20%。英国政府提高了交易税，以购买一套250万英镑的房屋为例，2010年的税收为10万英镑，现在则高达28.8万英镑。另外英国还对外国人征收了附加税。新西兰的做法最

绝，于去年10月全面禁止外国人购买现房。

资金成本也推动了房价下跌。在经历了长期宽松后，货币政策正在收紧。另一家咨询公司莱坊（Knight Frank）的利亚姆·贝利（Liam Bailey）指出，如今在美国，一套100万美元住房的还贷成本比三年前增加了65%。诚然，豪宅买家通常都是支付现金，但他们的购买欲望可能会因收益率下降而减弱。研究公司MSCIIPD的数据显示，2016年，可供投资的住宅的总租金收益率首次跌破5%。

收益率被压低，部分原因是供应过剩。房地产顾问乔纳森·范德莫伦（Jonathan Vandermolen）表示，在2016年之前的三年里，投资者会“向任何在开发伦敦新房产项目上有个性、有干劲、有合理想法的人砸钱”。曼哈顿也同样充斥着奢华，这很大程度上是因为新近流行的“超瘦”公寓楼，它们在曼哈顿中城的逼仄空间里拔地而起。待售的豪华公寓大约有8600套——按目前的销售速度，相当于六年的库存。

综上所述，这些因素显示世界进入了“慢球化”（slowbalisation）轨道——持续了20年的全球经济一体化在崩解。尽管这些城市里不那么富有的居民乐意看到房价下跌，但外国投资的降温可能会对更广泛的市场产生不利影响。受伦敦市长的委托，伦敦政治经济学院于2017年完成的一份报告发现，总体而言，对伦敦住宅的境外投资促进了住房供应，不然不会有这么多供应出现。

然而，以永远乐观为己任的房产经纪人认为，这些城市的房产市场不会长期低迷。他们的理论是，这些城市能吸引投资者自有其原因，而且土地是稀缺资源，所以房价势必会回升。这种论调有一定的道理。例如，香港房地产长期以来供不应求，而且中国大陆的投资者认为香港更安全。然而，任何反弹都不太可能像上次那样强劲。第一太平戴维斯认为，未来伦敦黄金地段的房价会更加平稳。

让房产经纪人庆幸的是，总有一些不管不顾的人。对冲基金大鳄肯·格里芬（Ken Griffin）最近以近1亿英镑的价格购买了伦敦蓓尔美尔街（Pall

Mall) 附近的卡尔顿花园3号（3 Carlton Gardens），这是十几年来伦敦金额最高的一笔住宅交易。之后他又以创纪录的2.38亿美元买下了曼哈顿的一处公寓。当一位果敢的富豪心血来潮，旁人很难阻止他。■



Free exchange

Natural talent

Alan Krueger, a quiet revolutionary of economics, died on March 16th

FEW ECONOMISTS can claim either to have successfully challenged the bedrock beliefs of their field or to have altered how governments pursue policies that affect millions. Alan Krueger, who died on March 16th, managed both. In research with David Card in the early 1990s, Mr Krueger showed, through careful data analysis, that increases in the minimum wage did not lead to reductions in employment, as standard models suggested they should. The research, which the authors summarised in a seminal book, "Myth and Measurement", published in 1995, drew a scathing initial response. Critics assaulted their motivations, data and analysis until allowing, finally, that the pair had a point. Their work changed economics and politics. It also exemplified Mr Krueger's career as both scholar and public servant.

Mr Krueger did not come across as the combative type. He was gracious and generous in person, and a skilled communicator. That came in handy during his time in Washington, as chief economist of the Department of Labour when Bill Clinton was president, and in the Treasury and the White House under Barack Obama during the most tumultuous economic times since the 1930s. He often wrote for the *New York Times* and appeared on television. Helping people understand what economists had learned was, he believed, part of an economist's job.

His passion, however, was the craft of economics. In 1987, as a newly minted PhD, Mr Krueger accepted a position at Princeton University, not far from the New Jersey town where he grew up. From the outset he was interested in understanding why workers earned what they did. But he recognised

that the question could not be answered satisfactorily without rigorous and careful study of data. Mr Krueger subscribed to the *New England Journal of Medicine*, and admired the way each article began by discussing the paper's research design. Economics badly lagged behind medicine and the physical sciences in the use of careful empirical work, not least because of the difficulty of running experiments on messy real-world interactions. In the late 1980s, however, some economists were honing methods to study "natural experiments", in which a more or less random, localised event allowed researchers to compare the experiences of affected and unaffected groups, in something of the way that a laboratory scientist might compare treatment and control groups.

Messrs Card and Krueger applied the approach to studying the effects of changes in the minimum wage. At the time most economists assumed that labour markets were more or less competitive. Workers could easily leave firms that offered them too little; firms had to accept prevailing market wages and would only hire as many workers as made financial sense. An increase in the minimum wage, by making labour more expensive, should thus translate directly into lower employment. But did it? Beginning in the early 1980s, increases in America's national minimum wage were infrequent and too small to overcome the effects of inflation. Some states responded by raising their own minimum rates, creating just the natural experiment Messrs Card and Krueger needed. They studied the effect of a rise in New Jersey's minimum wage in 1992 on employment in fast-food restaurants, using neighbouring Pennsylvania, which had not enacted an increase, as a comparator. They did not detect any negative effect on employment.

Though arguments about this research rumbled on for years, its impact has been undeniable. It opened the floodgates to a wave of work with natural experiments. It also stirred debate about competition in labour markets, to which Mr Krueger would contribute for the rest of his life. Markets might

not be very competitive at all, some economists reckoned, because it is costly for workers to find and switch jobs, or because large firms dominate markets or collude to suppress pay. In a talk last August, Mr Krueger cited a stream of recent research in arguing that stubbornly weak wage growth is strong evidence that workers have too little bargaining power, and that the economy is suffering as a result. It is wrong to label such dynamics “market imperfections”, he mused. As Mr Krueger pointed out, Adam Smith himself thought labour markets worked that way.

Mr Krueger’s papers explored how factors from education to race to technology influenced workers’ prospects, often rustling up new data sources in the process. He drew a link between America’s opioid-addiction crisis and declining participation in the labour market, especially among men. He made a habit of attending a festival for twins with Orley Ashenfelter, a mentor and Princeton colleague, to seek subjects for studies of the influence of education on earnings, using genetic similarities to isolate the effect. Mr Krueger’s curiosity was insatiable. He published on a remarkable variety of topics. After the attacks of September 11th 2001, he explored the factors contributing to the decision to become a terrorist. In a book in 2007 he argued that political repression, rather than a dearth of economic opportunity, did most to foment terrorism. He studied the entertainment industry, to understand how technology and globalisation are affecting the economics of popular music (another passion): a book is due out in June.

And, often in partnership with Daniel Kahneman, a Nobel laureate who pioneered the application of psychology to economics, Mr Krueger dug into the measurement of subjective well-being, hoping to find better ways of capturing shifts in what matters most in life. The goal of economic progress is after all to help people lead more satisfying lives, and to foster its pursuit, governments and scholars need reliable data. It was a message he preached throughout his career. His professional example inspired scores of young

scholars, whose work is a monument to his memory. Both economics and American public life are much poorer for his death. ■



自由交流

天赋异禀

经济学界安静的革命者艾伦·克鲁格于3月16日去世

少有经济学家能声称自己成功动摇了学界的基本理念，或改变了政府的决策思路从而影响了数以百万计的民众。3月16日去世的艾伦·克鲁格（Alan Krueger）都做到了。上世纪90年代早期在与戴维·卡德（David Card）合作的研究中，克鲁格通过细致的数据分析发现，与一般模型得出的结果相反，最低工资上升并不会导致就业率下跌。在1995年出版的对后世影响巨大的《迷思与计量》（Myth and Measurement）一书中，两位经济学家概述了这项研究，起初惹来了尖刻的批评。批评者抨击他们的动机、数据及分析，直到最终承认两人的发现有一定道理。他们的研究改变了经济学界和政治界，也是克鲁格集学者和公仆于一身的职业生涯的典型示例。

克鲁格看上去并不是那种好斗型的人物。他为人和蔼大方，善于与人沟通。在华盛顿担任政府公职期间，这些特质派上了用场。他曾担任克林顿政府劳工部的首席经济学家，在奥巴马任内那段上世纪30年代以来经济最动荡的时期，他先后在财政部和白宫任职。他经常为《纽约时报》撰文并现身电视节目。他认为，帮助人们了解经济学的研究发现是经济学家的职责之一。

然而，他最着迷的还是钻研经济学。1987年，刚刚博士毕业的克鲁格接受了普林斯顿大学的一份教职，那里离他长大的新泽西小镇不远。从一开始他就有意探索人们工作收入的机制。但他意识到，如果不严谨细致地分析数据，这个问题就无法得到满意的解答。克鲁格订阅了《新英格兰医学杂志》（New England Journal of Medicine），其中的每篇论文都会在开篇说明研究方法，这让他很是赞赏。在运用细致的实证研究方面，经济学严重落后于医学和物理学，主要是因为要对纷乱的现实互动展开实验的难度很大。然而到了80年代后期，一些经济学家开始探索开展“自然实验”的方法。那些或多或少随机性的局部事件让研究人员得以比较受影响和未受影响

响群体的经历，类似于实验室科学家对治疗组和对照组的比较。

卡德和克鲁格运用这种方法来研究最低工资标准的变化造成的影响。当时大多数经济学家认为劳动力市场多多少少是竞争性的。工人可以轻易离开报酬太低的公司，公司则不得不按市场工资水平支付薪酬，在确定该雇用多少员工时也只考虑财务上合算与否。按这种思路，提高最低工资导致劳动力成本上升，应该会直接导致就业人数下降。但真是这样吗？从上世纪80年代初开始，美国全国最低工资上调次数不多，幅度不大，不足以克服通胀的影响。于是一些州自行提高本州最低工资水平，这就产生了卡德和克鲁格所需的自然实验。他们研究了1992年新泽西州最低工资调高对快餐店就业的影响，以毗邻的宾夕法尼亚州（没有上调最低工资）作为比较对象。结果没有发现就业受到任何负面影响。

虽然该研究引发的争论持续多年，但其影响力无可否认。它打开了自然实验的闸门，之后涌现出一大批此类研究。该研究还激起了关于劳动力市场竞争性的争论，克鲁格在余下的岁月里又不断为之添砖加瓦。一些经济学家认为，市场可能根本不是高度竞争性的，因为工人寻找和转换工作的成本很高，或者因为大公司垄断了市场或合谋压低工资。在去年8月的一次演讲中，克鲁格引用了近期的一系列研究，指出工资增长持续疲软有力地证明了工人议价能力低下，而其结果就是经济受损。把这种情况简单归结为“市场不完善”是错误的，他沉思道。正如克鲁格指出的，亚当·斯密本人也认为劳动力市场就是这样运作的。

克鲁格的论文探讨了教育、种族和技术等因素如何影响工人的未来，过程中经常挖掘出新的数据源。他认为美国阿片类药物成瘾危机与劳动力市场参与度下降（特别是男性）存在关联。他定期与普林斯顿大学的同事、导师奥利·阿什菲尔特（Orley Ashenfelter）参加某个双胞胎节庆活动，为教育对收入影响的研究寻找研究对象，利用遗传相似性来分离出教育的影响。克鲁格的好奇心永无止境。他发表的文章主题非常多样化。2001年9月11日恐怖袭击发生后，他探讨了什么因素会促使人们成为恐怖分子。在2007年出版的一本书中，他表示最能助长恐怖主义的是政治压制，而非经济机会的紧缺。他也研究过娱乐业，探讨技术和全球化如何影响流行音乐

（另一个令他着迷的领域）产业的经济运作，一本这方面的书将于今年6月出版。

另外，克鲁格经常与诺贝尔奖获得者丹尼尔·卡尼曼（Daniel Kahneman，率先把心理学应用到经济学研究中）合作，研究对主观幸福感的衡量，希望找到更好的方法来发现人们对何为人生大事的认知变化。经济进步的目标终究是要帮助人们过上更称心的日子。而为了实现这一目标，政府和学者需要可靠的数据。这是他在自己整个职业生涯中一直传递的理念。他树立的专业榜样启发了大批年轻学者，他们的研究成果可谓是一座纪念克鲁格的丰碑。他的离世令经济学界和美国的公共生活都大为失色。 ■



America and the world

Pointillist power

Imperialism is an unduly neglected feature of American history

THE UNITED STATES was born out of rebellion against imperial power. Yet it then amassed more of an empire than is commonly realised, including by Americans. Indeed the country's history, according to Daniel Immerwahr's lively new book, is a history of empire.

Grasping that history means looking beyond today's "logo map" of America, as Mr Immerwahr, a historian at Northwestern University, calls the country's core. His focus is on the wider lands that have come under its control: the Greater United States. At various times this has included the Philippines (a colony from 1899 to 1946) and Puerto Rico (now a commonwealth), as well as American Samoa, Guam, the US Virgin Islands, Northern Marianas and myriad other territories around the world.

This history is a drama in three acts. The first describes the amassing of "logo" America through westward expansion and the displacement of Native Americans. The story of the land-hungry country's manifest destiny is well known but well told by Mr Immerwahr.

Next, in act two, comes the annexing of other territories. In the 19th century a craze for guano for use as fertiliser leads to the occupation of dozens of uninhabited islands in the Caribbean and Pacific. Alaska is purchased. Military victories bring in the northern part of Mexico and then Spain's overseas empire, including the Philippines, Puerto Rico, thousands of islands and 8.5m people, though at great cost. By one calculation, the fight for the Philippines claims more lives than the American civil war. With hostilities stretching from 1899 to 1913, it is America's longest conflict save

for the one that is still raging in Afghanistan today. The killing in the Philippines in the second world war is the most destructive event ever on American soil.

At the end of that war the Greater United States contains some 135m people outside the mainland, more than the 132m living in the core country itself. However, except for a brief period of enthusiasm for empire around the turn of the 20th century, the country's imperial reach is played down by its politicians. Unlike London, Washington is not festooned with grand offices to run the colonies.

And then, in act three, something remarkable happens: America gives up territory. The population of American lands beyond the core states shrinks from 51% of the total in 1945 to 2% in 1960 (after Hawaii and Alaska join the union). These days, all the overseas territories add up to an area smaller than Connecticut.

Why the retreat? Projecting power no longer requires going to the trouble of holding large amounts of land, often against the will of the local population. Instead, globalisation replaces colonisation. Thanks to aviation, logistical mastery and other world-shrinking innovations, America can substitute technology for territory.

Not that holding territory is wholly irrelevant, even now. The superpower has roughly 800 overseas bases (compared with some 30 held by others in total); in Mr Immerwahr's vivid formulation, its empire is now a "pointillist" one. The United States did not abandon empire, but "reshuffled its imperial portfolio, divesting itself of large colonies and investing in military bases, tiny specks of semi-sovereignty strewn around the globe".

Mr Immerwahr peppers his account with colourful characters and enjoyable anecdotes. This tale of territorial empire, he suggests, throws light on the

histories of everything from the Beatles to Godzilla, the birth-control pill to the transistor radio—even on the use of the word “America”, which entered common parlance surprisingly late, spreading only after 1898. It also has darker sides: racism, the legal grey zone in which many overseas territories exist and the lack of full representation that still affects the 4m or so people living in them. Deadly impacts of empire, according to Mr Immerwahr, range from terrorism in retaliation against the presence of American bases to inadequate responses to disasters in places with second-class citizenship (such as the feeble reaction to the carnage wreaked by Hurricane Maria in Puerto Rico in 2017).

He does not explore the implications of President Donald Trump’s back-to-the-core America First approach for the Greater United States. Nor does he dwell on the rise of a rival empire, which is famous for learning from the American experience. Some observers will look at the Belt and Road Initiative, and the occupation of islands in the South China Sea, and detect pointillism with Chinese characteristics. ■



美国和全世界

点彩派势力

帝国主义是美国历史上一个被过分忽视的特征【《如何隐藏一个帝国：大美利坚的历史》书评】

美国诞生于对皇权的反抗。然而它又聚集成为一个帝国，规模比包括美国人在内的大多数人所知的更大。丹尼尔·伊默瓦尔（Daniel Immerwahr）在他的新书中生动地阐述了这个国家的历史其实是一部帝国史。

要理解这样一部历史，就要让目光超越今天美国的“标志版图”——西北大学的历史学家伊默瓦尔用这个词来指称美国的核心地域。他关注的是业已在美国控制下的更广阔的土地：“大美利坚”。在不同时期，这包括菲律宾（1899年至1946年为美国殖民地）和波多黎各（现在是美国的自治邦），以及美属萨摩亚、关岛、美属维尔京群岛、北马里亚纳群岛和世界各地的无数其他领土。

这段历史是一部三幕剧。第一幕描述了通过西进和强制迁移美国原住民而聚集起来的“标志”美国。渴求土地的国家天命昭昭，这个故事众所周知，但在伊默瓦尔的笔下尤为生动。

接下来的第二幕是吞并其他领土。19世纪，一股将海鸟粪用作肥料的热潮掀起，导致加勒比海和太平洋上的数十个无人居住的岛屿被占领。阿拉斯加州被买进。军事胜利让美国夺取了墨西哥北部地区和当时西班牙的海外帝国，包括菲律宾、波多黎各，以及数千个岛屿和850万人口，尽管代价高昂。有计算表明，在争夺菲律宾的战争中伤亡人数超过了美国内战。敌对状态从1899年一直持续到1913年，除了今天仍在阿富汗肆虐的冲突，这是美国历史上持续时间最长的一次战争。二战期间发生在菲律宾的杀戮是美国土地上发生的最惨烈事件。

二战结束时，“大美利坚”在北美大陆以外拥有约1.35亿人口，比美国核心本土的1.32亿人口还多。但是，除了在世纪之交出现过一阵对帝国的短暂

热情之外，美国的政客们淡化了国家的帝国势力范围。与伦敦不同，华盛顿并未设立气派的办公室来管理殖民地。

接下来，在第三幕中，不同寻常的事发生了：美国放弃了海外领土。核心各州以外的土地的人口比例从1945年的51%减少到1960年的2%（夏威夷和阿拉斯加加入联邦后）。如今，所有海外领土加起来比康涅狄格州还小。

为什么要撤出？投射力量不再需要麻烦地占有大量土地，况且这种做法往往违背当地居民的意愿。相反，全球化取代了殖民地化。有了航空、物流技术和其他让世界变小的创新，美国可以用技术取代领土。

即便是现在，拥有领土也并非完全无关紧要。这个超级大国有大约800个海外基地（而其他国家总共拥有约30个）。伊默瓦尔生动地形容道，这个帝国现在是一个“点彩式”的帝国。美国没有放弃帝国，不过是“把它的帝国资产组合重新洗牌，剥离了大片殖民地，投资建设军事基地——遍布全球的半主权微小色点”。

伊默瓦尔在叙述中穿插了丰富多彩的人物和趣闻轶事。他认为，这个领土帝国的故事能够帮助认识从披头士到哥斯拉，从避孕药到晶体管收音机的种种历史，甚至包括“美利坚”这个词的使用。令人惊讶的是，这个词很晚才进入日常语汇，在1898年后才开始普及。这个帝国也有其黑暗面：种族主义；许多海外领土都处于法律上的灰色地带，且缺乏充分的代表，这一点仍影响着那里的约400万居民。在伊默瓦尔看来，从因美国军事基地而起的报复性恐怖主义活动，到对“二等公民”地区发生的灾害应对不足（如2017年美国在波多黎各遭受飓风“玛丽亚”重创时赈灾不力），都是帝国带来的致命影响。

他没有探讨特朗普回归核心地区的“美国优先”方针对“大美利坚”的影响，也没有详述一个以借鉴美国经验闻名、且可与之匹敌的帝国的崛起。一些观察人士将会审视“一带一路”倡议和对南海岛屿的占领，从中发现有中国特色的点彩主义。 ■



Conclusion

Hard and soft solutions

Water, the original solvent, can provide its own solutions

AFTER RATTLING into the hillside outside Jerusalem for 7km, the little three-carriage railway reaches the end of the line, some 300 metres underground. The diminishing speck of light at the tunnel's opening has long vanished altogether. This, for now, is as far as it goes. The German-Austrian contractor will eventually bore about 13.5km. But progress is fitful, depending on the rock being drilled through and whether it will need some artificial strengthening. The drill has already negotiated one large cave, complete with stalactites, which had to be reinforced with concrete. More such obstacles are expected. The contractor works non-stop, but the average progress made by Isabel, as their "double gripper" boring machine has been named, is just 22 metres a day. As its jaws grind into the wall of rock ahead, conveyor belts carry the rubble out to the tunnel's opening.

The tunnel will accommodate a tube 2.6 metres wide, the deepest potable-water pipe in the world, that will pump (mostly desalinated) water through 30km of tunnel from sea-level to an elevation of 860 metres to supply much of Jerusalem's drinking-water needs. In a country famous for its ambitious water-supply schemes, this is the biggest since the 1960s. It was in 1964 that Israel inaugurated its National Water Carrier, a public-works project to bring water from the north of the country down to the Negev desert in the south. It was an emblem of the young country's determination to survive. And it is a dominant theme in water policy to this day. In a dramatic symbol of a determination to shape the natural order to human needs, the direction of water-flow in the national carrier is to be reversed, to give clean, desalinated water back to "nature" in the north of the country.

Water “megaprojects” are not unique to Israel. Humanity has long embraced what Peter Gleick, a scientist who co-founded the Pacific Institute, a think-tank in California, calls “the hard path” to solving its water problems: one that relies “almost exclusively on centralised infrastructure to capture, treat and deliver water supplies”. When water has been short, the solution has been to find a new source, or to bring it from somewhere else, in ancient times using large amounts of human labour.

Ancient Sumerians in southern Mesopotamia dug canals. More than 4,000 years ago Egyptian farmers relied on the Nile—traces of their irrigation systems survive today. Throughout the Roman Empire cities were supplied by manmade aqueducts. High in the Andes in present-day Peru the Incas and their predecessors built cisterns and irrigation canals, and carved terraces into the hillsides.

Modern technology means that megaprojects now are on a scale the ancients could only dream of. China’s are the grandest. The Three Gorges Dam on the Yangzi river, which went into full operation in 2012, involved the flooding of hundreds of villages and the displacement of 1.2m people. The reservoir it created is 600km long. Besides providing energy for one of the world’s biggest power stations, the project was touted for improving navigation and preventing floods. Ever since it was first mooted as an idea a century ago, however, the dam has been controversial, with worries about its impact on biodiversity, cultural heritage and even seismology.

Environmentalists are also leery of another proud boast of modern Chinese hydraulic engineering: its south-to-north water-diversion project (pictured), by some measures the most expensive infrastructure project in the world. It counts as the largest transfer of water between river basins in history. It recognises that, for all China’s well-publicised struggles with air pollution, a shortage of water is its biggest environmental problem. That shortage is acute in the north, where 11 provinces have less than 1,000

cubic metres of water per person per year, the usual international measure of water stress. Those provinces include four of China's five biggest agricultural producers.

So, since 2014, two-thirds of the tap water and one-third of the total water supply in Beijing, in the arid north, has come by canal and pipeline from a reservoir 1,400km to the south, fed by a tributary of the Yangzi. China hails the project as an unqualified success, supplying more than 50m people in its early years of operation. And it is part of an even bigger project that will see up to 45bn cubic metres of water a year transferred—7% of Chinese consumption. Environmentalists and water experts at home and abroad are more sceptical, however. Mr Biswas at the Lee Kuan Yew School in Singapore says the project gives China at best “a few years’ grace”. The worry is that it is a distraction from more pressing and important policy changes—cutting demand for water—and may actually encourage wasteful use. As elsewhere, the authorities fear that charging users for the true cost of their water might provoke protests and threaten social stability.

Similar doubts surround India’s scheme to “interlink” 37 rivers through a network of 15,000km of canals, the ultimate aim being, as in China, to move water from well-endowed regions—such as some of the Himalayan foothills in the north—to areas of scarcity. The plan has been discussed for decades. The current government has tried to give it fresh impetus. But even if it forges a political consensus in Delhi behind the plan, it would be hard to realise because of tensions between different states over water.

With so many cities around the world facing an acute need for water, “the hard path” will not be abandoned. It will always seem easier to bring water in, or to exploit a new source, than to move tens of millions of people, or completely redraw the map of agricultural production. The scale of the problem was suggested by research published in 2014 by The Nature Conservancy, an American charity. Its list of water-stressed cities was

dominated by places in India and China—with Delhi second, Shanghai fourth and Beijing fifth. Mexico City came third. But top of the list was Tokyo. Other rich-world cities were also high up, including Los Angeles (eighth) and even London (15th).

Few, however, would disagree with Mr Gleick that the hard path alone is no longer enough and that it needs to be complemented with a “soft” one that seeks to improve the way water is used, rather than to find new sources of supply. That means spending on local facilities, efficient technologies and education and training.

How to do this is already known. In water-scarce regions where people—usually women—have to spend hours each day fetching water from a distant source, it may mean building pipes or bore-wells and training people to maintain them. In places with heavy seasonal rain followed by long dry seasons it means building (or in many cases restoring) storage systems, ideally in places where evaporation will be low. (In Bermuda, with abundant year-round rain, domestic water needs are met by harvesting rainwater from the islands’ roofs, which building regulations stipulate must make room for storage tanks.) And to ensure that the water people drink does not kill them, the discharge of untreated effluent has to be stopped, and people have to use toilets.

Waste water, as Israel and Singapore have shown, can be treated as a resource to exploit rather than a problem to dispose of. As the UN’s Sustainable Development Goals (SDGs), the targets for 2030 adopted in 2015, acknowledge, water-management has to be “integrated”, that is co-ordinated both between the various bodies responsible for different bits of the water cycle and other policies that have an impact on water. At times this will entail cross-border co-operation. It will always require community involvement.

None of this is rocket science, which helps explain a paradox of most conversations with scientists, ecologists and charity-workers who have devoted their lives to solving the world's water problems. Most are full of horror stories about how woefully the world is misusing and wasting its water. Yet most will profess cautious optimism about the long-term future.

The World Bank has even sought to cost the water-related SDGs. It estimated that, to "achieve universal and equitable access to safe and affordable drinking water for all" and "achieve access to adequate and equitable sanitation for all and end open defecation" would need \$114bn a year, 69% of it spent on sanitation. So to provide access to drinking water for the whole world would cost not much more than \$30bn a year, or roughly the size of the defence budget in, say, Italy or Brazil.

The total of \$114bn would amount to just 0.39% of the GDPs of the 140 countries the World Bank studied. That would, however, be 0.27 percentage points more than is currently spent globally. It would require a massive reallocation of resources. For that to be realised, three issues need to be tackled: ownership; price; and political priorities. On ownership, India and Israel represent two extremes. In India it may be hard to repeal the British-era law giving landowners the right to all the water on and under their property. But it should be possible to mitigate some of its effects by, for example, penalising the over-extraction of groundwater. Israel's nationalisation of all water supplies has helped "integrate" policy, but may not be replicable elsewhere. In many countries water rights are less clear and subject to litigation. America, for example, still suffers from tension between two different doctrines adopted in the early days of the modern nation: a "riparian" one in the east, giving rights to those near to a body of water, and the "prior-appropriation" one in the west, giving rights to the earliest users.

Pricing will be even harder. Few utilities in the world charge consumers

the full cost of the water they use. And even in countries where they do, a water subsidy may be included in the cost of the goods people buy in shops. To persuade people to recognise and pay for the water-intensity of their lifestyles may require concerted campaigns of the type that have helped cut smoking rates in many places. But because they will affect the entire population, it will be even harder. On the other hand, as experience in some unlikely places has shown—Phnom Penh, the capital of Cambodia, for example—poor people will pay for a clean, reliable source of water. After all, in much of the world, they already pay over the odds for dirty, dangerous and erratic supplies.

Finally, even if the world is cajoled into using water more sustainably, that will still leave questions of allocation. On the global level, it is easy to see where the priorities should lie: in the hundreds of millions who do not yet have access to safe and adequate drinking water and sanitation. At the national and subnational level, there will always be powerful interests lobbying for their own needs, whereas those without access to clean water are, almost by definition, the powerless. So, as Jonathan Farr, senior policy analyst at WaterAid, puts it, water management—however sustainable, progressive and integrated—has first to concentrate on access. Money is not the binding constraint. Nor is technology. It is a political choice. ■



结论

软硬兼施

水，最早的溶剂，可以带来自己的答案【专题报道《水》系列之七】

在进入耶路撒冷外的山坡中隆隆地晃荡了七公里后，这辆小型三车厢轨道车开到了头，这是地下约300米。隧道开口处越来越微弱的一点点光线早就消失不见。就目前而言，只能到这里了。德国-奥地利承包商最终将钻挖约13.5公里。但是进展断断续续，取决于钻到的是什么岩石，以及是否需要人工加固。钻头已经越过了一个满是钟乳石的大型洞穴，必须用混凝土加固。预计前路还会有更多这样的障碍。承包商不间断地工作，但他们名为“伊莎贝尔”的“双抓手”掘进机平均每天的进度仅有22米。它的颚板碾入前方的岩壁，传送带将碎石运到隧道的开口处。

这条隧道将容纳一条2.6米宽的管道，这是世界上最深的饮用水管道，它将通过30公里的隧道把（主要是淡化的）水从海平面泵送到海拔860米处，以供应耶路撒冷的大部分饮用水需要。在一个以宏伟的供水计划而闻名的国家，这是自上世纪60年代以来最大的一个项目。1964年，以色列开通了国家输水工程（National Water Carrier），这是一个公共工程项目，将水从北部带到南部的内盖夫沙漠。它是这个年轻国家生存决心的象征，而且至今依然是其水务政策的主旋律。这个引人注目的象征展现了人定胜天的决心，但输水工程的水流方向将被逆转，让干净的淡化水回到该国北部的“大自然”。

水资源“巨型项目”并非以色列独有。用加州智库太平洋研究所的共同创立者、科学家彼得·格莱克（Peter Gleick）的话说，长期以来，人类一直追随着一条“艰难道路”来解决水的问题——“几乎只依靠集中化基础设施来捕获、处理和运送供水”。当水短缺时，解决方案就是找到一个新的来源，或者从其他地方运来，这在古代要使用大量人工。

美索不达米亚南部的古代苏美尔人开挖运河。4000多年前，埃及农民依

靠尼罗河——当时灌溉系统的痕迹至今依稀可见。在整个罗马帝国，城市由人造水渠供水。在今天秘鲁的安第斯山脉中，印加人和他们的前辈建造了蓄水池和灌溉渠，并在山坡上挖出梯田。

现代技术意味着巨型项目已达到了古人梦寐以求的规模。中国的项目是最宏大的。长江三峡大坝于2012年全面投入运营，淹没了上千个村庄，迁移了120万人口。它创造的水库长达600公里。除了为世界上最大的发电站之一提供能源外，该项目还被吹捧为能够改善航运并防洪。然而，自一个世纪以前它作为一个想法被提出以来，争议就一直存在，一些人担心它对生物多样性、文化遗产乃至地震的影响。

让环保主义者心怀戒备的还有中国现代水利工程的另一个骄傲——南水北调（如图）。根据某些衡量方式，这是世界上最昂贵的基础设施项目。它是历史上最大的跨流域调水工程。它承认了一件事：尽管中国与空气污染的斗争广为人知，缺水才是这个国家最大的环境问题。北方地区缺水非常严重，有11个省达不到每人每年可用水量1000立方米这个国际上常用的水资源压力标准。这些省份包括中国五大农业省中的四个。

因此，自2014年以来，在位于干旱北方的北京，有三分之二的自来水和三分之一的供水总量通过运河和管道，从北京以南1400公里处长江支流上的一个水库送来。中国称该项目取得了无可比拟的成功，在其运营初期就造福了超过5000万人。它还只是一个更庞大项目的一部分，这个项目每年的调水量将达到450亿立方米，占中国用水总量的7%。然而，这让国内外的环保主义者和水文专家更加怀疑。新加坡李光耀公共政策学院的比斯瓦斯（Biswas）表示，该项目充其量只能为中国带来“几年的好处”。令人担心的是，它会干扰更紧迫、更重要的政策变化——削减用水需求，实际上可能还会助长浪费。和其他地方一样，当局担心向用户收取水的真实成本可能会引发抗议并威胁社会稳定。

类似的疑虑也笼罩着印度通过一个15,000公里的运河网络“互联”37条河流的计划。和中国一样，它最终的目标也是将水从丰水地区——例如北部的一些喜马拉雅山麓——调到缺水地区。这个计划已经讨论了几十年。现任

政府试图再推它一把。但即使在德里形成了政治共识来支持该计划，各邦之间围绕用水的紧张关系也会让它难以实现。

世界上有这么多城市如此缺水，“艰难道路”不会被抛弃。引水或是开发新水源似乎总是比迁移数千万人或完全重绘农业生产地图更容易。美国慈善机构自然保护协会2014年发表的研究报告揭示了问题的规模。其水资源紧张的城市清单上多数被印度和中国占据：德里排名第二，上海第四，北京第五。墨西哥城名列第三。但排名第一的是东京。其他富裕国家的城市也名列前茅，包括洛杉矶（第八）甚至伦敦（第15）。

但是，很少有人会不认同格莱克的一个观点：仅靠“硬”道路已经不够了，需要补充一种“软”方法——改善用水模式，而不是寻找新的供应来源。这意味着投资于地方设施、高效技术以及教育和培训。

如何做到这一点已是众所周知。如果缺水地区的人们——通常是女性——每天必须花费数小时从遥远的水源取水，那么就可能意味着要建造管道或钻井，并培训人们维护它们。在季节性的特大降雨伴随长久的干旱季节的地方，这意味着建造（或常常是修复）储水系统，理想情况是在蒸发量较低的地方。（在百慕大，全年雨量充沛，岛上的人们通过在屋顶收集雨水来满足生活用水需求，建筑法规规定屋顶必须为储水池留出空间。）而为确保饮用水不会致人死亡，必须停止排放未经处理的污水，而人们必须使用厕所。

正如以色列和新加坡所展现的那样，废水可以被视为可利用的资源，而不是要摆脱的问题。联合国可持续发展目标（SDG）于2015年定下了2030年的目标，它承认水资源管理必须“整合”，即协调运作负责水循环不同部分的各个机构以及其他对水有影响的政策。这有时需要跨境合作，但总是需要社区参与。

这些都不是什么高精尖的工作。这就是为何我们在与那些毕生致力于解决世界水问题的科学家、生态学家和慈善工作者对话时，常常都会听到似乎自相矛盾的论调。他们许多人都有一堆关于这个世界如何可恶地滥用和浪

费水的恐怖故事。但大多数人又会对长远的未来表达审慎的乐观。

世界银行甚至试图为联合国的SDG中与水有关的部分估价。它估计，“让所有人普遍而公平地获得安全又经济的饮用水”并且“为所有人提供充足而公平的卫生设施并终结露天排便”每年将需要耗费1140亿美元，其中69%用于卫生设施。因此，为全世界提供饮用水的费用每年为300多亿美元，大致相当于意大利或巴西的国防预算。

这1140亿美元的总额仅占世界银行研究的140个国家GDP的0.39%。然而，它比全球目前的支出高0.27个百分点。这就需要大幅重新分配资源。要实现这一目标，需要解决三个问题：所有权、定价以及政治优先级。在所有权方面，印度和以色列代表着两个极端。在印度，英国时代的法律可能很难废除，它赋予土地所有者对位于其地产上方和下方的所有水的权利。但应该有可能通过如惩罚过度开采地下水来减轻其影响。以色列将所有供水国有化有助于“整合”政策，但可能无法复制到其他地方。在许多国家，水权不太明确，要依靠诉讼裁决。例如，美国仍然在它于建国之初采用的两种不同学说之间拉锯：东部的“河岸权”把水权赋予靠近水体的人，而西部的“先占权”则把水权赋予最早的用户。

定价是更难的环节。世界上很少有公用事业公司向消费者收取所用的水的全部费用。哪怕有些国家这样做，人们在商店购买的商品的成本中也可能包含用水补贴。要说服人们意识到他们大量耗水的生活方式并为其付费，可能需要那种在许多地方帮助降低吸烟率的协同化运动。但因为水费影响所有人，这将是难上加难。另一方面，在一些意想不到的地方——例如柬埔寨首都金边——经验显示穷人愿意为清洁、可靠的水源付费。毕竟，在世界大部分地区，他们已经为肮脏、危险和不稳定的供水付出了太高的代价。

最后，即使世界被说服用更可持续的方式利用水资源，分配的问题依然存在。在全球范围内，很容易看出什么才是当务之急：数以亿计的人还无法获得安全和充足的饮用水和卫生设施。在国家和国家以下各级，总会有强大的利益集团展开游说以满足自己的需求，而那些无法获得清洁水的人几

乎无疑都是弱势群体。因此，正如WaterAid的高级政策分析师乔纳森·法尔（Jonathan Farr）所说，水资源管理——不管多可持续、多进步、多整合——首先要关心的是让人用到水。金钱不是决定性的制约因素。技术也不是。这是一个政治选择。 ■



Groundwater

Subterranean blues

Underground water has helped feed the world, but in many places it is dangerously depleted

IN 2004, WHEN Danmanti Devi was four years old, her mother took her to see a doctor because of pains in her legs. The doctor wrongly diagnosed polio. He could do no more than prescribe painkillers. Danmanti's legs are now deformed. Many others in Churaman Nagar, her 140-household hamlet of mud huts and a few "pukka" brick houses in rural Bihar, one of India's poorest states, also hobble on the knock knees or bow legs characteristic of a condition known as skeletal fluorosis. She is one of millions of Indians to suffer this, and to have contracted it merely from drinking water containing dangerous levels of fluoride. She is a victim of the over-exploitation of India's groundwater.

Fluoride, like arsenic, is present naturally in groundwater. It is harmless (or even beneficial) in small concentrations. The World Health Organisation (WHO) suggests a limit of 1.5 milligrams per litre. In Churaman Nagar, the water that comes from standpipes overseen by the local *panchayat* (village council) has 16mg.

The hamlet's inhabitants are among India's most downtrodden. They are *dalits*, once called "untouchables", at the bottom of the Hindu caste system. They eke a living as wage labourers in nearby brick kilns or by distilling moonshine.

In being poisoned by their drinking water, however, they are sadly typical. The most obvious danger—bacterial pollution—is a "second-order problem", says V.K. Madhavan, chief executive in India for WaterAid, a British charity. More fundamental is contamination by arsenic, nitrates,

salinity and fluoride. Some of this is natural, some a consequence of industrial effluent, and of seepage from landfills, septic tanks, leaky underground gas tanks and the overuse of fertilisers and pesticides. But the most intractable difficulty is the pumping of groundwater from ever deeper below the surface. The deeper the water, the more likely it is to be contaminated by chemicals such as arsenic seeping downwards.

As long ago as 2002, the WHO called the effects of arsenic contamination of groundwater in Bangladesh “the largest mass poisoning of a population in history”. Tens of millions are at risk in neighbouring India, too. Efforts to save people from the bacterial diseases carried by surface water leave them condemned to longer-term dangers hidden in the groundwater. Arsenic has been linked to cancers of the skin, gallbladder and lungs.

In the scheme of things, the extraction of groundwater for drinking and bathing by India’s poor, like those in Churaman Nagar, is a minor cause of its over-exploitation. Far more important is irrigation. Almost 60% of India’s irrigation needs are now met from groundwater. The Green Revolution which, in the 1970s, transformed India’s ability to feed itself and turned it into a big food exporter, relied on tube wells, powered by electric pumps.

It also turned India into the world’s biggest extractor of groundwater. The five largest such users, which include America, China, Iran and Pakistan, account for 67% of total extractions worldwide. In India, the water is free. A law from 1882 gives every landowner the right to collect and dispose of all water on and under his land. The cost of the electricity needed to pump it ever farther to the surface is one constraint. But Indian politicians love to lavish cheap or free electricity on rural voters when elections loom (as, in India, they often do). The Green Revolution saw agriculture’s share of total energy use climb from 10% in 1970 to 30% by 1995.

This freed many farmers from the fickle monsoon—India usually receives

more than 70% of its annual rainfall in the annual downpours from June to September. In Churaman Nagar, and elsewhere in Bihar, residents believe the rains are weaker than they were, though scientists have so far measured only a tiny decline in the rains in recent years.

In India and elsewhere the easy availability of groundwater has encouraged the cultivation of thirsty crops in water-stressed areas. Starting under British rule, irrigation canals and groundwater-extraction turned the arid lands of Punjab into India's agricultural powerhouse. Similarly, in China, the dry plains of the north-east now produce 60% of the country's wheat and 40% of its maize on an area with 4% of its water resources.

As Sunil Amrith, a historian at Harvard University, notes in his new book, "Unruly Waters", the half-century since the 1960s has reversed a centuries-old pattern in which agrarian wealth lay where rains were most abundant. Instead, Israel, Punjab and Manchuria have actually become net exporters of water, if you include what hydrologists call "virtual" water used in the production of a crop or good. In other words, they sell more water in the form of crops and products than they import in that form or extract from their own sources of water. Mr Amrith notes the "most bitter of ironies" in this agricultural miracle: intensified production means that more land is planted with crops, which reflect more solar radiation than forests. The land becomes cooler, weakening the temperature differences with the sea that drive the circulation of the monsoon. So measures taken to protect farmers from the vagaries of the monsoon have in fact themselves helped make the rains more fickle.

This phenomenon is not confined to India. Across the world, the need for more food production encourages deforestation and the use of more land for agriculture. That in turn will increase demand for irrigation which, as precipitation becomes more erratic and surface water is over-used, will probably rely ever more on groundwater. The long-term impact of this is

uncertain. Research led by Mark Cuthbert, of the School of Earth and Ocean Sciences at Cardiff University, found that groundwater systems are likely to take far longer fully to respond to differences induced by climate change than does surface water. Only half the world's groundwater flows are likely to find a new equilibrium within 100 years. The arid regions where water is scarce are often where response times are longest. So the full impact of withdrawals now may not be felt for decades, or much longer in some cases. ■



地下水

地下蓝调

地下水帮助养活了世界，但在许多地方已经危险地消耗殆尽【专题报道《水》系列之四】

二〇〇四年，丹曼蒂·德维（Danmanti Devi）四岁。因为腿疼，母亲带她去看医生。医生错误地诊断为脊髓灰质炎。除了开止痛药他什么也做不了。丹曼蒂的腿现在变形了。她住在印度最贫穷的邦之一哈尔邦的朱拉曼村，村里有140户人家，住在土屋和少量“普卡”【译注：意为“坚固的”】砖房里。村中很多人也都因为氟骨症造成的X型腿或O型腿而步履蹒跚。她是患这种病的数百万印度人中的一员，并且完全是因为饮用水含有危险水平的氟化物而得病的，是印度地下水过度开采的受害者。

与砷一样，氟化物也天然存在于地下水中。它在低浓度下是无害的（甚至是有益的）。世卫组织建议的上限为每升1.5毫克。在朱拉曼村，当地“潘查亚特”（乡村长老会）监管的水塔的水单位含量为16毫克。

这个村庄的居民属于印度受压迫最深的群体。他们是贱民，一度被称为“不可接触的人”，处在印度教种姓制度的底层。他们在附近的砖窑中打工，或是蒸馏私酒来维持生计。

然而，在饮用水中毒上，他们却成了可悲的典型。细菌污染这种最明显的危险是“二阶问题”，英国慈善机构WaterAid的印度首席执行官马达范（V. K. Madhavan）说。更重要的是砷、硝酸盐、盐分和氟化物的污染。其中一些是自然发生的，一些则来自于工业废水，以及垃圾填埋场、化粪池、地下储气罐泄漏，还有化肥和农药的过度使用。但最棘手的困难是从地表下更深处抽取地下水。水源越深，越容易被向下渗透的砷等化学物质污染。

早在2002年，世卫组织就称孟加拉国地下水砷污染的影响是“历史上最大规模的人口中毒”。邻国印度也有数千万人处于危险之中。取用地下水原

本是为了让人们避开地表水携带的细菌性疾病，结果却又把他们置于隐藏在地下水里的长期危险中。已知砷与皮肤癌、胆囊癌和肺癌有关。

放到全局中看，朱拉曼村村民等印度穷人抽取地下水来饮用和洗澡只是地下水过度开采的次要原因。一个重要得多的原因是灌溉。目前，印度近60%的灌溉需求都依靠地下水来满足。上世纪70年代，绿色革命让印度自给自足的能力大为改观，将其变成了一个食品出口大国。而这场革命依赖由电泵驱动的管井。

这场革命也使印度成为了世界上最大的地下水开采国。包括美国、中国、伊朗和巴基斯坦在内的五大用水国占了全球总开采量的67%。在印度，地下水是免费的。1882年的一项法律赋予每个土地所有者收集和处置其土地上和土地下所有水的权利。用泵把水从越来越深的地下送到地面所需的电力成本是一个限制因素。但是，每当接近选举时（在印度是常事），印度政客们喜欢向农村选民派送廉价或免费的电力。绿色革命使农业在总能源使用中的份额从1970年的10%上升到1995年的30%。

这使得许多农民不再受制于变幻无常的季风——印度通常在每年6月至9月的暴雨中获得超过70%的年降雨量。在朱拉曼村以及比哈尔邦的其他地方，居民们认为降雨量比以前小了，尽管科学家迄今只测量到近年降雨量微小下降。

在印度和其他地方，随处可得的地下水促使人们在缺水地区种植耗水作物。从英国统治时期开始，灌溉渠道和地下水开采将旁遮普省的干旱土地变成了印度的农业火车头。同样，在中国，东北的干燥平原如今在水资源占全国4%的土地上生产出了60%的小麦和40%的玉米。

哈佛大学历史学家苏尼尔·阿姆里斯（Sunil Amrit）在他的新书《不羁的水》（*Unruly Waters*）中指出，自上世纪60年代以来的半个世纪已经扭转了一个持续了数百年的模式，即农业财富处于降雨最丰富的地方。相反，如果你算上水文学家所谓的用于生产作物或商品的“虚拟”水，以色列、旁遮普和中国东北实际上已成为水的净出口地。换句话说，它们以庄

稼和产品的形式出售的水，比他们以这种形式进口或从他们自己的水源中开采的更多。阿姆里斯指出了这个农业奇迹中“最痛苦的讽刺”：扩大生产意味着更多的土地种植了作物，这比森林反射了更多的太阳辐射。陆地变得凉爽，缩小了与海洋的温度差异，而温差推动着季风的循环。因此，保护农民免受季风不定性影响的措施实际上本身也让降雨更加变幻无常。

这种现象并不局限于印度。全世界都需要更多的粮食生产，这鼓励人们砍伐森林，将更多土地用于农业。这反过来将增加对灌溉的需求，因为随着降水变得更加不稳定以及地表水被过度使用，灌溉可能会更多地依赖地下水。这种做法的长期影响尚不确定。由卡迪夫大学地球与海洋科学学院的马克·卡斯伯特（Mark Cuthbert）领导的研究发现，地下水系统完全响应气候变化引发的差异所花的时间很可能比地表水长得多。世界上只有一半的地下水流较有可能在100年之内找到新的平衡。缺水的干旱地区往往是响应时间最长的地区。因此现在抽取地下水的影响可能在几十年内不会完全感受到，在某些情况下花的时间还要长得多。 ■



Desalination

Worth its salt?

Manufactured water can supplement the natural stuff, but never replace it

THE SOREK desalination plant, about 15km south of Tel Aviv, is eerily unpopulated. This is the largest such plant in the world, producing as much as 230m cubic metres of desalinated water a year—about one-fifth of Israel's domestic water supply. Yet only 20 staff are needed at any time to operate it. Seawater is piped in from over a kilometre out at sea. It is given a preliminary clean in a series of large tanks where it is filtered slowly through sandbeds before being pumped through “reverse osmosis” membranes (pictured).

These are based on a design first patented in the early 1960s by Sidney Loeb, an American scientist who moved to Israel and saw his invention eventually oust competing methods and become the dominant desalination technology not just in his new homeland, but around the world, accounting for 69% of the output of desalinated water. They certainly seem effective. The water is absolutely tasteless. Indeed, what it lacks—calcium and magnesium, for example—causes more worries than pollutants.

But these are minor quibbles, easily fixed: at first sight, desalination seems the answer to the world's water needs. Seawater is not going to run out. Indeed, sea levels are already rising because of climate change. To be sure, desalination is catching on. A recent synthesis of available data by Manzoor Qadir, of the Institute for Water, Environment and Health at the UN University (UNU), and other scholars, found that 15,906 plants are in operation worldwide, producing 95m cubic metres a day of desalinated water. Israel already has five plants and is planning another two. The country has a target of increasing annual production from 600m cubic

metres a year now to 1.1bn in 2030. In global league tables, however, Israel remains a relatively small producer, with a 2% global share, compared with Saudi Arabia (15.5%), the United Arab Emirates (10.1%) and Kuwait (3.7%). Nearly half (48%) of global production is, not surprisingly, in the Middle East and north Africa. China and America also have large capacities (see chart). Eight countries (the Maldives, Singapore, Qatar, Malta, Antigua, Kuwait, the Bahamas and Bahrain) produce more desalinated water than they withdraw from natural sources.

That breakdown of where desalination is used hints at two reasons it is not a panacea. One is geography. If the sea is the feedstock it will be too costly to transport desalinated water long distances inland—to western China, for example. Secondly, even for coastal regions, desalination is very expensive, which explains why two-thirds of existing facilities are located in high-income countries. The expense comes partly in the capital cost of the plants. Sorek required a total investment of about \$400m. In Israel the desalination industry marks a departure from one of the cardinal principles of its water-management policies—that all water is a public good. From the moment a raindrop leaves a cloud it is the state's property. However, four out of the five desalination plants are privately owned.

The second big reason for the expense is the energy they use—typically between one-half and two-thirds of the cost of desalinated water. Israel has managed to achieve relatively good energy efficiency, partly through the use of innovative membranes. The price of Sorek's water is \$0.50-0.55 a cubic metre, down from \$0.78 for water from the first Israeli plant built on the public-private model at Ashkelon, which opened in 2005.

The UNU paper concentrated on a third drawback to desalination: what happens to the salty sludge (known as brine) left behind by the pristine, desalinated water. At Sorek, as is typical, it is taken out by a pipe and

discharged nearly 2km out at sea. Around the world, desalination plants produce nearly 50% more brine (141.5m cubic metres a day) than freshwater.

The researchers worry about the threat that uncontrolled discharge of brine could cause to marine life. At the very least it raises the salinity of the surrounding seawater, depleting the dissolved oxygen. But in some places it may be accompanied by toxic chemicals used in the treatment process. More optimistically, they also point to opportunities to use reject brine, for example, in aquaculture, where it has achieved increases in fish biomass of 300%.

The sea is not the only source of manmade water in Israel. It also treats and reuses 86% of its waste water. In this it claims to be far ahead of the rest of the world—with the next-highest recycler being Spain, with just 20%. This is cheaper than desalinated water and is primarily used for agriculture (which accounts for 52% of Israel's water usage), with about 10% returned to “nature” (eg, to increase river flow), or used for putting out fires. That leaves the expensive stuff to flow out from the taps in people's houses. In this area Singapore even goes one better: it drinks its treated sewage. “NEWater” is reclaimed wastewater treated with advanced membrane technologies and ultra-violet disinfection. Its four plants can meet up to 30% of Singapore's needs—three times as much as its local catchment.

All of this costs money. Both Israel and Singapore are unusual in trying to recoup the full cost from the consumer, though Singapore subsidises lower-income users. Pricing is a reminder to consumers in both places of water's importance to national security, and of the truth of an observation made by Mr Schor of the Israeli water authority: “Desalination is the most expensive way to produce a cubic metre of water. The cheapest way is to save it.” ■



海水淡化

除盐有所值？

人造水可以补充自然水，但永远无法取代它【专题报道《水》系列之五】

索莱克海水淡化厂位于特拉维夫以南约15公里处，里面人少得诡异。这是全球最大的海水淡化厂，每年生产多达2.3亿立方米的淡化水，贡献了以色列国内供水量的约五分之一。然而它在任何时候都只需要20名工作人员。海水从离岸一公里多的地方用管道输送过来，先在一串大罐子中缓慢流经沙床过滤，完成初步净化，再被泵入“反渗透”膜装置中（如图）。

这些设备采用在上世纪60年代初获得专利的设计，发明者是移居以色列的美国科学家西德尼·勒布（Sidney Loeb）。他目睹自己的发明最终淘汰了其他竞争性工艺，在他的新故乡乃至全世界都成为了主导的海水淡化技术，占到了淡化水总产量的69%。它们看起来确实有效。生产出的水绝对无味。事实上，它缺少的成分，如钙和镁，比它产生的污染物引发了更多担忧。

但这都是白璧微瑕，很容易解决。乍看上去，海水淡化似乎为世界用水需求提供了答案。海水取之不竭。事实上，由于气候变化，海平面还上升了。可以肯定的是，海水淡化正流行开来。联合国大学水资源、环境与健康研究所（UNU-INWEH）的曼苏尔·卡迪尔（Manzoor Qadir）及其他学者最近综合了现有数据，显示全世界有15,906家工厂投产，每天产出9500万立方米的淡化水。以色列已经有五家工厂，还有两家正在规划。该国的目标是到2030年将年产量从目前的每年6亿立方米提高到11亿立方米。然而，在全球排名中，以色列还是相对较小的生产国，占全球产量的2%；沙特阿拉伯占15.5%，阿联酋10.1%，科威特3.7%。全球近一半（48%）产量出自中东和北非，这不足为奇。中国和美国的产能也很大（见图表）。八个国家（马尔代夫、新加坡、卡塔尔、马耳他、安提瓜、科威特、巴哈马和巴林）生产的淡化水量超过了取自天然水源的水量。

把使用海水淡化技术的地区细分一下，就可以看出它并非灵丹妙药的两个原因。一是地理条件。如果海水是原料，那么把淡化水远距离输送到偏远内陆地区——比如中国西部——成本就太高了。其次，即使在沿海地区，海水淡化仍然非常昂贵，这就是为什么三分之二的现有设施都位于高收入国家。费用的一部分是工厂的资本成本。索莱克需要约四亿美元的总投资。在以色列，海水淡化产业脱离了该国水管理政策的一项根本原则，即所有水都是公共物品。自雨滴离开云层那一霎那起，它就是国家的财产。然而五家海水淡化厂有四家是私有的。

烧钱的第二大原因是能耗大——通常占淡化水成本的一半到三分之二。以色列已经想办法实现了较高的能效，部分要归功于创新的反渗透膜。索莱克生产的水售价为每立方米0.50到0.55美元，低于以色列第一家淡化水厂的0.78美元。那一家水厂位于阿什凯隆（Ashkelon），以公私合营模式创立，于2005年开工。

联合国大学的论文聚焦于海水淡化的第三个缺点：对纯净淡化水的副产品——盐泥（称为卤水）的处理。索莱克的方法很典型。用一根管子将它输送出去，在离岸近2公里处排掉。在世界各地，海水淡化厂产生的卤水（每天1.415亿立方米）比淡水多近50%。

论文的研究人员担心这种不受控制的卤水排放可能对海洋生物带来威胁。它至少会提高周围海水的盐度，耗尽水中的溶解氧。但在某些地方，它可能还带着工厂在处理过程中使用的有毒化学物质。较乐观的一面是，研究人员同时也指出了利用废弃卤水的机会，例如在水产养殖中，它令鱼类的生物量增加了300%。

大海不是以色列生产人造水的唯一来源。该国还处理和再利用了86%的废水。在这方面它声称自己远远领先于世界其他地区——回收比例第二高的国家西班牙仅为20%。这种水比淡化水便宜，主要用于农业（占以色列用水量的52%），有约10%返回“自然”（比如增加河川径流）或用于灭火。这样那些昂贵的水就可以留作居民用水。在这方面新加坡更胜一筹：把处理过的污水拿来喝。“新生水”（NEWater）是采用先进膜技术和紫外线消

毒处理的回收废水。四家新生水厂可满足新加坡30%的用水需求，是当地汇水区贡献水量的三倍。

所有这些都要花钱。以色列和新加坡都试图从消费者那里收回全部成本（虽然新加坡向低收入用户提供补贴），这种做法并不常见。对于这两个地方的消费者，定价提醒他们水对国家安全的重要性，还有以色列水务局的朔尔表达的一个事实：“要生产一立方米的水，海水淡化是最昂贵的方式。最便宜的方式是省出来。”■



India's economy

Modifications

Despite high expectations, Narendra Modi's economic policies have not made a decisive break with the past

NARENDRA MODI, India's prime minister, stormed to power so decisively in 2014 that it is difficult now to imagine any other outcome. But try. Imagine that the United Progressive Alliance (UPA), a tired coalition led (if that is the word) by the Congress party, had limped to victory instead. What economic policies might it have pursued in a third term? This is not an entirely idle question. Any assessment of Mr Modi's economic record in his first stint as prime minister requires a counterfactual scenario against which to measure it. A third UPA government is one such baseline.

A Congress-led government would no doubt have built on some of its existing pet initiatives, such as a job guarantee, providing employment on public works to rural households, and an identification scheme, giving every Indian a unique identity number based on a fingerprint or an iris scan. It presumably would have allowed the central bank to continue to fight against inflation, aided by a drop in oil prices.

A third UPA government would surely have shied away from reforming India's onerous labour laws or privatising poorly run public enterprises, like Air India. It probably would also have dallied with resolving the banking system's bad loans, fearing it might otherwise be condemned for bailing out crony companies.

As the next election approached, the UPA government would no doubt have indulged in giveaways to farmers (as in previous political cycles) and disguised its failure to hit fiscal targets through budgetary tricks. GDP growth and job creation would probably have improved little.

The UPA never, of course, got this third bite of the cherry. It lost instead to Mr Modi, who promised a radical alternative to this steady-as-she-goes approach. But despite these bold pledges, Mr Modi's first term in charge of the economy has proved to be rather similar to the hypothetical third UPA term described above. Much of what probably would have happened if Mr Modi had somehow lost also happened after he won.

The parallels loom large. GDP growth has averaged about 7%, quicker than any other big economy but little different from the average for the five years before Mr Modi entered office. There have been no big reforms of land or labour markets; no juking of the employment guarantee or the identity scheme; and a costly delay in tackling banks' bad loans. The government's proudest economic feat was to implement a nationwide value-added tax that Congress had previously proposed.

This continuity should not be a surprise. Although Mr Modi's party won a rare majority in parliament, India's political system still imposes checks on his power through the upper house, the courts, public auditors and the states, which have sole or joint responsibility for many of the reforms India needs. And although the Modi vote was a plea for more jobs and fewer scams, it was not a vote for liberal economics per se. Capitalism in India remains "stigmatised", notes Arvind Subramanian, a former economic adviser to the government, in his new book, "Of Counsel".

Mr Modi did manage some departures from the baseline. It is hard to imagine the UPA cutting red tape as zealously (India has risen 65 places in the World Bank's rankings of the ease of doing business since 2014) or courting foreign-direct investment (FDI) as assiduously. He contributed to the conquest of inflation by removing some fuel subsidies and limiting increases in the minimum prices for crops. His government helped open bank accounts for the poor and passed a welcome new bankruptcy law for firms. Corruption has been reduced.

Sadly, fertiliser subsidies persist, minimum crop prices have jumped again, and the new bankruptcy system will take about six years to clear the backlog of cases at its present pace, reckons Mr Subramanian. Planned changes to e-commerce rules could hobble foreign firms operating in the country, such as Amazon and Walmart.

Mr Modi's most innovative decision was also his worst: the abrupt cancellation of high-denomination banknotes. The aim was to wipe out "black money", piles of ill-gotten cash stashed outside the banking system. The government was therefore surprised when most of the notes were returned to the banks, before they expired, by long queues of depositors. It is a miracle the stunt did little lasting harm to the economy, if official data are to be believed.

And that, sadly, is a real question. The government's other alarming innovation has been to discontinue, revise or delay some official data that do not flatter it. It tried to prevent publication of a new report on employment, prompting two members of the country's statistical-oversight body to resign. They also objected to the manner in which revised GDP data were released (see chart). The world will never know what would have happened under a third UPA government. And with less reliable official statistics, it will be harder to know what has happened under Mr Modi, too. ■



印度经济

莫氏小改

尽管被寄予厚望，莫迪的经济政策并未真正突破过去

印度总理纳伦德拉·莫迪在2014年以压倒性的优势当选，以致于我们今天很难想象当时除此之外还能有什么其他结果。但还是不妨试想一下：假如当时国大党领导的（如果可以称之为“领导”的话）运转不良的统一进步联盟（UPA）勉强获胜，那么它在自己的第三个任期内可能实行怎样的经济政策？这一问题并非毫无意义。任何对莫迪首个总理任期经济成就的评价，都需要用一个反事实的设想来对比衡量。假想中的第三届UPA政府就是这样一个衡量基准。

国大党领导的政府无疑会沿袭某些它所钟爱的既有项目，比如就业保障和身份识别计划，前者为农村家庭提供公共工程的工作机会；后者则是根据指纹或虹膜扫描为每个印度人提供一个独一无二的身份号码。它应该会让央行借助油价下跌继续抗击通胀。

第三届UPA政府肯定不会对印度繁复的劳动法实施改革，或将印度航空等经营不善的公营企业私有化。它倒也可能在解决银行系统不良贷款的问题上做做样子，因为担心自己可能会被谴责为有裙带关系的企业纾困。

随着下一届选举的临近，UPA政府无疑又会采用它在过去的政治周期中使用的伎俩，大肆给农民发放补贴，并通过在预算上做手脚来掩盖自己未能实现财政目标的事实。GDP增长和创造就业两方面可能几乎毫无改善。

当然，UPA从没得到过这第三次机会，而是输给了莫迪。莫迪曾经承诺以大刀阔斧的改革代替这种循序渐进的做法。然而，尽管做出了这样大胆的承诺，事实证明莫迪掌管印度的第一个任期与假想的UPA第三任期很相似。如果当时莫迪因某种原因落选，那么随后可能出现的很多情况在他获胜后也发生了。

相似的程度严重。GDP平均增长率约为7%，超过其他任何大型经济体，但与莫迪上台前的五年里的平均增长率相差无几。土地或劳动力市场没有发生重大改革；就业保障或身份识别计划没有废止；处理银行不良贷款的行动拖延，代价高昂。而政府最引以为荣的经济成就则是实施了此前由国大党提出的全国性增值税。

这种政策连续性不足为奇。尽管莫迪的政党在议会中赢得了罕见的多数席位，但印度的政治体系仍然通过上议院、各级法院、公共审计机构和各邦来制约总理的权力，这些机构对印度所需的诸多改革都负有单独或共同的责任。虽然选民们投票给莫迪代表着对增加就业机会和减少欺诈的诉求，但并不意味着他们想要自由主义经济本身。政府前经济顾问阿尔温德·苏布拉曼尼（Arvind Subramanian）在他的新书《法律顾问》（Of Counsel）中指出，资本主义在印度仍然“不受待见”。

莫迪确实设法做到了一些第三届UPA政府不会去做的事情。很难想象UPA会像他一样热衷削减繁文缛节（自2014年以来，印度在世界银行的营商环境排名中上升了65位），或者如此不遗余力地吸引外国直接投资（FDI）。莫迪通过取消部分燃油补贴和限制粮食最低价格的上涨，控制了通货膨胀。莫迪政府帮助穷人开设银行账户，并通过了一项广受欢迎的新公司破产法。腐败现象已经减少。

苏布拉曼尼认为，遗憾的是，化肥补贴依然存在；粮食最低价格再次飙升；以目前的速度，新的破产制度将需要六年左右的时间才能清除所有积案。计划对电子商务法规进行的改革可能会阻碍亚马逊和沃尔玛等外国公司在印度开展业务。

突然废止大面额纸币是莫迪最具革新性、却也是最糟糕的决定。其目的是消灭“黑钱”，即藏匿于银行体系之外的大量不义之财。结果回收至银行的大额纸币大部分却是来自排着长队、好赶在截止期前换钞的储户，令政府大感意外。如果官方数据可信，这一危险之举并没有对经济造成什么持久的损害，简直是个奇迹。

不幸的是，官方数据是否可信还真是个问题。莫迪政府另一项令人震惊的创新便是中止、改动或延迟发布一些对其不利的官方数据。政府曾试图阻止发布一份新的就业报告，引发统计监督机构的两名成员辞职。这两人还反对修改GDP统计方法（见图表）的做法。世界永远无从得知第三届UPA政府领导下的印度会发生什么。而如果官方数据变得更不可靠，那么也将更难知道莫迪执政期间印度究竟发生了什么。 ■



Big energy and big tech

Oil rush

Technology firms stampede to woo the energy industry

A GIANT HOTEL in Houston teemed with oil-and-gas executives on March 11th, the start of a CERAWeek. IHS Markit, a research firm which organised the shindig, lined up America's energy secretary, the chief executives of BP and Chevron (two of the world's largest oil companies), and other luminaries. Among the dark suits was an open-collared newcomer: Andy Jassy, head of Amazon Web Services. Speaking to a vast ballroom, he extolled the cloud-computing giant's virtues of moving quickly and learning from failure. Mr Jassy was there not just to offer management advice to what were once the world's most valuable companies. He was also after their custom.

Energy companies are keen to produce oil and gas more efficiently, as they grapple with volatile prices and uncertain long-term demand. Digital investments promise to cut costs and boost output. Tech giants like Amazon, Microsoft and Alphabet, as well as a clutch of startups, want to help. For all of Silicon Valley's professed support for clean power over fossil fuels, the energy industry represents a huge opportunity. Oil companies' valuations are dwarfed by tech firms', but their coffers remain deep (see chart).

Countless industries claim that big data and artificial intelligence (AI) will usher in new prosperity. The trend in oil and gas is nevertheless notable, partly because it is marked, partly because it comes late. For years, many companies remained focused on increasing reserves of oil, not extracting it cost-efficiently. Managers struggled to use data siloed in different parts of the company or in different parts of the world.

That is changing. Abundant shale oil has made the hunt for reserves less urgent than the need to protect profits. Shale also highlights the utility of new analytics, says Paul Goyden of BCG, a consultancy, as data gush from thousands of wells studded through Texas, North Dakota and other rich fields. Falling costs of sensors, storage and computing power have made digital investments even more attractive.

Early projects are starting to bring results. BP is combining real-time information from sensors with its own models and analytics to optimise output—it estimates such digital tools boosted oil production by more than 30,000 barrels per day last year. Yuri Sebregts, the chief technology officer for Shell, says it could take months for a geoscientist to map faults underground. Software can now sort through seismic data, performing the same task in a few hours for about \$20.

As such efforts ramp up, energy firms are pairing in-house expertise with that of the tech industry. Microsoft has courted them the longest. In February ExxonMobil announced that its sprawling shale operations in the Permian basin, in Texas, would use Microsoft's cloud, AI and other services. That may help ExxonMobil to drill and deploy staff more efficiently, and limit methane leaks. Amazon is trying to catch up. The size of its oil-and-gas team has tripled in recent years, and the company is working with energy giants such as Halliburton and Shell. In Houston it showed off data-storage kit that was continuously showered with water, to prove its mettle in inhospitable oilfields.

Alphabet, Google's parent company, is a relative laggard, but hopes to change that. Last year Google Cloud hired Darryl Willis, a former BP executive, to lead a new energy group. He estimates that the industry is using 1-5% of available data. Alphabet has signed deals with Total of France, as well as Anadarko, an American oil company that is testing automated drilling and has an AI specialist on its board of directors.

Energy companies feel somewhat jittery about working with large tech firms—and not just because the Silicon Valley stars have outshone them. Automation raises the risk of hacking. Tech firms' ballooning ambitions raise eyebrows. One questioner asked Mr Jassy if Amazon would itself start producing oil and gas. He said no, as the room giggled nervously.

It is not just the oilmen who are uneasy about the partnerships. Amazon, Microsoft and Google rely on clever young coders, who dislike working for controversial industries. "We are a partner and we follow the energy partner's needs," says Caglayan Arkan, who oversees Microsoft's work with the energy sector. But in February Microsoft employees demanded that it cancel a contract to sell augmented-reality headsets to America's military. Last year Google decided not to renew a contract with the Pentagon, after some staff argued the company should not be in the "business of war". Tech workers may yet insist they not be in the business of fossil fuels either. ■



能源和科技巨头

石油热

科技公司争先恐后地争取能源产业的垂青

上月11日，剑桥能源周（CERAWeek）开幕，油气企业高管云集休斯顿一家大型酒店。这个由研究公司IHS Markit组织的盛大聚会邀请到了众多名人，包括美国能源部长，以及全球最大的两家石油公司英国石油（BP）和雪佛龙的首席执行官。在一众身着深色西装的与会者当中，有一位敞着领口的新面孔：亚马逊云服务平台AWS的主管安迪·雅西（Andy Jassy）。面对硕大的会场，他盛赞这个云计算巨头行动迅速以及能从失败中学习的优点。雅西参会并不仅仅是为了向各家曾经的全球最高市值公司提供管理建议。他还想和它们做生意。

能源企业要努力应对价格波动和长期需求充满变数的局面，因而迫切想提高油气生产效率。数字投资有望降低成本、提高产量。亚马逊、微软和Alphabet这样的科技巨头以及一小批创业公司希望能帮助它们一臂之力。尽管硅谷声称自己倡导的是清洁电能而不是化石燃料，但能源产业蕴藏着巨大的商机。石油公司的估值远不及科技公司，但它们的钱袋子始终是鼓鼓的（见图表）。

声称大数据及人工智能（AI）将为自己带来新繁荣的行业数不胜数。不过油气行业的动向值得关注，一方面是因为该行业地位昭然，一方面也因为它在采用新技术方面慢了一步。多年来，很多公司仍旧专注于提高石油储量，而不是用符合成本效益的方法开采石油。管理者也难以利用那些孤立地分散在公司不同部门或世界各地的数据。

情形正在改变。有了丰富的页岩油储备后，探寻储备的紧迫性就落在了保护利润的需要之后。波士顿咨询公司（BCG）的保罗·戈伊登（Paul Goyden）表示，随着遍布德州、北达科他州和其他储量丰富的油田的成千上万个油井产生出大量数据，页岩油还突显出新分析方法的实用性。传

感器、存储和计算成本的下降更是增加了数字投资的吸引力。

早期项目已开始开花结果。BP正将来自传感器的实时信息与自己的模型和分析方法相结合，以优化产出。它估计，这样的数字工具去年令石油日产量增加超过三万桶。壳牌的首席技术官尤里·赛博雷茨（Yuri Sebregts）说，一名地球学家测绘地下断层可能要耗时数月。如今软件可以查看并整理地震数据，短短几个小时便可完成同样的任务，成本约20美元。

随着能源企业加大力度采用这类工具和技术，它们开始让本行业和科技行业各自的专长“强强联手”。微软追逐它们的时间最久。2月，埃克森美孚宣布，其位于德州二叠纪盆地的庞大页岩油项目将采用微软的云、AI以及其他服务。这也许能帮助该公司更高效地钻取石油和部署人员，并控制甲烷泄露。亚马逊正在努力追赶。近些年其油气团队的规模已扩张至原来的三倍，且正与哈里伯顿（Halliburton）和壳牌等能源巨头合作。在休斯顿，它展示了持续被淋水的数据存储套件，以证明该设备无惧油田的恶劣环境。

谷歌母公司Alphabet的行动相对滞后，但希望改变局面。去年，谷歌云聘请了前BP高管达里尔·威利斯（Darryl Willis）来领导一个新的能源团队。他估计能源行业利用了1%到5%的可用数据。Alphabet已与法国的道达尔和美国石油公司阿纳达科（Anadarko）签订协议。阿纳达科正在测试自动化钻探，其董事会里还有一位AI专家。

能源企业对于和大型科技公司合作还是怀揣几分不安。原因不仅仅是硅谷明星们的光芒盖过了它们。自动化增加了被黑客攻击的风险。而科技公司日益膨胀的野心也引人侧目。一名提问者问雅西，亚马逊自己会不会开始生产石油和天然气。会场内发出一阵不安的轻笑声。他说不会。

对这种合作关系感到不自在的不止石油商。亚马逊、微软和谷歌靠的是年轻有为的程序员，而这些人不喜欢为有争议的行业工作。“我们作为合作伙伴，要遵照能源合作伙伴的需求行事。”微软的卡格拉雅恩·阿尔肯（Caglayan Arkan）说。他负责监督微软与能源行业的合作。但在2月，微

软的员工要求公司取消向美国军方出售增强现实头戴设备的合同。去年，谷歌一部分员工指出谷歌不应参与“战争生意”，随后该公司决定不与五角大楼续订合同。科技从业者可能也会坚持自己不参与化石燃料的生意。 ■



Saving water

Waste not, want not

The best way to solve the world's water woes is to use less of it

IF THE WORLD is to reduce its use of water, the most obvious area in which to look for savings is where most water goes: agriculture. How much water this accounts for varies enormously from country to country. In Britain, which is a huge importer of embedded or “virtual” water (that consumed in producing any crop or product) accounting for as much as two-thirds of its water needs, it is relatively little. In Egypt it is about 84%, and in India as much as 90%. Viewed more broadly, as a global water “footprint”—a concept developed by Arjen Hoekstra, a Dutch scientist—including not just the direct uses of water in agriculture, but the indirect ones all the way along the chain from field to fork, agriculture accounts for 92%.

Much of this is wasted. “Flood” irrigation systems, where water is released to inundate fields or furrows, lose water to evaporation, or to percolation (ie, to the soil itself before it can be absorbed by the crop’s roots). A common estimate is that flood-irrigation squanders 50% of the water it releases. Sprinkler systems can help with efficiency. But these, too, are imprecise, vulnerable to the wind and to loss of water through evaporation.

Far more effective are “drip” irrigation systems introduced in Israel in the 1960s and since spread around the world. As the name suggests, these direct limited amounts of water to the plants themselves, so that they get enough but not too much. Avi Schweitzer, chief technology officer of Netafim, an Israeli company that sells drip-irrigation equipment and technology in 110 countries, says that, by minimising both evaporation and percolation, it manages to achieve 95-97% efficiency in delivering the water to the photosynthetic process.

This saves large amounts of water and increases yields. Precise amounts of nutrient and crop-protection chemicals can be added to the irrigation water. And the new generation of systems employ remote sensors that can monitor weather, soil and plant conditions and calibrate how much water is delivered. Mr Schweitzer, however, concedes that, for now, the high capital cost precludes the use of drip irrigation in much of the world, and limits its use to cash crops. The goals for the future are to reduce costs for commodity crops such as grains, and to improve precision even more. The market will expand. Climate change is likely to mean that more rain-fed farmland—at present estimated to make up about 80% of the world's total—will be irrigated.

Greater efficiency, however, comes with risks of its own: that farmers persist in planting thirstier crops than is rational in an arid climate, or switch to more water-intensive ones. Even in Israel, just south of the shrinking Sea of Galilee, swathes of irrigated land are covered in plastic-draped banana plantations.

So reducing the water consumed by agriculture will depend not just on improving efficiency, but on rationalising crop-planting. And that in turn will depend on demand and hence on changes in diet and even fashion. A foretaste of controversies to come was a furore that arose last year over avocado-eating—criticised by many as an emblem of selfish millennial hipsterdom. Avocado consumption in America increased by 300% (to about 4.25bn avocados a year) from 2010 to 2015. Farmers scrambled to meet demand, including in very dry places, such as some parts of Chile and in Mexico, where the craze was blamed for a surge in deforestation. A kilo of avocados can need up to 2,000 litres of water, so local sources were strained, and activists mobilised to campaign against the culinary fashion.

In future, people around the rich world at least are likely to be made more aware of the water footprint of what they eat (and wear: the global average

water requirement for producing a kilo of cotton is 9,359 litres). Avocados may need more water than tomatoes (214 litres) but they are far more frugal in their water needs than meat—chicken takes 4,325 litres per kg, mutton 10,412 and beef 15,415 (see chart). Globally, however, the trend is not towards a low-water diet. On the contrary, as countries such as China grow richer, meat-eating is on the increase. Over the past 50 years, global meat production has quadrupled.

Another way in which water is used inefficiently in agriculture is in waste or loss of food, which adds up to as much as a third of global production. In countries such as India, the inadequacies of the cold chain and logistical hurdles mean that much never reaches the shops. Even in rich countries, food shops and consumers end up discarding vast amounts of uneaten food.

A new report by the World Economic Forum, a think-tank, emphasises technological fixes to this problem. Sell-by and use-by dates could be replaced, it argues, by remote sensor technologies, such as near-infrared spectrometers and hyperspectral imaging, capable of evaluating the perishability of individual items. It looks forward to the day when the imaging technology is available on shoppers' smartphones.

A less visible but perhaps more shocking waste is in the form of “non-revenue water”—that is, water supplied by utilities but never paid for. Some is diverted and stolen; much is simply lost through leakage. The lost revenue often leads to a vicious circle. Money is too short to maintain and repair the system, leaks increase, prices rise and theft becomes more widespread. The problem is most obvious in poor countries. Delhi's water board, for example, reported in 2011 that 53% of the water it distributed was non-revenue. In Hanoi that figure was 44%. But even in the rich world, where pipes and other infrastructure may be old, rates can also be staggering. London, for example, reported 28% and Montreal 40%. Again,

technology is helping. Sensors and smart valves that use the water itself to send a pulse, which alters when there is a leak, can make it easier to pinpoint trouble-spots.

In almost every aspect of water usage the scope for using less is enormous. It is a question of incentives. Optimists point to signs that this is changing. Some governments still use the availability of cheap and plentiful water as a lure to foreign investors. But some businesses are seeing water-efficiency as both an economic goal in itself and as an important part of their image-building. In the Canadian province of Ontario, for example, the local arm of Nestlé, a Swiss food-and-drinks giant that is one of the world's biggest sellers of bottled water, has found itself embroiled in a lawsuit between First Nations representatives and the provincial government, which has led to a moratorium on issuing new bottling permits.

Elsewhere, Nestlé is making much of its efforts to save water, aiming to reduce usage in every product category between 2010 and 2020 (a target it says is already within touching distance). In some countries, for example, such as America, Brazil and South Africa it makes baby milk in “zero-water” factories, reclaiming water evaporated from cow’s milk used in the manufacturing.

Unilever, another multinational, also has set “sustainability goals”. One is to keep the water used in its manufacturing processes to 2008 levels, despite greatly increased production. Already, it says, it has cut water use per tonne of production by 39% since 2008 in seven water-scarce countries representing half the world’s population. Less successful has been its drive to reduce the amount of water its customers use—by making products, such as detergents, for example, that need less water. Since 2010, per-consumer use has fallen only by 2%. ■



节水

不浪费，不短缺

解决世界水危机的最好办法是减少用水【专题报道《水》系列之六】

如果世界要减少用水，最显而易见的目标就是耗水最多的领域：农业。这个部分占各国用水量的比例差异极大。英国大量进口的“内含水”（也叫“虚拟水”，即生产任何作物或产品消耗的水）占到了英国用水需求的三分之二，农业用水的占比则相对较小。在埃及，农业用水约占84%，印度则高达90%。如果从更广泛的视角来看，采用荷兰科学家阿尔扬·胡克斯特拉（Arjen Hoekstra）提出的全球水“足迹”概念，也就是不仅统计农业中的直接用水，还要计入从田间到餐桌这整个过程中的间接用水，那么农业用去了世界总用水量的92%。

其中大部分都浪费掉了。在漫灌系统中，大量灌溉水淹没田野或耕地，因蒸发或渗漏（即水在被作物的根吸收前流失到了深层土壤中）损失了水。常见的估计是漫灌法浪费了50%的灌溉水。喷灌系统可以提高效率，但也够精确，容易受风的影响以及因蒸发而损失水。

滴灌系统要高效得多。它于上世纪60年代在以色列推出后传遍了全世界。顾名思义，这类系统把很有限的水量导向植物本身，让它们获得足够的水但不会过多。以色列公司Netafim在110个国家销售滴灌设备和技术，其首席技术官阿维·施魏策尔（Avi Schweitzer）表示，通过最大限度地减少蒸发和渗漏，令水送入光合作用过程的效率达到了95%到97%。

这节省了大量水，也提高了产量。灌溉水中可以添加精确剂量的营养物和保护作物的化学品。新一代系统采用了远程传感器，可以监测天气以及土壤和植物的状况，并校准输送的水量。然而，施魏策尔承认，目前而言，高昂的资本成本阻碍了世界大部分地区使用滴灌法，也限制了将它运用于经济作物。未来的目标是降低谷物等商品作物的成本，并进一步提高精确度。市场将扩大。气候变化很可能意味着更多雨养农田——目前估计占世

界农田总量的80%——将变成人工灌溉。

然而，效率提高有其风险：农民坚持在干旱的气候环境中种植需水量超出合理水平的作物，或改种更耗水的作物。即使在以色列，在萎缩的加利利海南部，大片灌溉田地上遍布着搭着塑料大棚的香蕉园。

因此，减少农业用水不仅取决于效率的提高，还取决于作物种植的合理化。而这又将取决于需求，继而取决于饮食甚至风尚的变化。从去年围绕吃牛油果而起的群情激愤可以预见未来将纷至沓来的各种争议。许多人批评牛油果热潮集中体现了千禧一代“潮人”的自私自利。2010年到2015年间，美国人的牛油果消费量增加了300%，达到每年约42.5亿只。农民争先恐后地种植牛油果以迎合需求，包括在一些非常干燥的地方，比如智利和墨西哥的一些地区，引发了抢种牛油果导致森林砍伐激增的指责。生产一公斤牛油果可能要耗费多达2000升的水，地方水源因而吃紧，活动家们动员起来反对这一饮食风尚。

将来，至少富裕国家的民众很可能会更多地被引导认识自己饮食的水足迹（还有衣服：生产一公斤棉花的全球平均用水量为9359升）。生产牛油果可能比生产西红柿耗费的水（214升）多，但和肉类相比是小巫见大巫：生产每公斤鸡肉耗水4325升，羊肉10,412升，牛肉15,415升（见图表）。然而，全球趋势并非低耗水饮食。相反，随着中国等国家变得更富裕，人们吃肉越来越多。过去50年里全球肉类产量已经翻了两番。

农业中的另一类低效用水在于浪费和丢弃食物，这占到全球食物产量的三分之一之多。在印度这样的国家，不完善的冷链系统和物流障碍导致大量食物从未能到达商店。即使在富裕国家，食品店和消费者最终也会丢弃大量还没吃过的食物。

智库世界经济论坛的一份新报告强调用技术解决这一问题。它认为，出售期限和使用期限可以被远程传感器技术取代，例如近红外光谱仪和高光谱成像，它们能评估每件食品的易腐性。它期盼有朝一日购物者的智能手机会带有成像技术。

一种不太明显却可能更叫人吃惊的浪费是“无收益水”——公用事业部门供应的一部分水没有收到回报。有些是被调取和盗用，还有大量水直接泄漏掉了。收入上的损失往往导致恶性循环：没有足够的资金来维修系统，泄漏增加，价格上涨，偷水变得更普遍。这个问题在贫穷国家最为明显。例如，德里的水务部门在2011年报告称，它供应的水有53%是无收益水。在河内，这个数字是44%。但即使在富裕国家，由于管道和其他基础设施可能已经陈旧，比例也可能高得惊人。例如，伦敦报告的这个数字为28%，蒙特利尔为40%。在这个问题上，技术也在带来改善。传感器和智能阀门用水本身发送的脉冲会在发生泄漏时改变，就能更容易地找出故障点。

在用水的几乎方方面面，节约的空间都是巨大的。问题在于激励机制。乐观主义者指出现状正在改变的迹象。一些政府仍然把提供廉价又充足的水用作吸引外国投资者的手段。但一些企业开始重视节水，不仅视之为一种经济目标，同时也是自身形象塑造的重要环节。例如，瑞士食品饮料巨头、全球最大瓶装水销售商之一雀巢在加拿大安大略省的分公司发现自己卷入了原住民代表和省政府之间的一场诉讼，当地政府随后暂停发放新的瓶装水许可证。

在其他地方，雀巢正在大力推进节约用水，目标是减少2010年至2020年间每个产品类别的用水量（它自称目标已触手可及）。在一些国家，如美国、巴西和南非，它在“零耗水”工厂里生产婴儿奶，回收利用制造过程中从牛奶中蒸发的水。

另一家跨国公司联合利华也制订了“可持续发展目标”。其中之一是将产品制造过程的耗水量维持在2008年的水平——尽管产量已经极大增加。它说，自2008年以来，在占世界人口一半的七个缺水国家里，它已将每吨产量的用水量减少了39%。它的另一项努力是减少洗涤剂等产品在消费过程中所需的水量，以减少用户的用水量。但成效不佳。自2010年以来，每个消费者的用水量仅下降了2%。 ■



Water conflicts

Water fights

Disputes over water will be an increasing source of international tension

IT HAS BECOME a cliché of doom-mongering: future wars will be over water. The forecast is old enough to face a sceptical backlash. Whatever happened, people ask, to the water wars? One answer emphasises the role water has played in past conflicts. In his autobiography, Ariel Sharon, who before becoming Israel's prime minister had been a commander in the six-day war of 1967, wrote that it "really started on the day Israel decided to act against the diversion of the Jordan...The matter of water diversion was a stark issue of life and death."

Another answer is that, though many conflicts involve water, it is rarely their sole motivation. That will remain true. But it also seems likely that water will be an aspect of ever more conflicts. A chronology maintained by the Pacific Institute, a think-tank in Oakland, California, of water-linked conflicts, shows a startling increase in their number in just the past few years (see chart).

The institute distinguishes between three types of violence. Sometimes water itself can be used as a weapon, as when China in 1938 breached dykes along the Yellow River to repel the Japanese army, or, just last year al-Shabaab, a terrorist group, diverted water from the Jubba river in Somalia, causing a flood that forced opposing forces to move to higher ground where they were ambushed.

Sometimes water is the trigger, as last year when conflicts over pasture land and water led to violence in both northern Kenya, and central Nigeria, where 11 people were killed in an attack by Fulani herdsmen on a farming

community. Finally, water installations can also be the target of military action, as in 2006 when Hezbollah rockets damaged a wastewater plant in Israel, which mounted retaliatory attacks on water facilities in Lebanon. Last year, during ethnic strife in the populous Oromia region of Ethiopia, dozens of water systems were attacked.

Most water conflicts will be subnational disputes. But transboundary tensions are also likely to intensify. A study last year by the Joint Research Centre, a think-tank under the European Commission, used computer modelling to rank the rivers where these are most likely to flare up. Its scientists listed five: the Nile, Ganges-Brahmaputra, Indus, Tigris-Euphrates and Colorado.

In all these instances, downstream nations fear or resent the effect on their waters of the actions of upstream countries. Egypt worries about the Grand Renaissance Dam that Ethiopia is building on the Blue Nile, about 40km from the Sudanese border. India and Bangladesh fear that China's water-diversion ambitions might one day turn towards the Brahmaputra as a source for China's thirsty north. South-East Asian nations are concerned, too. Pakistan and India, in turn, squabble over the treaty they concluded in 1960 (to which the World Bank was also a signatory) on sharing the waters of the Indus.

In contrast, no treaty regulates the Tigris and Euphrates rivers where dam construction in Turkey has reduced flow in Iraq and Syria. The Colorado river is shared by seven US states and two in Mexico. After a 19-year drought, water flow has dropped by nearly 20%. In Mexico, the river that created the Grand Canyon and fed a vast marshy delta has, for two decades, been almost completely dry. ■



水资源冲突

打水仗

围绕水的纷争将日益频繁地引发国际紧张局势【专题报道《水》系列之三】

有一句话已成了世界末日论中的陈词滥调：未来的战争是为了水。这种预言已存在太久，不免要面对怀疑者的反击。水的战争？都发生了些什么？人们问道。一种答案强调水在过去的冲突中扮演的角色。阿里埃勒·沙龙（Ariel Sharon）在成为以色列总理之前曾是1967年六日战争中的指挥官，他在自传中写道，这场战争“真正爆发于以色列决定反抗约旦河被引流改道的那天……调水的事是一个攸关生死的严酷问题。”

另一种答案是，虽然许多冲突涉及水，但它很少是唯一的动机。未来依然会如此。但与此同时，看起来水很可能会成为越来越多冲突的一部分。位于加州奥克兰的智库太平洋研究所（Pacific Institute）持续更新一份与水相关的冲突年表，它显示此类冲突的数量在过去几年里出现了惊人的增长（见图表）。

该研究所区分了三类暴力冲突。有时水本身可被用作武器，比如：1938年中国掘开黄河河堤以逼退日军；去年，恐怖组织青年党从索马里的朱巴河（Jubba）引流形成洪水，迫使敌军转移至高地再进行伏击。

有时水是导火索，比如去年在肯尼亚北部和尼日利亚中部都发生了因争夺牧场和水而起的暴力事件。在尼日利亚的冲突中，富拉尼牧民袭击了一个农业社区，造成11人死亡。最后，水利设施也可能成为军事行动的目标，比如2006年真主党用火箭弹炸毁了以色列的一家污水处理厂，以色列又对黎巴嫩的供水设施发动了报复性袭击。去年，埃塞俄比亚人口稠密的奥罗米亚地区（Oromia）发生种族冲突，期间有数十个供水系统被破坏。

大多数水资源冲突将会是次国家争端。但跨境紧张局势也很可能加剧。欧盟委员会下属智库联合研究中心（Joint Research Centre）去年开展了一项研究，用计算机模型对局势最有可能突然恶化的河流流域排序。该中心的

科学家团队列出了五个：尼罗河、恒河-雅鲁藏布江、印度河、底格里斯-幼发拉底河，以及科罗拉多河。

在所有上述流域，下游国家担心或憎恶上游国家的行动对自己境内的水域造成的影响。埃塞俄比亚正在距苏丹边境约40公里处的青尼罗河上建造复兴大坝（Grand Renaissance Dam），这令埃及深感不安。印度和孟加拉国担心中国的调水野心有朝一日会把雅鲁藏布江【译注：流入印度境内后称布拉马普特拉河】用作缓解中国北方干旱问题的水源。东南亚国家也很关切。巴基斯坦和印度为双方在1960年缔结的印度河水资源共享协定（世界银行也是签署方）争执不休。

相比之下，在底格里斯-幼发拉底河水系并没有任何约束性协定，而土耳其建造的大坝已经减少了该水系在伊拉克和叙利亚境内的流量。科罗拉多河流经美国的七个州和墨西哥的两个州。在经过长达19年的干旱后，其水流量已经减少了近20%。在墨西哥境内，这条曾形成了大峡谷和巨大的三角洲湿地的河流近乎完全干涸的状态已持续20载。 ■



Water

Thirsty planet

Climate change and population growth make the world's water woes more urgent, says Simon Long

AS IT SCOURS the universe for signs of extraterrestrial life, NASA has a motto-cum-mission-statement: "Follow the water". About 70% of the human body is made up of water, it says, and 70% of Earth's surface is covered in the stuff. "Water creates an environment that sustains and nurtures plants, animals and humans, making Earth a perfect match for life in general."

If water is a proxy for life itself, it is perhaps not surprising that worries about the health and availability of supplies here on Earth can take on apocalyptic overtones. A scorching, arid future marked by a fierce, bloody struggle for a few drops of water is a standard theme of dystopian fiction and film-making. This report will examine how close such nightmares are to reality. It will look at the state of the world's freshwater and at the increasing demands on it, and consider the ways they can be met.

The first thing to recognise is that the 70% figure is largely irrelevant to the debate. The sea it represents is salty, accounting for 97.5% of all the water on Earth. A further 1.75% is frozen, at the poles, in glaciers or in permafrost. So the world has to rely on just 0.75% of the planet's available water, almost all of which is subterranean groundwater, though it is from the 0.3% on the surface that it draws 59% of its needs (see chart). This report will argue that misuse of water may indeed lead to a series of catastrophes. But the means to dodge them are already known, and new technologies are constantly evolving to help.

The fundamental problems, however, are neither the resource itself, since water is likely to remain abundant enough even for a more populous Earth, nor technical. They are managerial, or, more precisely, how to withstand economic, cultural and political pressures to mismanage water. In the harsh words of Asit Biswas, a water expert at the Lee Kuan Yew School of Public Policy in Singapore: “Lack of money, scarcity, and so on—they’re all excuses. The problem everywhere is bad management.” Or, as Jean-Claude Juncker, president of the European Commission, put it in an entirely different context: “We all know what to do, we just don’t know how to get re-elected after we’ve done it.”

Even governments not facing the vexatious business of winning over voters struggle to institute sensible water policies. People regard access to water as a fundamental human right and hence as something that should be available on the basis of need, rather than the ability or willingness to pay. That makes it hard to charge a proper price for it, which in turn encourages profligate use. Even those who would be willing to curb their consumption for the benefit of generations to come may not be aware how much they are using. They consume it mostly not through drinking or washing, but through the water that has gone into the food they eat and the clothes they wear.

In any event, water seems an infinitely renewable resource. Used in a bath, it can be reused—to water plants, for example. Rainwater can be “harvested” or may seep into the ground to replenish an aquifer. Water that evaporates from lakes, swimming pools and reservoirs, or “transpires” in the photosynthetic process whereby water passes into the leaves of plants, joins the atmosphere and will eventually be recycled. Over 60% of the rain and snow that falls is returned in this way through “evapotranspiration”. But, like water that has run into the sea, it cannot be used again until nature has recycled it.

The present-day world provides ample examples of environmental devastation that serve as a warning that water usage has its natural limits. Boats are stranded aground in the middle of nowhere, amid the vanished waters of what was once the world's fourth-largest saline lake, the Aral Sea, between Uzbekistan and Kazakhstan. Last year Cape Town in South Africa averted only narrowly the unwanted prize for being the first of the world's big cities to run out of water. By the time rain finally broke a three-year drought, water levels in the reservoirs supplying the city had fallen to below 20%, and officials were discussing the feasibility of towing an iceberg from Antarctica to provide meltwater to drink. Four years earlier, it had been São Paulo in Brazil that had teetered on the brink, with reservoirs reduced to 5% of capacity.

Even the sober assessment of the UN's latest annual world "water development report" smacks of a kind of desperation. Already, it notes, more than a quarter of humanity—1.9bn people, with 73% of them in Asia—live in areas where water is potentially severely scarce (up, other studies suggest, from 240m, or 14% of the world's population, a century ago). The number facing shortages almost doubles if you count those at risk at least one month a year. Meanwhile, global water use is six times greater than it was a century ago—and is expected to increase by another 20-50% by 2050. The volume of water used—about 4,600 cubic kilometres a year—is already near the maximum that can be sustained without supplies shrinking dangerously. A third of the world's biggest groundwater systems are in danger of drying out. So the numbers living under severe water stress are expected to climb to as many as 3.2bn by 2050, or 5.7bn taking seasonal variation into account. And they will not just be in poor countries (see map). Australia, Italy, Spain and even America will endure severe water shortage.

Three main factors will drive the continued growth in demand: population, prosperity and climate change. In 2050 the number of people in the world

is expected to increase to between 9.4bn and 10.2bn, from just under 8bn now. Most of the increase will come in parts of the world, in Africa and Asia, that are already short of water. People will be leading more water-intensive lifestyles and move into cities, many of them in places at great risk of water shortage.

The biggest uncertainty in projecting future demand lies in estimating how much will be needed for agriculture, which currently accounts for about 70% of water withdrawals, mostly for irrigation. Some forecast a big increase in demand, as food production has to rise to feed a growing population. Others, such as the OECD, have predicted a small decline in water use in irrigation thanks to a reduction in wastage and a rise in productivity.

Still less predictable is the impact of climate change. The scientific consensus is that, in the words of Henk Ovink, the Dutch government's special envoy on water matters, the process will be "like a giant magnifying glass, making all our challenges more extreme". Wet places will become wetter and dry places drier. The world's water endowment is already highly unequal—just nine countries account for 60% of all available fresh supplies. China and India have about 36% of the world's people, but only about 11% of its freshwater. Climate change will exacerbate this inequity. And rainfall, such as the South Asian monsoons, on which much of subcontinental economic life hinges, will become more erratic.

The most dramatic short-term effects have been the increasing number of extreme weather events. Over the past two decades these have affected on average about 300m people every year. Last September's almost simultaneous storms—Hurricane Florence in the east of America, and super-Typhoon Mangkhut in East Asia—were linked by scientists to rising levels of greenhouse gases, warming oceans and changing climate. Measurements of sea temperatures down to 2,000 metres show a steady

rise since the 1950s, to new records. Climate models have long forecast that warmer oceans will lead to more intense, longer-lasting storms. The rising temperatures are accompanied by rising sea levels—at a rate of about 3mm a year—as the warmer water expands, and as ice at both poles melts. Higher seas bring storm surges that can reach farther inland. And warmer air temperatures mean the atmosphere can hold more moisture that eventually falls as precipitation.

In the long run, however, the bigger problem from climate change will not be too much water but too little. As a report by the World Bank puts it: “The impacts of water scarcity and drought may be even greater, causing long-term harm in ways that are poorly understood and inadequately documented.” Of course, a lot depends on how much the climate changes and how fast.

Last October the Intergovernmental Panel on Climate Change published a report comparing the consequences of restraining global temperature rises to 1.5°C above pre-industrial levels as opposed to 2°C. It concluded “with medium confidence” that, with a 2°C rise, an additional 8% of the world’s population in 2000 will be exposed to new or aggravated water scarcity by 2050. With a 1.5°C rise, that falls to 4%. There would be considerable regional variation. For example, it cited research showing that, in the Mediterranean region, a 1.5°C rise in temperatures would lead to statistically insignificant changes in the mean annual flow in its rivers and streams. A 2°C rise, however, would bring decreases of 10-30%.

Decreasing streamflow is a worldwide phenomenon. Some of it results from declining rainfall. But much is the direct result of human intervention—the damming and diversion of rivers for flood control, water-storage and irrigation. And, where rivers still flow, the water in them is often unsafe to drink or even bathe in. In surveying the Earth, surface water is an obvious place to start. As throughout this report, examples will be drawn worldwide,

but especially from two countries with very contrasting experiences: Israel, which is sometimes held up as a model of sensible water management; and India, which almost never is. ■



水

干渴的星球

西蒙·朗说，气候变化和人口增长使世界的水危机变得更加紧迫【专题报道《水》系列之一】

美国国家航空航天局（NASA）在宇宙中搜寻外星生命的迹象时有这样一句座右铭兼使命宣言：“追踪水”。人体约70%由水构成，它说，而地表的70%被水覆盖。“水创造了一个维持和供养动植物及人类的环境，使地球完美地匹配一般意义上的生命。”

如果水是生命本身的代名词，那么对地球上水质和水供应量的担忧会带着世界末日的意味或许也就不足为奇了。未来，人们将在酷热、干旱的气候里为了几滴水展开激烈、血腥的争斗——这是反乌托邦小说和电影的标准题材。本专题报道将审视这样的噩梦距离现实有多近。它将考察世界上淡水资源的现状以及对它不断增长的需求，并思索满足这些需求的方式。

首先要认识到的是，70%这个数字与这场辩论无甚关系。它所代表的海洋是咸水，占地球上水总量的97.5%。另外还有1.75%冻结在地球两极、冰川或永冻层中。如此，全世界只能依靠其余的0.75%的水。这一部分几乎全是地下水，虽然位于地表的0.3%满足了59%的需求（见图表）。本报道将论述滥用水资源可能确实会引致一系列灾难。但是，避免它们的方法已经众所周知，而新技术也在不断演进以改善局面。

然而，根本问题并不在于水资源本身，因为即使地球人口增加，水可能仍然足够丰富。问题也不在技术上。它们是管理上的，或者更确切地说，是如何抵御因经济、文化和政治方面的压力而错误地管理水资源。新加坡李光耀公共政策学院（Lee Kuan Yew School of Public Policy）的水资源专家阿西特·比斯瓦斯（Asit Biswas）言辞犀利地说道：“缺钱、水荒，诸如此类的，都是借口。所有地方的问题都是管理不善。”欧盟委员会主席让-克洛德·容克（Jean-Claude Juncker）则用了一种全然不同的表达：“我们都

知道该做什么，我们只是不知道做完后还怎么能再当选。”

即使那些不用为争取选票伤脑筋的政府也难以制订出明智合理的水政策。民众把使用水视为一项基本人权，因而认为它应按需供应，而不是基于购买力或购买意愿。这就使得政府很难恰当地给水标价，而这继而又助长了浪费水的习惯。有些人愿意为了子孙后代的福祉节约用水，但他们仍然可能不清楚自己到底用了多少。他们消耗水主要不是饮用或洗涤，而是用来生产他们吃的食品和穿的衣服。

无论如何，水看起来是一种无限再生的资源。比如，洗澡用过的水可以用来浇花。雨水可以被“收集”或渗入地下而补充地下含水层。从湖泊、泳池和水库中蒸发出来的水，或者在水进入植物叶子的光合作用过程中“蒸腾”出来的水，都会进入大气中，最终构成循环。超过60%的降雨和降雪通过这种“蒸发蒸腾作用”返回大气中。但是，和那些流入了海洋中的水一样，在大自然完成循环之前，你无法再次使用它。

当今世界提供了足够多的环境恶化实例，警告我们水的使用是有其自然限制的。在乌兹别克斯坦和哈萨克斯坦之间的咸海（Aral Sea）曾是世界第四大咸水湖，如今那里大片水域干涸消失，船只搁浅在无人之地。去年，南非开普敦差一点就摘得了一个它不想要的荣誉——成为世界上第一个无水可用的大城市。当雨水终于打破那里持续了三年的干旱天气时，为该市供水的水库的水位已经降到20%以下，当时官员们已经在讨论是否可以从南极拖一座冰山来，把冰融化来做饮用水。再往前四年，当时濒临同样绝境的城市是巴西的圣保罗，当地水库里的水已经只剩下5%。

连联合国最新的年度《世界水发展报告》中的冷静评估也传递出一种绝望的气息。它指出，超过四分之一的人类——19亿人，其中73%在亚洲——已经生活在水资源面临严重稀缺的地区（其他研究表明一个世纪前这一数字为2.4亿，占世界人口的14%）。如果把那些一年中至少有一个月面临这种危险的地区也计在内，那么这个数字几乎要翻一番。与此同时，全球用水量已达到一个世纪前的六倍，预计到2050年还将增加20%到50%。目前的用水量为每年约4600立方千米，已经接近引发水供应危险萎缩的阈

值。世界上最大的地下水系统中有三分之一面临干涸的危险。因此，预计到2050年，生活在严重缺水压力下的人数将增至32亿，如果计入季节性变化则为57亿。而他们不只生活在贫穷国家（见地图）。澳大利亚、意大利、西班牙，甚至美国都将遭遇严重水荒。

三个主要因素将推动需求的持续增长：人口、经济繁荣和气候变化。到2050年，世界总人口预计将从目前的不到80亿增加到94亿至102亿。增加的大部分将来自非洲和亚洲目前已经水供应不足的地区。人们将过着更密集耗水的生活方式并移居城市，其中许多人生活在有严重缺水风险的地方。

预测未来需求的最大不确定性在于估算农业用水——目前占总用水量的70%左右，主要用于灌溉。一些人预测需求将大幅增加，因为粮食产量势必要上升才能满足不断增长的人口的需求。经合组织等其他机构则预测，由于减少浪费和生产率提高，灌溉用水量将小幅下降。

更不可预测的是气候变化的影响。科学界有一个共识，用荷兰政府水务特使亨克·沃温卡（Henk Ovink）的话来说就是气候变化的过程将“像一个巨大的放大镜，让所有的挑战都变得更为极端”。潮湿的地方会更潮湿，干燥的地方更干燥。世界各地的水资源分布已经高度不平等——仅九个国家拥有占全球60%的淡水资源。中国和印度的人口占世界的36%，但淡水拥有量却只占约11%。气候变化将加剧这种不平等。而降雨会变得更不稳定，比如与南亚经济生活息息相关的南亚季风。

最具戏剧性的短期影响是极端天气事件的频率增加。过去20年中，这类事件平均每年影响约三亿人。科学家们认为去年9月几乎同时发生的两场风暴——美国东部的佛罗伦萨飓风和东亚的超强台风山竹——与温室气体浓度升高、海洋变暖及气候变化相关。在深海2000米处的测量显示，自上世纪50年代以来水温稳步上升至新高。长期以来，各种气候模型都预测更温暖的海洋将导致更强烈、持久的风暴。随着更温暖的海水膨胀，以及两极的冰融化，海平面也将随之上升——每年约3毫米。更高的海平面带来

的风暴潮可以冲击更远的内陆地带。而更温暖的气温意味着大气中会含有更多水分，最终变成降水。

然而，长远来看，气候变化带来的更大问题不是水太多而是水太少。正如世界银行的一份报告所说：“水荒和干旱的影响可能更大，而人们对它们如何造成长期损害知之甚少，也未能充分记录。”当然，这很大程度上取决于气候变化的幅度和速度。

去年10月，政府间气候变化专门委员会（IPCC）发布了一份报告，比较了将全球气温升高控制在比工业化前高 1.5°C 和高 2°C 的后果。它以“中等置信度”得出结论称，如果温度上升 2°C ，到2050年，会有相当于2000年全球人口数8%的人面临新的或加剧的水资源短缺；如果温度上升 1.5°C ，则这一比例跌至4%。地区间差异会相当大。例如，它引用的研究表明，在地中海地区，气温上升 1.5°C 对其河流和溪流年平均水流量带来的变化在统计并不显著，但上升 2°C 却会令水量下降10%到30%。

河川径流量减少是一个全球现象。其中一些因降雨量减少造成。但很大部分是人为干预的直接后果——为防洪、蓄水和灌溉而筑坝及让河流改道。此外，在依然水流潺潺的河道，水却往往不能饮用，甚至连洗澡都不安全。在勘察整个地球时，地表水是一个显而易见的起点。本报道将援引世界各地的实例，但会重点探讨两个经验截然相反的国家：有时被誉为合理管理水资源范本的以色列，以及几乎从来不曾如此的印度。■



Rivers and lakes

Surface tension

Poisoned and over-exploited, many rivers are in a parlous state

THE RIVER VIEW HOTEL on the banks of the Yamuna river at Okhla, on the outskirts of Delhi, lives up to its name. But the view is not uplifting. Rubbish is strewn along the water's edge. As elsewhere in India, industrial pollution, untreated sewage and the still widespread practice of open defecation make this stretch of the Yamuna a toxic soup teeming with bacterial infection. According to India's Central Pollution Control Board (CPCB), in 2016 the water contained at times 1.6bn faecal coliform bacteria per 100ml—more than 3m times the CPCB'S “desirable” bathing limit of 500 per 100ml.

About 600km (373 miles) downstream from Okhla the sacred Yamuna joins an even holier river, the Ganges, or Ganga, at Prayagraj (formerly Allahabad), site from January to March this year of the six-yearly *kumbh*, a Hindu festival that is expecting 150m devotees—perhaps the largest human gathering ever held anywhere. They have waited for days for the chance to cleanse their souls, if not their bodies, by taking a short dip (limited to 41 seconds, in an effort to avert stampedes) in the blessed waters. The river there is considerably less toxic. In December the CPCB ordered state governments to stop “grossly polluting units”—distilleries, paper mills and textile factories—discharging effluent into the river. The Tehri dam upstream released more water to ensure it flowed just fast enough to wash away sins but not sinners.

Even farther downstream, the Ganges reaches Varanasi, Hinduism's holiest city and the parliamentary constituency of India's Hindu-nationalist prime minister, Narendra Modi. Year-round, devotees visit to bathe or drink the waters, or to cremate their dead on the ghats, the series of broad stone

staircases that line the southern bank. One of Mr Modi's first and most fervent pledges in office was to clean up the Ganges, to ensure its "purity and uninterrupted flow". He renamed the Ministry of Water Resources by adding to its title "River Development and Ganga Rejuvenation".

But the water remains polluted and dangerous to health, and the Ganges' flow is weakening, in part because of the hydroelectric dams on its upper reaches. A study in 2018 found its flow in some stretches may have fallen by 50% since the 1970s. Climate change has actually encouraged the damming of the river. By one reckoning about 70% of the Ganges' flow is contributed by meltwater from the Himalayan glaciers from where it springs. Engineers had assumed that, as temperatures rise, more ice would melt, increasing the river's flow and hence its hydroelectric potential. In fact, it has declined in the past few years, because the aquifers supplying Himalayan rivers have been shrinking as winter precipitation drops. In the long run, however, the fate of the glaciers might doom the great rivers. A study published in February by the International Centre for Integrated Mountain Development, a think-tank in Nepal, warned that even on relatively benign forecasts of global warming, more than a third of Himalayan glaciers will have melted by 2100, with river flows declining from the 2060s.

The state of the holy river is worth dwelling on. Some 400m people—5% of humanity—live on its plains. But it may also be the most powerful symbol anywhere of the sheer difficulty of managing freshwater supplies. As Victor Mallet, a British journalist, asks in his book on the Ganges, "River of Life, River of Death", "Why do Indians and their governments tolerate for even a week the over-exploitation of their holy river—sometimes to the point of total dehydration—by irrigation dams and its poisoning by human waste and industrial toxins?" After five years of government under Mr Modi, that question remains unanswered.

The clean-up effort has two main elements. The first involves a nationwide

campaign, known as *swachh bharat* (clean India) to end open defecation, in which India in 2014 led the world, with 600m open defecators out of a global total of 1bn. Thanks to subsidies for the construction of 92m toilets (mostly simple twin-pit arrangements that turn faecal sludge into harmless compost), the government says the “ODF” (open-defecation free) rate has risen from 39% in 2014 to 99% now. Many scoff at such hyperbole, but, at the very least, in many places to venture at dawn through the Indian countryside is no longer to intrude on a mass latrine.

The second aim, building treatment plants, has been beset by disagreements over the design of the scheme. Private companies are to bid for treatment contracts, with payment partly based on sensors tracking the water they produce. They are handicapped by the lack of sewers in much of India, so in many cases they will have to block discharges with weirs to divert them for treatment.

If such a sacred source is so hard to rescue, what hope for other ravaged rivers and lakes, in India and elsewhere? For his book “When the Rivers Run Dry”, published in 2006 and recently updated, Fred Pearce, a British writer, visited dozens of countries around the world and writes of river after river under seemingly life-threatening stress. Three of the rivers have, since Mr Pearce’s first visit, become test-cases for different approaches to solving surface-water problems: large-scale infrastructure to bring water from elsewhere; flow-management through digital monitoring; and the use of economic levers.

In Israel, the state of its famous sources of surface water—the River Jordan and the Sea of Galilee (in fact, a freshwater lake)—is also a national preoccupation. After five years of its worst drought in nearly a century, the level of the Sea had sunk late last year to alarming levels. Heavy rains in December and January ended the crisis, but Israel’s supply of natural freshwater remains precarious, according to Uri Schor of Israel’s water

authority.

For much of Israel's history, Galilee supplied most of its drinking water. Under the British mandate over Palestine, economists used to worry that immigration into the territory would overwhelm its available water resources. In 1939, 834,000 people lived there. The upper limit was seen as 2m. Israel now has 8.7m inhabitants, with another 5m people living in the occupied territories. They no longer rely on the Sea of Galilee for water. More than half the water Israel uses is man-made, from desalinated seawater and treated effluent. So during the drought the 400m cubic metres that used to be pumped annually from the Sea was cut, to less than 70m in 2018. Now Israel plans to replenish it with desalinated water so it will form a strategic water reserve.

For now, though, the Sea of Galilee is probably more important to tourists and pilgrims. They can also survey the River Jordan, which runs south into the Dead Sea, the fast-evaporating saltwater lake at Earth's lowest point on dry land (430 metres below sea-level). The Jordan has long disappointed visitors expecting to see the "deep and wide" waterway from which Michael rowed his boat ashore. In places it can be crossed with a standing jump.

The Yellow River in China, the world's seventh-longest at 5,500km, now counts as a success story. It gets its colour, and name, from the loess-soil sediment it carries downstream. Its fertile basin was the cradle of Chinese civilisation and, in an epithet often given the river, its "sorrow". A build-up of sediment changed the river's course 26 times before 1949. But the sediment also raises the river above the surrounding plains, so that it has to be contained by dykes. Often it has flooded, catastrophically. The risk of floods remains, but a massive dam at Xiaolangdi in Henan province enables engineers to release water to flush the sediment downstream, reducing the danger.

By 2015 this system had also more than doubled the channel's capacity. But it was still only two-thirds what it had been 50 years before. Indeed, in recent years the river's drying out has been as big a concern as its flooding. By 1997 it was so overused that it only reached the sea 139 days in the year. At that stage 40% of its waters were too polluted even for irrigation. The quality has much improved but by 2017 water in one-tenth of samples taken from the Yellow River was still deemed unfit for farming. Since then digital centralised controls over the release of water from dams have been introduced. Billed as the world's most advanced water-rationing system, this has kept the flow to the sea uninterrupted. Environmentalists, however, complain that the dams have harmed the river's ecosystem, and that pressure has shifted from the river itself to its increasingly polluted tributaries and underground aquifers, which are shrinking alarmingly.

In Australia, the Murray river, with its main tributary, the Darling (known as the Murray-Darling basin), drains one-seventh of the country, a region the size of France and Spain combined. It irrigates farms, and supplies cities in the east. When Mr Pearce visited the region in 2006 drought had already lasted more than a decade, yet he was shocked to find local farmers insouciant about squandering water, using wasteful flood irrigation, for example, when the water was available. Since the 1970s enormous farms growing thirsty crops such as cotton and nuts had spread across the basin.

That disastrous drought prompted government action to restore the river—if not to its heyday, when paddle-steamers plied it, then at least to levels where it could sustain the farms and people that rely on it. Australia already had an elaborate system for trading water rights, allowing farmers to buy or sell entitlements according to their need in any given season. An index compiled by Aither, a consultancy, tracks a weighted price for these entitlements in the Murray-Darling basin, and showed a 96.1% rise in the ten years from July 2008. The government's plan aimed to reduce water consumption by at least 2.75 cubic km a year, or about a fifth, either by

purchasing water licences from farmers who were willing to offload them, or by financing projects that would save water (eg, through more efficient irrigation).

Water usage was cut by two-thirds of this target, recovering 2.1 cubic km of the surface water. In 2016 the state of South Australia saw its highest flows since 1993. Yet by last year the river was again low, with hundreds of kilometres running dry, entitlement prices rising fast and fish dying in huge numbers. Scientists concluded the basin as a whole was yet to show real improvement. ■



河流和湖泊

地表水之争

许多河流因污染和过度开发而处于危险状态【专题报道《水》系列之二】

位于德里郊区奥卡哈的亚穆纳河畔的河景酒店名副其实，但景观并不怎么让人高兴。垃圾散落在水边。与印度其他地方一样，工业污染、未经处理的污水以及仍然很普遍的露天排便，使得这一段亚穆纳河成了一锅满是细菌感染的毒汤。根据印度中央污染控制委员会（CPCB）的数据，2016年，这里每100毫升水有时含有多达16亿个粪便大肠杆菌——比CPCB的“理想”沐浴限度每100毫升500个高出了300万倍。

在奥卡哈下游约600公里处，神圣的亚穆纳河在普拉雅格拉吉（原安拉阿巴德）汇入了一条更神圣的河流——恒河。今年1月至3月是六年一度的大壶节，这个印度教节日预计有1.5亿名信徒参加——也许是有史以来最大规模的人类聚会。他们已经等了很多天才能有机会净化自己的灵魂（如果不是他们的身体的话），这需要在圣洁的水域中短暂浸泡（限时41秒，以避免踩踏）。这条河的毒性要低得多。去年12月，CPCB命令邦政府阻止“污染严重的单位”——酿酒厂、造纸厂和纺织厂——将污水排入河中。上游的特里坝释放出更多的水，以确保水流速度足以冲走罪恶，而不会冲走罪人。

再往下游走，恒河会到达印度教最神圣的城市瓦拉纳西，以及印度民族主义总理纳伦德拉·莫迪的议会选区。一年到头都有信徒来这里沐浴或饮水，或者在南岸一排排宽阔的石阶上火化死者。莫迪执政后第一个也是最热烈的承诺之一就是清理恒河，以确保其“纯净和不断流”。他给水资源部改了名，加上了“河流开发和恒河复兴”的字眼。

但恒河仍然被污染，对健康造成危险，而且流量越来越小，部分原因是上游的水电大坝。2018年的一项研究发现，自上世纪70年代以来，某些河段的流量可能下降了50%。气候变化实际上鼓励了在河流上筑坝。有人估

计，大约70%的恒河流量来自它的发源地喜马拉雅冰川的融水。工程师们认为，随着温度的升高，会有更多冰融化，增加河流的流量，从而增加水力发电的潜力。事实上，在过去的几年里，由于冬季降水减少，为喜马拉雅山河流供水的含水层一直在缩减。然而，从长远来看，冰川的命运可能会毁灭大河。尼泊尔智库国际山地综合开发中心2月发表的一项研究警告说，即使根据相对温和的全球变暖预测，到2100年，超过三分之一的喜马拉雅冰川将融化，河流流量从2060年代开始降低。

圣河的状态值得关注。约有四亿人——占人类总数的5%——生活在恒河平原上。而在管理淡水供应的困难程度上，它可能也算得上全世界的标杆。正如英国记者维克多·马利特（Victor Mallet）在他关于恒河的著述《生命之河，死亡之河》（River of Life, River of Death）中的发问：“灌溉水坝过度开发他们的圣河，有时甚至导致它完全干涸，人类排泄物和工业毒素也侵害它，为什么印度人和他们的政府能够容忍这些，哪怕一个星期？”莫迪上任五年后，这个问题仍没有答案。

清理工作包含两个主要部分。第一个是以消除露天排便为目标的全国运动，称为“清洁印度”（*swachh bharat*）。2014年印度在露天排便上称霸全球，占了全球总共10亿露天排便者中的六亿。在发放补贴建造9200万间厕所（大多数为简单的双坑式，将粪渣转化为无害的堆肥）后，政府称“ODF”（无露天排便）率从2014年的39%上升到现在的99%。许多人对这种夸张的统计手法嗤之以鼻，但至少在很多地方，在黎明时分壮胆走进印度农村不再像是闯入了一个大型露天厕所。

第二个目标是建造污水处理厂，但被计划设计方面的分歧所困扰。私营公司将竞标污水处理合同，会有传感器跟踪它们生产的水并据此决定支付的部分费用。但它们受制于一个挑战：印度大部分地区没有下水道。因此在许多情况下，它们将不得不用围堰拦住废水，再将其引向污水处理设备。

如果这样一个神圣的水源都如此难以拯救，那印度——以及别的地方——其他那些被摧残的河流和湖泊还有什么希望呢？英国作家弗雷德·皮尔斯（Fred Pearce）的《当河流干涸时》（When the Rivers Run Dry）一书在

2006年出版并于最近修订，作者访问了全球数十个国家，并在据称危及生命的压力下写下了一条条河流的故事。自皮尔斯首次访问以来，有三条河流成了解决地表水问题的不同方法的试验案例：从其他地方引水的大规模基础设施；通过数字监控来管理流量；以及使用经济杠杆。

在以色列，其著名的地表水源——约旦河和加利利海（实际上是一个淡水湖）——也让举国上下忧心忡忡。经过近一个世纪以来最严重的五年干旱之后，湖面在去年年底降到了令人担忧的低位。据以色列水务局的乌里·朔尔（Uri Schor）称，12月和1月的大雨结束了危机，但以色列的天然淡水资源仍然不稳定。

在以色列历史上的大部分时间里，加利利海提供了大部分的饮用水。在英国托管巴勒斯坦期间，经济学家过去担心进入这一区域的移民会让现有的水资源不堪重负。1939年时，有83.4万人在那里生活。当时认为上限是200万人。以色列现有870万居民，另有500万人居住在以色列占领区。他们不再依靠加利利海取水。以色列的用水中有一半以上是人造的，来自淡化海水和经过处理的污水。因此，在干旱期间，过去每年从湖中抽取的4亿立方米被减少到2018年的不到7000万立方米。现在，以色列计划用淡化水补充这个湖，这将形成一个战略水储备。

但就目前而言，加利利海对游客和朝圣者来说可能更为重要。他们还可以游览约旦河，它向南流入死海，这个快速蒸发中的咸水湖是地球陆地上的最低点（海平面以下430米）。游客们希望看到那条迈克尔划船靠岸的“深又宽”的水路【译注：《迈克尔把船划靠岸》（Michael Row the Boat Ashore）是一首著名的民谣，里面有一句“约旦河深又宽”】。但约旦河长期以来都让他们失望。在某些地方，立定跳远都能跳过河。

中国的黄河有5500公里长，是世界上第七长的河流，现在被归为一个成功故事。它的颜色和名字都来自于它带到下游的黄土沉积物。它肥沃的盆地是中华文明的摇篮，但它也得了一个中华之“患”的绰号。沉积物的积聚让它在1949年之前改道了26次。而沉积物也使河流高过周围的平原，因此必须用堤坝围起来。它经常决口，造成灾难。洪水的风险仍然存在，但河南

小浪底的一座大坝使工程师能够放水来冲走下游的沉积物，减少危险。

到2015年，该系统也已让河道容量增加了一倍多。但它仍然只是50年前的三分之二。事实上，近年来，黄河干涸的问题与洪水一样令人担忧。到1997年，过度用水使得一年中只有139天能够入海。在那个时期，它的水体有40%被污染到了连灌溉也不能用的程度。之后水质有了很大改善，但到2017年，从黄河提取的水样中仍有十分之一被认为不适合农用。从那以后，中国引入了对水坝放水的中央化数字控制。它被宣传为世界上最先进的水资源配给系统，这使得水不间断地流入海洋。然而，环保主义者抱怨大坝已经损害了河流的生态系统，而且这种压力已经从河流本身转移到日益受污染的支流和地下含水层，其萎缩程度令人担忧。

在澳大利亚，墨累河及其主要支流达令河（称为墨累-达令盆地）流域覆盖该国的七分之一，面积与法国和西班牙的总和相当。墨累河水被用于灌溉农场，并为东部城市供水。当皮尔斯于2006年访问该地区时，干旱已经持续了十多年，但他惊讶地发现当地农民对挥霍用水毫不关心，比如有水的时候就十分浪费地大水漫灌。自上世纪70年代以来，种植诸如棉花和坚果等耗水作物的大型农场遍布整个盆地。

这场灾难性的干旱促使政府采取行动修复河流——如果达不到明轮船通航的鼎盛时期，也至少要达到可以维持依赖它生存的农场和居民的水平。澳大利亚已经有一个精心设计的水权交易系统，允许农民根据自己的需要在任何一个季节买卖权利。由咨询公司Aither编制的指数追踪墨累-达令流域这些水权的加权价格，显示价格在2008年7月之后的十年内增长了96.1%。政府的计划旨在将用水量每年减少至少2.75立方千米，或约五分之一，要么是通过向愿意卖出用水许可的农民购买许可证，要么是通过为能节约用水的项目（例如更高效的灌溉）提供融资。

用水的减少达到了该目标的三分之二，收回了2.1立方千米的地表水。2016年，南澳大利亚州出现了1993年以来的最高流量。然而到去年，这条河再次处于低位，数百公里的河段干涸，水权价格快速上涨，鱼类大批死亡。科学家们总结说，该盆地整体尚未显示出真正的改善。■



Turkey

Default setting

Credit curtailed, imports imploding: the struggle to restore a stricken economy

DURING TURKEY'S constitutional upheavals in 2016-17, when President Recep Tayyip Erdogan faced down an attempted coup and gathered up new political powers (and prisoners), the country's economic reformers remembered better days. They talked wistfully of an imminent return to "factory settings". Turkey, they believed, had a default set of successful policies, from which it had recently deviated and to which it could quickly revert, undoing any mistakes in between.

Instead the economy suffered something closer to a system crash. Excessive lending, some of it guaranteed by the government, contributed to rising inflation and a widening current-account deficit. The central bank's ability to restore order was stymied by Mr Erdogan's hostility to orthodox monetary policy (he compared interest rates to tools of terrorism). When the government fell out with President Donald Trump over the arrest of an American pastor working in Anatolia, foreign investors (and many Turkish depositors) lost their nerve. Turkey's currency, the lira, fell by 40% against the dollar in the first eight months of 2018.

That drop was excruciating for the many companies that had borrowed in euros or dollars: foreign-currency corporate debt amounted to over 35% of GDP in 2018. Hundreds of firms have since defaulted or applied for *konkordato*, a court-approved rescheduling of debt that allows them to avoid declaring bankruptcy. Their number includes the Turkish franchises of Gloria Jean's Coffees owned by Haci Sayid, a cafeteria chain founded by two brothers who have been making baklava since 1968.

The full extent of the damage became clearer on March 11th, when Turkey reported its latest GDP figures. They showed that the economy shrank by 3% in the fourth quarter of 2018 compared with a year earlier (see chart). That was an even sharper fall than expected. But if anything, it understates the suffering. An unusually large share of this diminished output was exported to foreigners, rather than enjoyed at home. Household consumption, a better measure of pleasure and pain, shrank by almost 9%.

The crisis has, however, forced the government to reset its reckless macroeconomic policies. The appointment in July of Berat Albayrak, the president's son-in-law, as finance minister did not bode well. But for the moment the family dynamic seems to be working in the economy's favour, helping to reconcile Mr Erdogan to the need for monetary and fiscal restraint. The central bank was belatedly permitted to unholster its terrorist tools and raise interest rates. The government has also set itself ambitious fiscal targets that will require cutting pensions and postponing investment to narrow the budget deficit.

The flow of credit has been sharply curtailed, imports have collapsed and exports have boomed. The current account even swung into surplus for four months in a row from August to November, as Turkey welcomed more foreign tourists and fewer foreign goods. This rebalancing has helped to revive the lira, which rose by 28% from the end of August to the end of January.

But how long will it take for stability to translate into growth? An economy, unfortunately, cannot be reset as easily as a smartphone. Past mismanagement tends to become embedded in the circuits. The Turkish public, for example, will not quickly forget last year's erosion in the value of the lira. They now hold nearly half of their deposits in foreign currency. And the central bank will have to keep interest rates high for some time

to convince people that it can conquer inflation, which remains at almost 20%. In its impatience, the government has resorted to opening subsidised food stalls in big cities to dampen the rise in the price of groceries, which Mr Albayrak has branded “food terrorism”.

Inflation should fall further later in the year, as the effects of the lira’s decline wear off. Credit is already beginning to revive, led by state banks. And some early indicators for 2019 suggest that the pace of economic contraction is starting to ease. BBVA, a bank, believes growth will return in the second half of the year, leaving the economy 1% bigger this year than last.

A cyclical recovery will not, however, resolve questions about Turkey’s longer-term future. It is hard now to argue that the market-friendly policies embraced by Mr Erdogan’s party from 2002 to 2011 represent the economy’s default mode. After all, the populism and cronyism of more recent years is hardly new in Turkey. A similar kind of mismanagement reared its head many times before the financial crisis of 2001 and the promise of European Union membership motivated a decade of reform. Perhaps populism, not liberalism, represents Turkey’s factory settings, to which it has returned after all. ■



土耳其

默认设置

信贷减少，进口急剧萎缩：恢复崩溃经济的努力举步维艰

在2016至2017年围绕土耳其修宪引发的动荡中，总统埃尔多安挫败了一场未遂政变，集聚了新的政治权力（还有囚犯），而土耳其的经济改革派回忆着从前的好日子。他们伤感地谈论着希望土耳其能立即恢复“出厂设置”。他们相信土耳其已经有一套默认的成功政策，虽然近年有些偏离方向，但可以迅速回归，并消弭其间的任何错误。

然而，土耳其经济几乎接近系统崩溃。过度放贷（部分由政府担保）推动通胀上升、经常账户赤字扩大。埃尔多安反对正统货币政策（他把利率比作恐怖主义工具），这让央行无法恢复秩序。土耳其政府因拘捕在安纳托利亚（Anatolia）工作的美国牧师而与特朗普闹翻后，外国投资者（以及许多土耳其储户）紧张起来。土耳其里拉兑美元汇率在2018年前八个月下跌了40%。

对许多以欧元或美元贷款的企业而言，这样的跌幅打击沉重：2018年，企业外币债务占了GDP的35%以上。数百家企业出现违约或申请“*konkordato*”，即向法院申请延期还款，以避免宣布破产。其中就包括由连锁餐厅哈西-萨伊德（Haci Sayid）在土耳其特许经营的高乐雅咖啡（Gloria Jean's Coffees）。哈西-萨伊德由自1968年起一直制作果仁蜜饼的两兄弟创立。

经济受创的程度在3月11日土耳其公布最新GDP数据时变得愈加清晰。数据显示，2018年第四季度该国经济同比萎缩3%（见图表），比预期跌幅更大。但它实际上还没有充分体现土耳其人所承受的苦楚。本已下滑的产出中有异常大的比例出口到了国外，而不是用于国内消费。家庭消费这个更能衡量人们苦与乐的指标缩减了近9%。

不过，这场危机已迫使政府重新设置其鲁莽的宏观经济政策。去年7月，总统的女婿贝拉特·阿尔巴耶克（Berat Albayrak）被任命为财政部长，这不是个好兆头。但就目前而言，这种家族关系似乎对经济有利，它有助于让埃尔多安接受货币和财政需要紧缩的现实。央行终于得到迟来的许可，被准予利用他口中的恐怖主义工具提高利率。政府还为自己制定了雄心勃勃的财政目标，将需要削减养老金并推迟投资以缩小预算赤字。

信贷流动受到严重限制，进口已经崩溃，出口急剧增加。由于土耳其迎来了更多外国游客，同时减少了外国商品的进口，经常账户甚至在去年8月至11月间连续四个月出现盈余。这种再平衡帮助重振了土耳其里拉，从8月底到1月底，里拉汇率上涨了28%。

但是稳定要持续多久才能转化为增长？遗憾的是，一个经济体不能像一部智能手机那样轻松恢复出厂设置。过去的管理不善往往会造成深刻的创伤。例如，土耳其民众不会很快忘记去年里拉的大跌。现在，他们近半的存款是外币。而央行将不得不在一段时间内保持高利率，以让民众相信它可以战胜通胀，而通胀率仍接近20%。政府已急不可耐地开始在大城市开设食品摊位，由政府提供补贴，以抑制食品价格上涨——阿尔巴耶克斥之为“食品恐怖主义”。

随着里拉下跌的影响逐渐消退，通胀将在今年晚些时候进一步下降。在国有银行的带领下，信贷已经开始复苏。2019年的一些早期指标显示经济收缩的速度开始放缓。西班牙对外银行（BBVA）认为，今年下半年经济将恢复增长，使得今年整体较去年增长1%。

然而，周期性复苏无法解决有关土耳其长远未来的问题。现在很难说2002年至2011年间埃尔多安所在政党积极采取的顺应市场的政策代表了土耳其经济的默认模式。毕竟，更近些年来的民粹主义和任人唯亲在土耳其并不是新鲜事。类似的管理不善在2001年金融危机和为加入欧盟而推动十年改革之前曾多次抬头。也许土耳其的出厂设置就是民粹主义，而不是自由主义，而土耳其已经回归到这一设置。 ■



Regulating tech giants

Europe takes on the tech giants

To understand the future of Silicon Valley, cross the Atlantic

“THE BIRTHDAY of a new world is at hand.” Ever since Thomas Paine penned those words in 1776, America has seen itself as the land of the new—and Europe as a continent stuck in the past. Nowhere is that truer than in the tech industry. America is home to 15 of the world’s 20 most valuable tech firms; Europe has one. Silicon Valley is where the brainiest ideas meet the smartest money. America is also where the debate rages loudly over how to tame the tech giants, so that they act in the public interest. Tech tycoons face roastings by Congress for their firms’ privacy lapses. Elizabeth Warren, a senator who is running for president in 2020, wants Facebook to be broken up.

Yet if you want to understand where the world’s most powerful industry is heading, look not to Washington and California, but to Brussels and Berlin. In an inversion of the rule of thumb, while America dithers the European Union is acting. Last month Google was fined \$1.7bn for strangling competition in the advertising market. Europe could soon pass new digital copyright laws. Spotify has complained to the EU about Apple’s alleged antitrust abuses. And the EU is pioneering a distinct tech doctrine that aims to give individuals control over their own information and the profits from it, and to prise open tech firms to competition. If the doctrine works, it could benefit millions of users, boost the economy and constrain tech giants that have gathered immense power without a commensurate sense of responsibility.

Western regulators have had showdowns over antitrust with tech firms before, including IBM in the 1960s and Microsoft in the 1990s. But today’s

giants are accused not just of capturing huge rents and stifling competition, but also of worse sins, such as destabilising democracy (through misinformation) and abusing individual rights (by invading privacy). As AI takes off, demand for information is exploding, making data a new and valuable resource. Yet vital questions remain: who controls the data? How should the profits be distributed? The only thing almost everyone can agree on is that the person deciding cannot be Mark Zuckerberg, Facebook's scandal-swamped boss.

The idea of the EU taking the lead on these questions will seem bizarre to many executives who view it as an entrepreneurial wasteland and the spiritual home of bureaucracy. In fact, Europe has clout and new ideas. The big five tech giants, Alphabet, Amazon, Apple, Facebook and Microsoft, make on average a quarter of their sales there. And as the world's biggest economic bloc, the EU's standards are often copied in the emerging world. Europe's experience of dictatorship makes it vigilant about privacy. Its regulators are less captured by lobbying than America's and its courts have a more up-to-date view of the economy. Europe's lack of tech firms helps it take a more objective stance.

A key part of Europe's approach is deciding what not to do. For now it has dismissed the option of capping tech firms' profits and regulating them like utilities, which would make them stodgy, permanent monopolies. It has also rejected break-ups: thanks to network effects, one of the Facebabies or Googlettes might simply become dominant again. Instead the EU's doctrine marries two approaches. One draws on its members' cultures, which, for all their differences, tend to protect individual privacy. The other uses the EU's legal powers to boost competition.

The first leads to the assertion that you have sovereignty over data about you: you should have the right to access them, amend them and determine who can use them. This is the essence of the General Data Protection

Regulation (GDPR), whose principles are already being copied by many countries across the world. The next step is to allow interoperability between services, so that users can easily switch between providers, shifting to firms that offer better financial terms or treat customers more ethically. (Imagine if you could move all your friends and posts to Acebook, a firm with higher privacy standards than Facebook and which gave you a cut of its advertising revenues.) One model is a scheme in Britain called Open Banking, which lets bank customers share their data on their spending habits, regular payments and so on with other providers. A new report for Britain's government says that tech firms must open up in the same way.

Europe's second principle is that firms cannot lock out competition. That means equal treatment for rivals who use their platforms. The EU has blocked Google from competing unfairly with shopping sites that appear in its search results or with rival browsers that use its Android operating system. A German proposal says that a dominant firm must share bulk, anonymised data with competitors, so that the economy can function properly instead of being ruled by a few data-hoarding giants. (For example, all transport firms should have access to Uber's information about traffic patterns.) Germany has changed its laws to stop tech giants buying up scores of startups that might one day pose a threat.

Europe's approach offers a new vision, in which consumers control their privacy and how their data are monetised. Their ability to switch creates competition that should boost choice and raise standards. The result should be an economy in which consumers are king and information and power are dispersed. It would be less cosy for the tech giants. They might have to offer a slice of their profits (the big five made \$150bn last year) to their users, invest more or lose market share.

The European approach has risks. It may prove hard to achieve true interoperability between firms. So far, GDPR has proved clunky. The open

flow of data should not cut across the concern for privacy. Here Europe's bureaucrats will have to rely on entrepreneurs, many of them American, to come up with answers. The other big risk is that Europe's approach is not adopted elsewhere, and the continent becomes a tech Galapagos, cut off from the mainstream. But the big firms will be loth to split their businesses into two continental silos. And there are signs that America is turning more European on tech: California has adopted a law that is similar to GDPR. Europe is edging towards cracking the big-tech puzzle in a way that empowers consumers, not the state or secretive monopolies. If it finds the answer, Americans should not hesitate to copy it—even if that means looking to the lands their ancestors left behind. ■



监管科技巨头

欧洲挑战科技巨头

欲知硅谷未来，且看大西洋彼岸

“新世界诞生在即。”自1776年托马斯·潘恩（Thomas Paine）写下这句话以来，美国一直自视为新大陆，视欧洲为守旧的大陆。科技行业最符合这种认知。全球20家最具价值的科技公司中，美国占了15家，而欧洲只有一家。在硅谷，世界上最聪明的想法与最明智的投资汇合在一起。与此同时，美国也在激烈争论如何驯服这些科技巨头，以让它们的行动符合公众利益。科技大佬们因为他们的企业存在隐私漏洞而遭到国会痛批。角逐2020年总统竞选的参议员伊丽莎白·沃伦（Elizabeth Warren）希望拆分Facebook。

然而，如果要了解这个世界上最强大的行业往哪走，不要看华盛顿和加州，而要看布鲁塞尔和柏林。因为有悖常理的是，美国还在犹豫不决之时，欧盟已经在采取行动。上月，谷歌因阻碍广告市场的竞争而被罚款17亿美元。欧洲可能很快会通过新的数字版权法。Spotify已向欧盟状告苹果违反反垄断法。此外，欧盟正在率先实践一种全新的科技业原则，目标是让个人能掌控自己的信息和信息产生的利润，并迫使科技公司直面竞争。如果这一原则行之有效，可能会令数百万用户受益，经济也将得到提振，而那些已积聚起巨大影响力却缺乏相应责任感的科技巨头也可能受到约束。

此前，西方监管机构曾就反垄断问题与科技公司展开过较量，包括上世纪60年代与IBM以及90年代与微软的交锋。但如今的科技巨头为人诟病不仅是因为它们攫取高额经济租和压制竞争，还包括传播虚假信息从而破坏民主稳定、侵犯隐私进而践踏个人权利等更恶劣的行径。人工智能的兴起带动了信息需求激增，数据由此成为一种宝贵的新资源。然而该由谁来掌控数据？利润应该如何分配？这些关键问题仍然存在。而唯一能让几乎所有人达成共识的是，为这些问题做决策的绝不能是丑闻缠身的Facebook老板。

马克·扎克伯格。

而对很多企业高管而言，由欧盟牵头解决这些问题似乎匪夷所思，因为在他们看来，欧盟是一片创业荒漠，也是官僚主义的精神家园。但事实上，欧洲有影响力，也有新想法。Alphabet、亚马逊、苹果、Facebook和微软这五大科技巨头平均四分之一的销售额来自欧洲。作为世界最大的经济体系，欧盟制定的标准经常被新兴国家效仿。经历过专制统治的欧洲对隐私问题很警觉。与美国相比，欧洲的监管机构不太容易被游说左右，欧洲法院的经济观点也更与时俱进。科技公司数量不多倒有助于欧洲采取更客观的立场。

欧洲行动的一个关键环节是决定“有所不为”。目前，欧洲已经排除了为科技公司利润设定上限或像监管公用事业部门那样地去监管它们。因为那样做会让科技公司成为死板、永久的垄断企业。欧洲也拒绝拆分科技巨头，因为由此而来的“小Facebook”或“小谷歌”可能会凭借网络效应重新占据主导地位。而欧盟的原则结合了两个方面：一方面利用其成员国的文化——虽各有不同却都倾向于保护个人隐私；另一方面是利用欧盟的法律权力来促进竞争。

第一点导向了用户对个人数据的主权主张——用户应该有权获取和修改个人数据，并决定谁可以使用它们。这便是《通用数据保护条例》（GDPR）的实质。GDPR的原则已经被世界各地许多国家效仿。下一步是实现不同服务之间的互操作性，这样用户就可在不同的供应商之间轻松切换，转向那些提供更优惠的产品或者更合乎道德地对待客户的公司。

（设想有一家名为Acebook的公司，不仅隐私保护标准高于Facebook，还让你从它的广告收入中分得一杯羹，那你就可以把所有的朋友和帖子都转移到Acebook。）一种模式是英国一项名为“开放银行”的计划，让银行客户将自己的消费习惯、经常性支付等数据共享给其他供应商。一份提交给英国政府的新报告主张科技公司必须以同样的方式开放。

欧洲的第二条准则是，企业不能将竞争拒之门外。也就是说企业要对使用自己平台的竞争对手一视同仁。欧盟已经阻止了谷歌对在它的搜索结果中

出现的购物网站，或使用其安卓操作系统的其他浏览器的不公平竞争。德国的一项提议指出，垄断企业必须与竞争对手共享大部分匿名数据，这样经济才能正常运转，而不是被少数几家数据囤积大户控制。举例来说，所有的交通服务公司都应该能够获取优步的路况信息。德国已经修改了法律，阻止科技巨头大量收购日后可能对自己构成威胁的创业公司。

欧洲的方法提供了一种新视角，即由消费者掌控自己的隐私和如何用自己的数据赚钱。消费者轻松切换供应商的能力会带来竞争，而竞争应该会扩大选择范围并且提高标准。如此产生的经济体中，消费者就是上帝，信息和权力也都分散开来。而对科技巨头来说，这可不是什么好事。它们可能不得不将一部分利润（五大科技巨头去年盈利1500亿美元）分给用户，要么加大投资，要么失去市场份额。

但欧洲的方法存在风险。企业之间要实现真正的互操作性可能很难。就目前而言，GDPR确实非常繁冗。开放数据流不应凌驾于隐私保护之上。在这一点上，欧洲的官僚们将不得不依赖企业家（很多来自美国）来找到解决方案。另一个较大的风险是，欧洲的方法不被其他地方所采纳，致使欧洲在科技领域成为与主流世界隔绝的“加拉帕戈斯群岛”。但是，大型科技公司不会愿意让自己的企业分属两个互不相通的大陆。而有迹象表明，美国在对待科技行业的问题上正在向欧洲靠拢：加州已经正式通过一项与GDPR类似的法律。欧洲正在逐步解决科技巨头引发的难题，它将增强消费者的权力而不是国家或隐秘的垄断企业的权力。如果欧洲找到了答案，美国人应毫不犹豫地效仿——即使这意味着将希望寄托于那片他们的祖先曾与之挥别的土地。 ■



Mobile networks

5G or fifth column?

Ericsson's boss doubts that Huawei's woes will help its European rivals

IN THE DAYS of pre-internet capitalism the troubles of one dominant company in an industry tended to be good news for its rivals. In today's hyperconnected world a threatened ban by Western governments of Huawei, the Chinese market leader in telecoms gear, is also a worry for its competitors. Both Ericsson, a Swedish company, and Nokia, a Finnish one, would prefer the geopolitical saga to end, the better to focus on competing for contracts related to the launch of super-speedy “fifth generation” (5G) mobile-phone networks.

The American government is not letting up its campaign to persuade allies to freeze Huawei out of 5G tenders. It worries that Huawei's kit may contain “back doors”—deliberate security flaws inserted to allow Chinese spooks eavesdrop on, or attack, phone networks. Earlier last month, in a letter to Germany's economics minister, America's envoy to Berlin, Richard Grenell, threatened to cut back American co-operation with German security agencies if the country allowed Huawei or other Chinese firms to participate in the roll-out of 5G. Mike Pompeo, America's secretary of state, suggested in Hungary recently that doing business with Huawei could tip decisions on where America stations troops.

So far Britain and Germany, among others, have not yielded to American demands. Angela Merkel, the German chancellor, said on March 19th that she does not believe in excluding a company from the German market “simply because it's from a certain country”, though a final decision is pending. Even if America prevailed in Europe, as it has in Australia and Japan, Ericsson and Nokia are unlikely to win back much of the market they

have lost in recent years. Between 2015 and 2018 Huawei's share rose from 24% to 28%; Nokia's dipped from 20% to 17% and Ericsson's from 15% to 13%. An escalation in the war on Huawei might prompt Beijing to retaliate by kicking Western firms out of China.

That would be a blow to the Nordic duo. China accounted for 10% of Ericsson's 211bn krona (\$24.2bn) in global sales last year. The company runs two research and development sites in China. Nokia derives a similar share of revenues from the Chinese mainland, Hong Kong and Taiwan. Extra sales in Europe in the event of a Huawei ban would not offset losses in China, argues Pierre Ferragu of New Street Research, not least because the Chinese will launch 5G a year or two earlier.

More important, worries Börje Ekholm, chief executive of Ericsson, a ban on Huawei would slow down the launch of 5G in Europe. The continent is already lagging three to four years behind America in 4G, the current generation of wireless technology, he says. Uncertainty over regulation, pricing and, most of all, how to deal with Huawei, is likely to slow Europe down further. European operators are lobbying hard to maintain the choice between three purveyors; many prefer Huawei wares, which are often cheaper (and some say better).

The spectre of a Huawei ban is putting a damper on Germany's auction for 5G mobile spectrum that kicked off on March 18th in Mainz. The auction, which drew four big operators, is expected to last several weeks. All four bidders already make extensive use of Huawei hardware, such as antennae or routers. Upgrading to 5G will require splurging on new kit. Huawei wants to be one of their principal suppliers (though it may first need to meet more stringent security requirements which the German government is mulling). In November the Chinese company opened a lab in Bonn, the base of Germany's cyber-security regulator, where its equipment can be tested.

Though it is possible to ban Huawei completely from Europe, its biggest market outside of China, industry insiders warn that it would be hugely complex and costly. It would be especially disruptive in countries where Huawei is deeply embedded, such as Italy, Poland and Britain, says Stéphane Téral of IHS Markit, a research firm. With only a hint of hyperbole Bengt Nordstrom of Northstream, a consultancy, likens the resulting shock to the collapse of Lehman Brothers in 2008. Most of Europe's roughly 200 operators of mobile networks use Huawei's 4G gear.

Asked whether talk of a Huawei ban had any effect on the order books of Ericsson, Mr Ekholm responds that "the candid answer is no". On March 18th TDC, Denmark's biggest telecoms firm, confirmed that it was plumping for Ericsson over Huawei, its current equipment-maker, to build its 5G network. That deal, though, was struck before any concerns over Huawei were ever aired. So far, the entire controversy has been a headache for Mr Ekholm and his counterpart at Nokia, not a gift. ■



移动网络

5G还是第五纵队？

华为的麻烦会让它的欧洲竞争对手得利吗？爱立信的老板表示怀疑

在互联网资本主义时代之前，一个行业里的主导企业遭遇的麻烦往往 是其竞争对手的好消息。在今天的超连接世界中，西方国家政府威胁禁用中国 电信设备市场的领导者华为的产品，却也让它的竞争对手感到担忧。瑞典 的爱立信和芬兰的诺基亚都希望这场旷日持久的地缘政治大戏早日结束， 让它们能更好地专注在争取超高速“第五代”（5G）移动电话网络的推出 带来的合同。

美国政府仍在努力说服盟友禁止华为参与5G招标。它担心华为的产品可能 包含“后门”（蓄意留下的安全漏洞），能让中国的间谍窃听或攻击电话网 络。上月早些时候，美国驻德国大使理查德·格雷内尔（Richard Grenell） 致信德国经济部长，威胁称如果德国允许华为或其他中国公司参与部署 5G，美国将减少与德国安全机构的合作。美国国务卿迈克·蓬佩奥（Mike Pompeo）近期在匈牙利表示，与华为做生意可能会影响美国派驻军队的 决策。

到目前为止，英国和德国等国还未顺应美国的要求。德国总理默克尔3月 19日表示，德国还没有做出最终决定，但她认为不应“只是因为它来自某 个国家”就将一个公司排除在德国市场之外。即使美国在欧洲的游说像在 澳大利亚和日本那样获得成功，爱立信和诺基亚也不太可能赢回太多在近 年失去的市场。2015年至2018年间，华为的市场份额从24%上升至28%； 诺基亚从20%下降到17%，爱立信从15%下降到13%。对华为的战争如果升 级，可能会促使中国实施报复，将西方企业赶出中国。

这将对这两家北欧企业造成沉重打击。去年，在爱立信2110亿克朗（242 亿美元）的全球销售额中，中国市场贡献了10%。爱立信还在中国设有两 个研发中心。诺基亚来自中国大陆、香港和台湾的收入所占的份额也与爱

立信相当。新街研究（New Street Research）的皮埃尔·费拉格（Pierre Ferragu）认为，如果对华为的禁令生效，这两家企业在欧洲获得的额外销售额并不能弥补在中国的损失，尤其是因为中国会提前一两年前推出5G。

更重要的是，爱立信的首席执行官鲍毅康（Börje Ekholm）担心对华为的禁令将延缓欧洲推出5G的进程。他表示，欧洲在这一代4G无线技术方面已经落后了美国三四年。在监管、定价，以及最重要的一点——如何应对华为——等方面的不确定性很可能进一步拖慢欧洲的步伐。欧洲运营商正在努力游说以求能继续在三家供应商中做选择。许多运营商更喜欢华为的设备，因为通常会更便宜（还有些人说更好）。

对华为禁令的忧虑影响了3月18日在德国美因茨（Mainz）开幕的5G移动频谱拍卖的热度。此次拍卖吸引了四家大型运营商，预计将持续数周。所有四家竞标企业都已经在广泛使用华为的天线或路由器等硬件。升级到5G将需要大量购置新设备。华为希望成为它们的主要供应商之一（尽管可能首先需要满足德国政府正在考虑的更严格的安全要求）。去年11月，华为在德国网络安全监管机构所在地波恩（Bonn）开设了一个测试设备的实验室。

虽然要在欧洲这个华为在中国以外最大的市场全面禁用华为是可以实现的，但业内人士警告说这会极其复杂，且代价高昂。研究公司IHS Markit的斯特凡·泰拉尔（Stéphane Téral）说，在意大利，波兰和英国等大量使用华为产品的国家，禁令引发的混乱将尤其严重。北流咨询公司（Northstream）的本格特·诺德斯特姆（Bengt Nordstrom）略带夸张地将这种冲击比作2008年的雷曼兄弟倒闭。欧洲约200家移动网络运营商中大多使用华为的4G设备。

当被问及围绕华为禁令的议论是否影响了爱立信的订单时，鲍毅应回应称“坦率地说，没有”。3月18日，丹麦最大的电信公司TDC证实将舍弃现在为自己提供设备的华为，选择爱立信为其建设5G网络。不过，这笔交易在因华为而起的种种担忧广为流传之前就已经敲定了。到目前为止，有关禁令

的争议整体而言对鲍毅康和诺基亚总裁是麻烦而不是礼物。■



Medical devices

Powered by the heart

A way to charge pacemakers using the heart's own muscle

FOR THOSE whose hearts occasionally go off rhythm, pacemakers are, quite literally, life savers. By providing a small electrical jolt at the right moment, they can keep a heart working at the appropriate pace. Their main drawback is that they use batteries. Even the best of them eventually run out of energy, and replacing the batteries requires surgery.

Since surgery is generally best avoided, the search has been on for long-lasting power sources. Various options have been explored, including, in the 1970s, plutonium. Nuclear-powered pacemakers have thankfully fallen out of fashion and today, devices with lithium batteries last between 5 and 15 years. Zhang Hao of the Second Military Medical University, in Shanghai, and Yang Bin of Shanghai Jiao Tong University sought a way of recharging a pacemaker's battery by scavenging energy from inside the body. As they report in the journal *ACS Nano* they have used the heart muscle itself to power a tiny generator.

Previous attempts to use cardiac muscle power to run pacemakers relied on piezoelectric materials. These release electrons when deformed, and can be attached to beating hearts so that they are slightly bent with each heart beat, generating electricity. This has worked, but not well enough: the output has rarely exceeded five microwatts, while most pacemakers require at least ten.

Dr Zhang and Dr Yang speculated that they could improve matters by arranging for their piezoelectric composites to be more dramatically deformed. First, they created a small capsule from a sheet of flexible polymer a tenth of a millimetre thick. After compression, this capsule

would return to its original shape. They then attached strips of piezoelectric composite to either side of the capsule, attached electrodes to these strips, and covered the strips with a protective layer of silicone. This layout meant that the strips were slightly bent from the beginning and required only a tiny, brief pressure to generate 15 microwatts.

The question was where to put the capsule, either in or on the heart, in order to get a similar effect. A study of cardiac anatomy suggested the pericardial sac, at the organ's base, would be ideal. It would squeeze the capsule tightly as the heart contracted and still keep a firm grip on it when the heart was relaxed.

To test this idea, the capsule's electrodes were attached to a commercial pacemaker that had had its battery removed, and surgically implanted into a 50kg Yorkshire pig. The capsule generated enough power for the pacemaker to function normally. Whether such an arrangement will pass human trials remains to be seen. But if it does, the days of pacemakers that need battery replacements, with all their associated surgery, may be numbered. ■



医疗设备

心脏驱动

用心脏自身肌肉为起搏器充电

对于不时心律失常的人来说，心脏起搏器是切切实实的救星。通过在适当的时候发出脉冲微电流，它们能刺激心脏保持正常律动。其主要缺点是要使用电池。即便是最好的起搏器也有把电耗尽的一天，而更换电池需要做手术。

手术毕竟是能免则免的事，所以研究人员一直在寻找持久的动力源。探索过的方案多种多样，包括上世纪70年代用过的钚驱动。所幸这种核动力心脏起搏器已经过时，而今天，装有锂电池的起搏器可以维续5到15年。上海第二军医大学的张浩和上海交通大学的杨斌寻求一种收集人体内部能量来给起搏器充电的方法。据他们在学术期刊《ACS Nano》上的报告，他们用心肌本身成功驱动了一个微型发电装置。

先前以心肌力量驱动起搏器的尝试依赖压电材料。这些材料在变形时释放电子，因而可以将它们附着在跳动的心脏上，随每次心跳轻微弯曲，从而发电。这种方法确属可行，但还不够好：这样产生的电能一般不超过五微瓦，而大多数心脏起搏器需要至少十微瓦。

张浩和杨斌认为，可以通过加大压电复合材料的变形幅度来提高发电能力。首先，他们用0.1毫米厚的柔性聚合物薄片制成一个小胶囊。这个胶囊在挤压后能恢复原始形状。然后，他们把压电复合材料条带附于胶囊两侧，接上电极，并用硅树脂保护层覆盖条带。这种设计意味着条带从一开始就略微弯曲，只需短暂的微小压力即可产生15微瓦的电能。

问题是要获得类似的压力，胶囊是应该置于心脏内还是心脏上。一项心脏解剖学研究表明，围心囊位于心脏底部的区域是个理想的位置。当心脏收缩时，这个部分会紧紧挤压胶囊，在心脏放松时也仍能牢牢固定胶囊。

为测试这个想法，研究人员把胶囊的电极连接到一个已取出电池的商用起搏器上，并通过外科手术将之植入一头50公斤重的约克夏猪体内。胶囊产生了足够的电来使起搏器正常工作。这种设计能否通过人体试验仍有待观察。如果成功，仍需要为心脏起搏器更换电池和做手术的日子就屈指可数了。 ■



A unicorn stampede

Lyft and the unicorns

It belongs to a particularly fertile subspecies of the mythical \$1bn-plus startups

UNICORNS ARE horned mythical creatures that do not exist. In the world of technology they have multiplied in recent years, at least if you define them as privately held startups valued at more than \$1bn. Some 330 such firms exist globally, according to cbInsights, a data provider. All told, venture capitalists value them above \$1trn. Ride-hailing apps, which allow passengers to summon cars driven by their owners, form a particularly fertile subspecies. On March 29th one of these “taxicorns”, Lyft, floated its shares on the Nasdaq exchange in New York. Its stock price has since experienced a roller-coaster ride. Analysts had expected other unicorns to rush to the stockmarket after a successful listing of Lyft. Uber, the world’s biggest ride-hailing firm, is likely to do so in a few weeks (on March 26th it bought Careem, a Middle Eastern rival, for \$3.1bn). Other candidates include Pinterest, which lets users create digital pin-boards, and Slack, a corporate messaging service. Once they list, of course, companies cease to be unicorns. Will the magic disappear, too? ■



独角兽蜂拥而上

Lyft与独角兽

价值超过十亿美元的神话般的创业公司有一个亚种尤为繁盛，*Lyft*便属于这类

“独角兽”是一种神话中虚构的长角生物。在科技业中，独角兽的数量近年来成倍增长——在这里，独角兽指的是估值十亿美元以上的私有创业公司。数据供应商cbInsights的数据显示，全球约有330家独角兽公司。加在一起，风险投资家对它们的估值超过一万亿美元。网约车应用让乘客可以召唤由私家车主驾驶的汽车，这类公司成为独角兽中尤为繁盛的一个亚种。3月29日“出租车独角兽”中的一员Lyft在纽约纳斯达克交易所上市。之后其股价经历了大幅涨落。分析师此前预计Lyft的成功上市将吸引其他独角兽纷纷涌入股市。全球最大的网约车公司优步很可能会在几周后上市（3月26日优步以31亿美元的价格收购了中东竞争对手Careem）。有望上市的独角兽还包括让用户自己创建数字图片墙的Pinterest和企业通讯服务Slack。当然，上市后，它们就不再是独角兽了。那么，它们的魔法也会消失吗？■



Health care and technology

The AI will see you now

Artificial intelligence is coming to medicine—for good, ill or both

FOR ALL the technological wonders of modern medicine, from gene-editing to fetal surgery, health care—with its fax machines and clipboards—is often stubbornly antiquated. This outdated era is slowly drawing to a close as, belatedly, the industry catches up with the artificial-intelligence (AI) revolution. And none too soon, argues Eric Topol, a cardiologist and enthusiast for digital medicine.

Dr Topol's vision of medicine's future is optimistic. He thinks AI will be particularly useful for repetitive, error-prone tasks, such as sifting images, scrutinising heart traces for abnormalities or transcribing doctors' words into patient records. It will be able to harness masses of data to work out optimal treatments (for both conditions and individuals), and improve workflows in hospitals. In short, AI is set to save time, lives and money.

Much of this is hypothetical—but AI is already outperforming people in a variety of narrow jobs for which it has been trained. Eventually it may be able to diagnose and treat a wider range of diseases. Even then, Dr Topol thinks, humans would oversee the algorithms, rather than being replaced by them.

The fear the author harbours is that AI will be used to deepen the assembly-line culture of modern medicine. If it confers a “gift of time” on doctors, he argues that this bonus should be used to prolong consultations, rather than simply speeding through them more efficiently.

That is a fine idea, but as health swallows an ever-bigger share of national wealth, greater efficiency is exactly what is needed, at least so far as

governments and insurers are concerned. Otherwise, rich societies may fail to cope with the needs of ageing and growing populations. An extra five minutes spent chatting with a patient is costly as well as valuable. The AI revolution will also empower managerial bean-counters, who will increasingly be able to calibrate and appraise every aspect of treatment. The autonomy of the doctor will inevitably be undermined, especially, perhaps, in public-health systems which are duty-bound to trim inessential costs.

The Hippocratic Oath holds that there is an art to medicine as well as a science, and that “warmth, sympathy and understanding may outweigh the surgeon’s knife or the chemist’s drug”. That is not just a platitude: the patients of sympathetic physicians have been shown to fare better. As Dr Topol says, it is hard to imagine that a robot could really replace a human doctor. Yet as demand for health care outstrips the supply of human carers, the future may involve consultations on smartphones and measurements monitored by chatbots. The considerably warmed stethoscope, placed gently on a patient’s back, may become a relic of the past.

In the end technology may even be able to solve the empathy deficit. Japanese engineers are working on robots that simulate human presence, or *sonzai-kan*. A machine could never truly develop the shared humanity that helps patients heal. That doesn’t mean it cannot be faked. ■



医疗与科技

AI可以给你看病了

人工智能进驻医疗——也许好，也许坏，也许兼而有之【《深度医疗：人工智能如何让医疗重新人性化》书评】

尽管有从基因编辑到胎儿手术等各种现代医学技术奇迹，但医疗行业往往又非常因循守旧——它还在广泛使用传真机和夹纸记录板。而今这个行业总算开始追赶人工智能（AI）革命的热潮，一个落伍的时代正慢慢走向尾声。心脏病学家、数字医学信徒埃里克·托普尔（Eric Topol）认为这样的变化早该发生了。

托普尔对医学的未来持乐观态度。他认为AI对于重复性的、易出错的任务尤其有用，例如筛选图像、检查心脏异常的迹象，或将医生的话转录成病历。AI将能够利用大量数据来制定出治疗某种疾病以及特定个体的最佳方案，并改善医院的工作流程。简而言之，AI有望节省时间、金钱，并挽救生命。

这其中也有相当一部分仍只是假设。但在经过专门训练后，AI在各种特定工作任务中的表现已经超越人类。最终它也许将能够诊断和治疗更多类型的疾病。托普尔认为，即便真的如此，人类仍将监督算法，而不是被AI取代。

作者心中的担忧是，AI会被用于进一步强化现代医学的流水线文化。如果它能给医生带来“时间的馈赠”，他认为应将这个好处用于延长问诊时间，而不是简单地追求提高效率，快速完成诊疗。

这是个不错的想法，但随着医疗支出耗费国家财富的比重越来越高，需要做到的正是提高效率，至少对政府和保险公司而言是这样。否则，富裕社会可能无法应对老龄化和人口增长带来的医疗需求。和患者多谈五分钟很有价值，但成本也很高。AI革命还将赋能财务管理人员，提高他对治疗的方方面面做出调整和评估的能力。医生的自主权将不可避免地被削弱，在

有责任削减不必要的成本的公共卫生系统中也许尤其如此。

按希波克拉底誓言所说，医学既是科学又是艺术，“医生给予病人的温暖、同情和理解有时比外科医生的手术刀和药剂师的药更重要”。这并不是陈词滥调：研究显示，医生富有同情心，患者恢复得更好。正如托普尔所说，很难想象机器人真的可以取代人类医生。然而，随着对医疗的需求超过了人类医疗工作者的供给，未来人们可能需要通过智能手机问诊，由聊天机器人来监控测量结果。医生体贴地将听诊器捂暖后再轻轻贴在病人背部的情形可能会成为历史。

未来，技术甚至可能会解决共情缺失的问题。日本工程师正在研究模拟人性（*sonzai-kan*）的机器人。机器可能永远无法真正发展出人类共有的特性来帮助患者康复，但这并不意味着它们不能假装有。■



First-class air travel

The people in front

Why demand for the best seats on scheduled flights is stagnating

Dubai is often called a “Disneyland for the rich”. At the city’s airport the three first-class lounges of Emirates, the United Arab Emirates’ flag-carrier, do not disappoint. Each one is as big as the terminal’s concourse, built to accommodate thousands of passengers. But every day only a hundred or so enter each first-class lounge. Instead of the overpriced fast-food on offer in the public concourse, a maze of restaurants and bars serve free caviar and champagne. In their duty-free sections no knock-off cigarettes or booze are in sight. Think instead Bulgari necklaces and whisky at \$25,000 a bottle. The facility is so large, its manager admits, that the most common reaction heard from new arrivals is, “Oh my God, where is the lounge?”

Yet the rows of hundreds of empty armchairs suggest that something is not quite right. Airlines are falling out of love with first class. And that is true even of Emirates, which sells far more first-class tickets than any other carrier (see chart 1). The time to launch new first-class offerings is at ITB Berlin, the world’s largest trade show for the travel industry, which opened on March 6th. At this event in 2017 Emirates unveiled a new onboard bar and lounge for its highest-paying passengers. The same year its big rival in the Gulf, Qatar Airways, launched the world’s first skyborne double-beds. But the mood has changed. Last year Emirates stopped attending the show at all.

The decline of first-class air travel seems at first glance surprising. Facilities onboard have never been so good. On its A380 superjumbos, Emirates first class provides in-flight showers. Moreover, the number of very rich people has risen sharply. *Forbes*, a magazine, estimates that the stock of billionaires has doubled to more than 2,100 over the past two decades. And

the rest of the luxury-travel business is booming. Richard Clarke of Bernstein, a research firm, estimates that the number of luxury hotels in Asia could increase by as much as 168% over the next decade.

Even so, many analysts predict that first class will soon disappear. In America it is already almost extinct. Ten or so years ago almost all the many hundreds of long-haul aircraft based there offered first-class seating; now only about 20 do. Elsewhere in the world an increasing number of airlines, including Turkish Airlines and Air New Zealand, have already scrapped it completely. On the majority of the most-travelled long-haul routes the number of first-class seats available has fallen sharply in the past decade (see chart 2). Even the airlines that sell the most first-class fares are curbing their enthusiasm. The number of first-class seats has been slashed from 14 to 11 on Emirates' superjumbos and from 12 to six on those flown by Singapore Airlines.

When commercial aviation got going after the second world war there was only one class: first. Economy appeared in the 1950s. It was followed in the 1970s by business class and in the 1990s by premium economy, to fill the gap between business and cattle class.

Despite the proliferation of cheaper seats, airlines still make a lot of their money from the more expensive ones. Emirates claims that first- and business-class passengers are 12% of the total but generate about 40% of its turnover. High demand for flat beds on transatlantic flights is what has saved European flag-carriers such as British Airways (BA), Air France and Lufthansa from going out of business. Ross Harvey of Davy, a stockbroker, points out that transatlantic low-cost airlines that have tried to offer just economy or premium-economy seats, such as Norwegian and WOW, have struggled to make money.

Airline bosses are acutely worried about the decline in demand for first class. But they have themselves partly to blame. The industry has disrupted itself, points out Geoffrey Weston of Bain & Company, a consultancy. On short-haul flights, the low-cost model has won. Most “first-class” passengers on these routes now sit in seats with the same legroom as economy passengers, albeit with an empty middle seat, and make do with extras such as lounge access, and food and drink.

On longer routes, new seats that turned into fully flat beds were a game-changer. These were originally introduced by BA in first class in 1995, and much sought after. If travellers can sleep comfortably in the sky, they can save the cost of a hotel or, more importantly for time-pressed corporate warriors, a day's working time. However, in 2000 BA launched a similar seat in business, and most carriers have followed suit. That has weakened the case for flying first class. Most companies think a flat bed in business class is good enough for their employees. Only a few honchos are allowed to enjoy first class on the company dime, says Greeley Koch of the Association of Corporate Travel Executives, a trade group.

Changing attitudes among the very rich are also sapping demand. Over the past decade the number of billionaires has grown fastest in China, India and the tech hubs of America. But many self-made tycoons want their children to have the “normal” middle-class upbringings they themselves had, says Charlotte Vangsgaard of ReD Associates, a consultancy. So they book themselves and their families into business, or sometimes economy, rather than first.

Airlines that offer first class say they still do so for two main reasons. The first is to use upgrades from business class as an incentive for loyalty from both corporate and individual customers. But as the gap between business and first has narrowed, frequent flyers have begun to respond better to other incentives, such as access to lounges or to special hotlines.

The second reason for maintaining first class is also weakening. That is what Samuel Engel of ICF, another consultancy, calls the “halo effect” an airline creates by advertising first-class facilities. In other words, flyers begin to think economy on Emirates, say, is fancier than on other airlines by association with features in its first class, such as in-flight showers. This can be an effective marketing tool. For instance, Etihad, a rival to Emirates in the Gulf, has probably had more press coverage for its onboard first-class apartments called “The Residence”, of which it has only ten, than all its 30,000 other seats combined.

Many airlines, however, are no longer convinced by this argument and have slimmed down their first-class offerings. One such is Air France-KLM, whose chief executive in 2014, Alexandre de Juniac, claimed that first class was “little more than a costly marketing gimmick” and that “no one makes money out of it”.

Yet some still do, particularly Emirates. One advantage it has is that it can combine traffic from various destinations using its hub in Dubai. This helps it make first class viable on routes where it might otherwise struggle to attract first-class passengers. As a result, over 90% of its first-class bookings are paid for, rather than free upgrades.

Why do some passengers still want to fly first rather than business? Privacy is one reason, says Sir Tim Clark, the airline’s president. Smaller cabins and walled-off seats make it easier for a celebrity to fly unnoticed by fellow passengers who might otherwise tweet unflattering pictures of them drooling in their sleep. Another is flexibility. First-class passengers want to sleep and eat when they choose, not on a timetable set by cabin crew, as often happens in business class, says Joost Heymeijer, head of Emirates Inflight Catering.

But even Emirates’ first- and business-class sales are threatened by private

jets. These let executives avoid the wait for a scheduled flight. It is also much quicker to pass through security in a private-jet terminal than an airport. And in America ten times as many airports are open to private jets as are available for the bigger aircraft airlines use. Moreover, executive jets are becoming cheaper in relative terms, says Adam Twidell of PrivateFly, a private-jet booking service. New shared-ownership and ride-hailing services allow the cost of a private jet to be spread over many users.

The rise of the private jet may be good news for bigwigs rushing to meetings. But it is bad news for the environment. The World Bank estimates that first- and business-class passengers on a narrow-body jet already generate between 2.5 and six times more carbon emissions per person than the poor saps crammed into the cheap seats. Private jets, obviously, are worse. A half-filled private jet is roughly five times dirtier than business class and 12 times dirtier than economy on short-haul routes.

A new breed of supersonic executive jets will be even more polluting. The International Council on Clean Transportation, a think-tank, estimates that their emissions will be five to seven times greater than for standard private jets. Boom, one of the startups hoping to produce these jets, has forecast that up to 2,000 such supersonic aircraft will be built by 2035.

Another trend that could hasten the end of the arms race in first-class facilities is the shift towards smaller passenger jets. On February 14th Airbus, maker of the A380 superjumbo, announced that it will stop production of new ones from 2021. This aircraft's bulbous fuselage left space that could be devoted to fancy first-class features such as Emirates' showers and Etihad's apartment suites. The smaller and more efficient jets that have consigned the A380 to an early grave lack this extra space. It would be hard to fit showers, for instance, in the new long-haul narrow-body jets now available.

So Emirates will need another way to get its passengers to pay extra—perhaps by further upgrading those cavernous lounges. Its lounge manager in Dubai sounds perplexed: "You need to do something different to make first class worth it." ■



头等舱飞行

坐在前面的人

为什么对定期航班头等舱座位的需求陷入停滞

迪拜常被称作“富人的迪士尼乐园”。在迪拜机场，阿联酋的国家航空公司阿联酋航空的三个头等舱休息室绝不会令人失望。每个休息室都和候机楼的大厅一样大，可容纳数千名旅客，但每天只迎来一百来人。在这里，形形色色的餐厅和酒吧提供免费的鱼子酱和香槟，而不是公共候机区那些标价过高的快餐。免税商店区看不到山寨名牌烟酒，而是在销售宝格丽项链和2.5万美元一瓶的威士忌。主管承认，由于贵宾休息室非常庞大，第一次来的旅客最常见的反应就是：“哦，天哪，休息室在哪？”

不过，一排接一排、数百张空荡荡的扶手椅显示情况有点不对劲。航空公司对头等舱的热情在消褪。阿联酋航空也一样，即便它的头等舱机票销量远远超过了其他航空公司（见图表1）。3月6日，世界最大的旅游贸易展柏林国际旅游交易会（ITB Berlin）开幕。这是航空公司发布头等舱最新产品的时间。在2017年的展会上，阿联酋航空展示了为最高票价旅客推出的全新机上酒吧和休息室。同年，它在海湾地区的主要竞争对手卡塔尔航空推出了世界上第一张机上双人床。但行业情绪已经发生了变化。去年，阿联酋航空根本没参加这个展会。

乍看之下，头等舱乘客人数的下降似乎令人惊讶。机上设施前所未有地好。阿联酋航空的空中“巨无霸”A380的头等舱还提供淋浴间。此外，超级富翁的人数急剧增加。据《福布斯》杂志估计，在过去20年里，亿万富翁的数量翻了一番，达到2100多位。而豪华旅游业的其余部分也在蓬勃发展。研究公司盛博（Bernstein）的理查德·克拉克（Richard Clarke）估计，未来十年里亚洲豪华酒店的数量可能会增加168%。

尽管如此，许多分析师预测头等舱很快将消失。在美国，头等舱几乎已经绝迹。大约十年前，往返美国的几百架长途客机几乎全都提供头等舱座

位，现在大约只有20个航班还保留着头等舱。在世界其他地方，土耳其航空和新西兰航空等越来越多的航空公司已经完全取消了头等舱。过去十年中，航班最密集的那些长途航线的头等舱座位数大多急剧下降（见图表2）。即使是头等舱销量最高的航空公司也在抑制自己的热情。阿联酋航空巨无霸客机上的头等舱座位数从14个减少到11个，新加坡航空从12个减少到6个。

二战后商业航空开始兴起时，机上座位只有一个等级：头等舱。经济舱出现在50年代。到70年代出现了商务舱，90年代又有了高端经济舱，填补了商务舱和经济舱之间的空白。

尽管便宜的座位越来越多，但航空公司仍然从票价更高的座位上赚了很多钱。阿联酋航空称，头等舱和商务舱乘客占其乘客总数的12%，却贡献了40%左右的营业额。对跨大西洋航班平躺座椅的高需求让英国航空、法国航空和汉莎航空等欧洲各国的国家航空公司免于破产。股票经纪公司戴维（Davy）的罗斯·哈维（Ross Harvey）指出，挪威航空和WOW航空公司等尝试仅提供经济舱或高端经济舱的跨大西洋低成本航空公司一直都难以盈利。

航空公司的老板十分担心头等舱需求的下降，但这在一定程度上是他们咎由自取。咨询公司贝恩的杰弗里·韦斯顿（Geoffrey Weston）指出，是航空业自己颠覆了自己。就短途航班而言，低成本模式已经胜出。大多数“头等舱”乘客伸展腿脚的空间与经济舱乘客并无不同，只不过不需要挤在两个人中间，并且可以凑合着享受下休息室、餐食和饮料等额外待遇。

在较长的航线上，可完全放平变成一张床的新型座位改变了局面。这种座位最初是由英国航空在1995年于头等舱中推出，受到热捧。如果旅客可以在飞行途中舒服地睡觉，就可以节省酒店的费用；或者对于时间紧迫的公差人员来说，更重要的是能省出一天的工作时间。然而到了2000年，英航在商务舱也推出了类似的座位，多数航空公司纷纷效仿。这就削弱了买头等舱机票的理由。大多数企业认为商务舱的平躺座椅对员工来说已经够

好了。行业组织企业差旅管理协会（Association of Corporate Travel Executives）的格里利·科赫（Greeley Koch）表示，只有少数高管能用公司的钱坐头等舱。

超级富豪态度的转变也在削弱对头等舱的需求。在过去十年中，中国、印度以及美国科技产业中心的亿万富翁人数增长最快。但咨询公司ReD Associates的夏洛特·范斯嘉德（Charlotte Vangsgaard）表示，许多白手起家的大亨希望自己的孩子能有“平常”的中产阶级成长经历，就像他们当初那样。因此，他们给自己和家人预订机票时会选择商务舱，有时甚至是经济舱，而不会选头等舱。

仍在提供头等舱的航空公司表示，它们这样做有两大原因。首先是可以通过把商务舱升级到头等舱来激励企业和个人客户保持忠诚度。但随着商务舱和头等舱的差距缩小，飞行常客开始对使用休息室或特殊热线等其他激励措施更有兴趣。

维持头等舱的第二个原因也在弱化。它就是另一家咨询公司ICF的塞缪尔·恩格尔（Samuel Engel）所说的，航空公司对头等舱设施的宣传会产生“光环效应”。换句话说，旅客得知阿联酋航空的头等舱有淋浴间等设施，就会开始觉得它的经济舱也会比其他航空公司更好。这可以是一种有效的营销工具。例如，阿联酋在海湾地区的竞争对手阿提哈德航空仅提供10套名为“空中官邸”的头等舱套间，但它们获得的新闻曝光率可能比它其余的三万个飞机座位的总和还要多。

但许多航空公司已不再信这一套，减少了自己的头等舱座位数。法航荷航集团就是其中之一。2014年，时任该公司首席执行官的亚历山大·德·朱尼亞克（Alexandre de Juniac）声称，头等舱“只不过是一个代价高昂的营销噱头”，“没有谁能靠它赚钱”。

但有些航空公司还是能靠头等舱赚到钱的，尤其是阿联酋航空。它的一个优势是可以利用迪拜的枢纽地位整合不同目的地的航班客流。这有助于它在原本可能难以吸引到头等舱乘客的航线上经营头等舱。因此，阿联酋航

空超过90%的头等舱机票都是旅客付费买的，而不是靠免费升舱。

为什么相比商务舱有些旅客仍然更愿意坐头等舱呢？阿联酋航空的总裁蒂姆·克拉克爵士（Sir Tim Clark）说私密性是原因之一。头等舱较小，座位也都围起来，名人们就更不容易被其他旅客发现而把他们在睡梦中流口水的丑照发到推特上。另一个原因是灵活性。阿联酋航空机上餐饮部的负责人尊斯特·赫美佳（Joost Heymeijer）表示，头等舱乘客想要自己选择休息和用餐的时间，而不是按照机组人员设定的时间表，商务舱往往就要接受这样的安排。

但即便是阿联酋航空的头等舱和商务舱的销售也受到了私人飞机的威胁。私人飞机让高管们无需等待定期航班。在私人飞机航站楼过安检的速度也比普通机场快得多。在美国，对私人飞机开放的机场的数量十倍于向飞机较大的航空公司开放的机场数量。此外，私人飞机预订服务公司PrivateFly的亚当·泰威德尔（Adam Twidell）表示，相对来说，公务机的价格正在降低。新出现的共享所有权和“召机”服务让私人飞机的成本分摊到多个用户身上。

私人飞机的兴起对于赶时间参加会议的大亨们来说可能是个好消息，但对环境而言是坏消息。世界银行估计，一架窄体喷气式飞机的头等舱和商务舱旅客的人均碳排放量就已比挤在廉价座位上的可怜虫高出2.5到6倍，私人飞机显然更糟糕。一架坐满一半座位的私人飞机的人均碳排放量大约比短途航线商务舱高出五倍，比经济舱高12倍。

新型超音速公务机的污染甚至更加严重。智库国际清洁运输委员会（International Council on Clean Transportation）估计，它们的排放量将是普通私人飞机的五到七倍。Boom是打算生产这种喷气式飞机的创业公司之一。它预计到2035年将有多达2000架这样的超音速飞机建成。

另一个趋势也可能加速终结头等舱军备竞赛：向较小客机的转变。2月14日，空中巨无霸A380的制造商空客宣布将从2021年起停产该机型。这款飞机的庞大机身提供了充足空间，可以装下阿联酋航空的淋浴间和阿提哈德

航空的公寓套房等豪华头等舱设施。让A380提前退役的更小、更高效的喷气客机缺乏这样的额外空间。例如，现在市场上出现的新型长途窄体喷气客机上很难安装淋浴间。

因此，阿联酋航空将需要想些其他办法让乘客支付额外的费用——也许是进一步升级那些巨大的休息室。迪拜休息室的主管听起来充满困惑：“总得与众不同才能让头等舱物有所值吧。”■



Chinese trains

The red-train blues

A giant Chinese trainmaker's push abroad is running out of steam

LIKE MANY towns with an industrial heritage, the transformation of a factory that had stood derelict for decades into a shiny modern manufacturing site might seem a welcome development. But in Springfield, Massachusetts, famous for the rifles produced at its National Armoury, the arrival of a Chinese trainmaker has hit the buffers.

It is not that Springfield has no history of trainmaking; two centuries ago it built some of the first American-made railway carriages to replace British imports. The need for a local manufacturing base is what led CRRC, the world's biggest producer of locomotives and rolling stock, to set up shop there in 2017. Since then it has been attacked by the press as a threat to American jobs and national security. The firm was subsequently clobbered with tariffs on imported parts, and recently denied an exemption. Lawmakers in Washington, DC, are now trying to prevent federal funds from being spent on its trains.

Some of the hostility is down to CRRC's sheer size. Founded in 2015 from the merger of China's two biggest train manufacturers, CRRC controls over 90% of the Chinese railway market—which also happens to be the world's biggest. With its domestic business cornered, the company set its sights on expansion abroad. Liu Hualong, CRRC's chairman, went about this by setting up overseas subsidiaries to handle some of the support and assembly operations. First he took aim at Asia and Africa, then Europe and America.

CRRC now employs 180,000 people worldwide and posts annual revenues

of \$30.6bn, around a tenth of which comes from outside China. Between 2013 and 2017 CRRC made 44% of the world's electric trains and a whopping 71% of its high-speed ones, estimates Maria Leenen of SCI Verkehr, a railways consultancy in Hamburg. Its earnings from railway equipment alone are far bigger than the railway earnings of its big European competitors, Siemens of Germany, Alstom of France and Bombardier of Canada.

America is an especially attractive market, owing to its preference for customised trains, which fetch a premium over the off-the-yard variety favoured elsewhere in the world. Thanks to a renewed interest in rail travel, particularly among America's carless young, it is also fast-growing, says Jia Bo, president of CRRC's Springfield subsidiary. Since 2014 the company has won four big contracts in America for subway carriages. It delivered its first American-built train in December.

CRRC's manoeuvres have spooked its Western rivals. Siemens and Alstom have cited the threat posed by the Chinese firm's overseas expansion in defence of the attempted merger of their rail divisions, which the European Commission last month vetoed because it feared it would hurt competition. Erik Olson of the Rail Security Alliance, a campaign group made up of American freight-wagon builders and their suppliers, claims that CRRC threatens to wipe out his members' businesses through predatory pricing, just as he reckons the company did in Australia after it set up shop there. Add labour shortages and protectionist "Buy America" rules, which will soon force trainmakers to source 70% of their components from American suppliers, and the market suddenly looks far less appealing. Kawasaki, CRRC's Japanese rival, has said it is considering leaving America altogether.

CRRC's provenance is making things worse. The trade war with China simmers on. Controversy surrounding Huawei, a huge Chinese maker of

telecoms gear which has been accused (without any evidence being made public) of being a vehicle for Chinese spying, has infected other Chinese companies, CRRC among them. Mr Olson believes that carriages made by the firm and fitted with CCTV could be combined with facial-recognition technology to help the Chinese government track individuals. A fantasy, perhaps, but a real enough fear for CRRC to insist that it complies with all of America's rules about cyber-security.

All of this means that CRRC's overseas expansion is nowhere near on track. It recently lost a contract in New York and has made virtually no headway in Europe. In Africa CRRC has done better, although rail firms there would prefer to buy Western trains if only they could obtain financing on the same generous terms as that provided by the Chinese, says Howard Rosen of the Rail Working Group, an international trade body. But Western firms cannot do this owing to rules imposed by the OECD, a club of rich countries that excludes China.

This rough ride is causing CRRC to turn its attentions back to China. It says it may soon quit the American market for freight cars. To help manage the integration of the vast merger and deal with limits placed by the Chinese government on how much money it can invest abroad, CRRC has started to temper its overseas expansion, says Karen Li of JPMorgan Chase, a bank. The firm has quietly dropped a target to double its share of orders from abroad to 20% by 2021, she says. Better, it seems, to concentrate on winning orders for a coming glut of new high-speed lines in China.

Correction: Last week we reported that SoftBank bought a \$5.9bn stake in Didi in 2017. In fact, it accumulated the stake in several transactions between 2015 and 2017. We also said that transfers of assets between SoftBank and the Vision Fund are disclosed to SoftBank's board and approved by the Vision Fund's three-person investment committee. Such transfers also require the consent of the fund's limited partners. We

apologise for the error and the omission. ■



中国列车

红色列车的蓝调鸣咽

中国列车制造巨头的海外闯荡之旅失去动力

和在许多传统工业重镇一样，一家废弃了数十年的工厂变身为一个光鲜的现代化生产基地看似一种可喜的发展。但在马萨诸塞州的斯普林菲尔德（Springfield）——一个因为当地一家国家兵工厂生产的步枪而闻名的地方，中国列车制造商的进驻却突然触礁。

这并非因为斯普林菲尔德与列车制造毫无渊源：两个世纪前，首批美国制造的、用以代替英国进口的火车车厢有一些正是出自此地。全球最大的铁道机车和车厢生产商中国中车为了在美国设立本地制造基地，于2017年来这里投资设厂。自那之后，美国新闻界对中车攻击不断，认为它对美国就业和国家安全构成了威胁。该公司随后因进口零件关税备受打击，最近一项关税豁免申请又遭到拒绝。目前，华盛顿的议员正试图阻止使用联邦资金采购中车制造的列车。

一部分敌意是因中车庞大的规模而起。中车成立于2015年，由中国最大的两家列车制造商合并而成，控制着中国铁路车辆市场（也是全球最大的市场）90%以上的份额。在国内业务中取得垄断性主导后，该公司将目光投向海外扩张。为此，中车董事长刘化龙设立了海外子公司，处理部分支持和组装业务。他先是瞄准亚洲和非洲，然后是欧洲和美国。

中车目前在全球有18万名员工，对外公布年收入达306亿美元，其中约十分之一来自中国以外。位于汉堡的铁路咨询公司SCI Verkehr的玛丽亚·林内恩（Maria Leenen）估计，2013年至2017年期间，中车制造了全球44%的电力列车，以及多达71%的高速列车。中车单单在铁路设备上的收入就远高于两大欧洲竞争对手德国西门子和法国阿尔斯通，以及加拿大庞巴迪的铁路业务收入。

美国市场尤其具有吸引力，因为它偏爱的定制列车比世界其他地方喜欢的

常规列车叫价更高。中车马萨诸塞州公司总经理贾波表示，由于人们又重新开始对轨道出行感兴趣，特别是那些没有私家车的美国年轻人，这部分业务的增速也很快。自2014年以来，该公司在美国赢得了四份地铁车厢的大宗合同，去年12月交付了第一辆在美国制造的列车。

中车的阵势吓到了西方竞争对手。西门子和阿尔斯通曾以这家中国公司的海外扩张对自己构成威胁为由，为两方合并铁路业务部门的计划辩护。欧盟委员会担心合并不会损害竞争，于2月否决了该计划。由美国货运车厢制造商及其供应商组成的活动组织“铁路安全联盟”（Rail Security Alliance）的埃里克·奥尔森（Erik Olson）声称，中车的掠夺性定价可能会吞噬联盟成员的业务。他认为中车在澳大利亚设厂后，在当地就显现了这样的恶果。在美国还存在劳工短缺的问题，以及“只买美国制造”的保护主义规定——很快就将迫使列车制造商从美国供应商那里采购70%的零部件，因而这个市场突然显得不那么吸引人了。中车的日本竞争对手川崎重工表示正考虑完全撤出美国市场。

中车的出身问题更是令局面恶化。中美贸易战还在继续。中国大型电信设备制造商华为被指控为中国政府的间谍工具（尚没有任何证据被公开），围绕它的争议已波及其他中国公司，包括中车。奥尔森认为，由中车制造并装配闭路监控的车厢加上人脸识别技术，就可能帮助中国政府追踪个人。这也许是幻想，但也是切实存在的恐惧，以致于中车要坚称自己符合美国网络安全方面的所有规定。

所有这一切都意味着中车的海外扩张远未走上正轨。近期它失去了纽约的一份合同，在欧洲也几乎没有进展。它在非洲的发展相对较好，尽管那里的铁路公司更愿意购买西方制造的列车，如果西方厂商能提供像中国公司那样慷慨的融资条款的话，国际行业机构“铁路工作组”（Rail Working Group）的霍华德·罗森（Howard Rosen）说。但碍于富裕国家俱乐部经合组织（中国不在其中）定下的规则，西方厂商无法做到这一点。

这一艰难旅程促使中车把注意力转回国内。它表示可能很快将撤出美国货

运列车市场。摩根大通的李郁匀表示，为更好地管理大规模合并后的整合以及应对中国政府对其海外投资金额的限制，中车已开始减轻海外扩张的力度。她表示，中车已悄然放弃了到2021年把海外订单份额翻倍至20%的目标。现在看来，似乎还是集中精力在中国即将到来的新高铁线建设热潮中赢得订单为妙。





Cryptocurrencies

The madness of crowds

The flaws revealed by the cryptocurrency bust make a lasting revival unlikely

“BE MORE BRENDА,” said the ads for CoinCorner, a cryptocurrency exchange. They appeared on London’s Underground last summer, featuring a cheery pensioner who had, apparently, bought Bitcoins in just ten minutes. It was bad advice. Six months earlier a single Bitcoin cost just under \$20,000. By the time the ads appeared, its value had fallen to \$7,000. These days, it is just \$4,025 (see chart).

While the price was soaring, big financial institutions such as Barclays and Goldman Sachs flirted with opening cryptocurrency-trading desks. Brokerages sent excited emails to their clients. The Chicago Board Options Exchange (CBOE), one of the world’s leading derivatives exchanges, launched a Bitcoin futures contract. Hundreds of copycat cryptocurrencies also soared, some far outperforming Bitcoin itself. Ripple rose by 36,000% during 2017.

The bust has been correspondingly brutal. Those who bought near the top were left with one of the world’s worst-performing assets. Cryptocurrency startups fired employees; banks shelved their products. On March 14th the CBOE said it would soon stop offering Bitcoin futures. Bitmain, a cryptocurrency miner, appears to have pulled a planned IPO. (Miners maintain a cryptocurrency’s blockchain—a distributed transaction database—using huge numbers of specialised computers, and are paid in newly minted coins).

The speed with which the bubble inflated and then popped invites comparisons with past financial manias, such as the Dutch tulip craze in

1636-37 and the rise and collapse of the South Sea Company in London in 1720. Cryptocurrency enthusiasts like to claim a more flattering comparison—with the 1990s dotcom bubble. They point out that, despite the froth, viable businesses emerged from that episode. But the cryptocurrency fiasco has exposed three deep and related problems: the extent of genuine activity is hugely exaggerated; the technology does not scale well; and fraud may be endemic.

Consider the overstatement of activity, first. Ten years after their invention, using cryptocurrencies to pay for goods and services remains a niche pastime. Bitcoin is the original cryptocurrency and still the most popular. In January Satoshi Capital Research, a cryptocurrency firm, declared that Bitcoin transactions in 2018 added up to \$3.3trn, more than six times the volume handled by PayPal. But such figures include an awful lot of double-counting, mostly related to the way Bitcoin handles change, says Kim Grauer at Chainalysis, a firm that analyses Bitcoin's blockchain. Strip that out, and Chainalysis reckons that Bitcoin accounted for around \$812bn of genuine transfers of value.

Of that, Ms Grauer reckons, only a fraction was used to buy things. Around \$2.4bn went to merchant-service providers, which handle payments for businesses—a piffling sum compared with the \$15trn of transactions in 2017 on Alipay and WeChat Pay, two Chinese payment apps. Darknet markets, which sell stolen credit-card details, recreational drugs, cheap medicines and the like, made up \$605m, and gambling sites \$857m. Most of the rest was related to speculation.

Even for speculators, business is less brisk than it seems. “Wash trading”, in which traders buy and sell to each other (or themselves) to create the illusion of volume, is widespread. Bitwise Asset Management, a cryptocurrency-fund manager, analysed 81 cryptocurrency exchanges for a presentation on March 20th to the Securities and Exchange Commission,

an American financial regulator. The firm estimated that 95% of trading volume could be artificial. The Justice Department is investigating claims of price manipulation.

The second problem is that the technology is too clunky to operate at scale. Cryptocurrencies are unlikely ever to achieve mass adoption, says Nicholas Weaver, a computer scientist at the University of California, Berkeley. Unlike Alipay or WeChat Pay, cryptocurrencies are intended as new financial systems rather than extensions to the current one. But they have serious design flaws.

Bitcoin's pseudonymous creator, Satoshi Nakamoto, wanted it to be resistant to control by tyrannical governments and banks. Payment records are therefore not held centrally, but broadcast to all users. A new batch of Bitcoin is issued every ten minutes on average. That limits the network to processing about seven transactions per second (Visa, by contrast, can handle tens of thousands per second). In 2017, as the crypto-bubble was inflating, the system became clogged. To ensure that transactions went through, users had to pay miners—at one point, as much as \$50 per transaction.

Moreover, Bitcoin is designed such that only 21m Bitcoins will ever be created, making it inherently deflationary. Mining, essentially a self-adjusting lottery in which participants compete to buy tickets, is energy-hungry. At the height of the boom it was thought to consume as much electricity as Ireland (these days, it merely consumes as much as Romania).

The final problem is fraud. Transactions are irreversible—a boon for con-artists. Ponzi schemes are common, as is incompetence. Cryptocurrency exchanges often collapse or are hacked. In February QuadrigaCX, a Canadian exchange, filed for bankruptcy, saying it had lost \$165m in deposits when its founder, Gerard Cotton, died, since only he had known the encryption keys

protecting QuadrigaCX's deposits. But on March 1st Ernst & Young, which was appointed to handle the bankruptcy, said that the deposit addresses seem to have been empty for at least eight months before the date Mr Cotton is said to have died.

Attempts are under way to get round some of these limitations. Some Bitcoin enthusiasts are testing an add-on called the Lightning Network, which tries to speed things up by moving many transactions off the blockchain. Stablecoins, whose value is supposedly pegged to something else, are touted as a way to rein in speculation. Once again, promise often falls short of reality. On March 14th Tether, the most popular stablecoin, with \$2bn-worth in circulation, said that it might not be fully backed with dollars after all. None has achieved even Bitcoin's limited take-up.

Most fans simply want cryptocurrency prices to start rising again. In 2017 John McAfee, a cryptocurrency enthusiast who made his money in antivirus software, said that if Bitcoin was not worth \$1m in 2020 he would eat an intimate part of his anatomy on television. On March 20th he tweeted that losing that bet was "not mathematically possible". Last year Jack Dorsey, Twitter's boss, said he thinks Bitcoin will be the world's "single currency" within a decade. Facebook is working on some kind of cryptocurrency project. Market analysts and pundits provide cheery reassurance that the currency will soon soar again.

Mr Weaver is sceptical, at least in the short term. The very visible boom and bust, and more attention from regulators, have probably cut the number of willing new punters, he says. But boosters are trying their best. They have taken to referring to the post-bust period as a "crypto winter". The intended analogy is with artificial intelligence: the "AI winters" were funding crunches in the 1970s and 1980s after hype outstripped reality. The implication is that, one day, summer will return. ■



加密货币

随众癫狂

从加密货币泡沫破灭揭示的缺陷来看，它不太可能获得持久复苏

“学学布伦达”，这是加密货币交易所CoinCorner的广告词。去年夏天它在伦敦地铁里发布了这条广告，上面是一位很开心的退休老人，看似刚花了短短十分钟买入了比特币。这个广告的建议很糟糕。在它发布六个月前，一枚比特币价值近2万美元，到它发布时已跌至7000美元，而现在只剩4025美元了（见图表）。

比特币价格飙升时，巴克莱银行和高盛这样的大型金融机构都动过心思，计划开设加密货币交易柜台。经纪公司激动不已地向客户发送电子邮件。全球领先的衍生品交易所之一芝加哥期权交易所（CBOE）推出了比特币期货合约。数以百计的山寨版加密货币也水涨船高，有一些升幅还远超过比特币本身。2017年，瑞波币就上涨了36,000%。

升得快，跌得也惨。那些在接近最高位买入加密货币的人手里留下了全世界表现最差的资产之一。加密货币创业公司纷纷裁员；银行也搁置了相关产品。3月14日，芝加哥期权交易所表示将很快停止提供比特币期货。加密货币挖矿公司比特大陆似乎已经撤回了计划的IPO。（加密货币挖矿公司使用大量专用计算机来维持运行加密货币的区块链——一种分布式交易数据库。作为回报，它们会获得新的加密货币）。

加密货币泡沫从膨胀到破灭的速度之快，堪比历史上的那些金融狂潮，例如1636年至1637年的荷兰郁金香热，以及1720年伦敦南海公司（South Sea Company）的兴衰。加密货币的拥趸则喜欢把这场泡沫与上世纪90年代的网络泡沫相提并论，显得更高大上一些。他们指出，尽管存在泡沫，期间仍然涌现出可行的业务。但加密货币遭遇重挫暴露了三个相互关联的深层问题：真实交易量被严重夸大；技术可扩展性差；以及可能难以摆脱欺诈。

先看看交易量夸大的问题。加密货币发明已十年，但用它来购买商品和服务还只是小众的消遣。比特币是最早的加密货币，也依旧是最受欢迎的。今年1月，加密货币公司Satoshi Capital Research宣布，2018年比特币交易总额达到3.3万亿美元，是PayPal处理的支付交易额的六倍多。但是，比特币区块链分析公司Chainalysis的金姆·格劳尔（Kim Grauer）表示，这些数据包含了大量的重复计算，这主要与比特币处理的变化有关。刨去那一部分，Chainalysis估计比特币的真实交易额约为8120亿美元。

格劳尔估计，这一总额中只有一小部分用于购物。约有24亿美元付给了处理企业支付的商户服务供应商，这与中国两大支付应用支付宝和微信支付2017年总共15万亿美元的交易额相比简直微不足道。出售被盗信用卡信息、软性毒品、廉价药品等的暗网市场占了6.05亿美元，赌博网站占8.57亿美元。其余大部分都与投机相关。

即使对投机者而言，生意也不像看上去那么好。交易者互相买卖（或自买自卖）以制造虚假交易量的“倒仓”现象十分普遍。加密货币基金管理公司Bitwise Asset Management在3月20日向美国金融监管机构证券交易委员会汇报时，分析了81个加密货币交易所。该公司估计有95%的交易量可能是虚假的。美国司法部正在针对价格操纵的指控展开调查。

第二个问题是加密货币技术太过笨重而无法大规模扩展。加州大学伯克利分校的计算机科学家尼古拉斯·韦弗（Nicholas Weaver）说，加密货币不大会实现广泛运用。与支付宝或微信支付不同，加密货币的目标是要成为新的金融体系，而非当前体系的扩展。但它们有严重的设计缺陷。

化名中本聪的比特币创造者希望它不受专制政府和银行的控制。因此，付款记录不是集中保存，而是广播给所有用户。平均每十分钟生成一批新的比特币。这将整个网络处理交易的能力限制在每秒约七笔（相比之下，Visa每秒可以处理数万笔）。2017年，加密货币泡沫膨胀，系统堵塞。为确保交易顺利进行，用户不得不向挖矿公司支付交易费用，一度高达每笔50美元。

此外，根据其设计，比特币的总量限定在2100万枚，这自然会导致通缩。比特币挖矿本质上就像个自我调节的彩票系统，参与挖矿者就像在竞相购买彩票，过程十分耗能。据估计，在比特币热潮的高峰期，挖矿的耗电量相当于爱尔兰全年的电力消耗（现在只和罗马尼亚一样多）。

最后一个问题是欺诈。比特币交易是不可逆的——这对骗子来说简直是天赐良机。庞氏骗局很常见，无能导致的问题也不少。加密货币交易所经常崩溃或遭黑客攻击。今年2月，加拿大交易所QuadrigaCX申请破产，称在创始人杰拉德·科顿（Gerard Cotton）去世时损失了1.65亿美元的用户存款，因为只有他才知道保护QuadrigaCX存款的加密密钥。但受命处理破产事宜的安永会计师事务所3月1日表示，至少在所给出的科顿死亡日期之前的八个月里，存款地址似乎就已经空了。

为了克服这些局限性，人们正在尝试各种方法。一些比特币拥趸正在测试一个名叫“闪电网络”（Lightning Network）的附加层，它试图把区块链中的许多交易转至链下以加快速度。还有稳定币（Stablecoins），其价值据称与其他东西挂钩，被吹捧为一种控制投机的手段。但承诺往往与现实有差距。3月14日，最受欢迎的稳定币——流通市值达20亿美元的泰达币（Tether）——表示它可能不会100%由美元支持。还没有一种新方式的交易量能赶上比特币有限的交易量。

大多数追随者只是希望加密货币的价格能再次上涨。2017年，靠杀毒软件发家的加密货币爱好者约翰·迈克菲（John McAfee）表示，如果到2020年比特币的价格不到100万美元，他就在电视上吞了自己的“小弟弟”。上月20日，他发推说他输掉的可能性“微乎其微”。去年，推特的老板杰克·多尔西（Jack Dorsey）表示他认为比特币将在十年内成为全球的“单一货币”。Facebook正在研究某种加密货币项目。市场分析师和专家们都乐观地保证比特币价格很快将再次飙升。

韦弗对此持怀疑态度，至少在短期内如此。他说，比特币泡沫及泡沫破灭显而易见，加上又引来了监管机构的更多关注，愿意投注的新玩家数量可能已经减少。但支持者们正在用尽全力。他们开始把泡沫破灭后的时期称

作“加密寒冬”，希望让人联想起人工智能的“AI寒冬”，即上世纪七八十年代在脱离现实的大肆炒作之后出现的资金短缺。这里的潜台词是，有朝一日，盛夏终将回归。 ■



Bartleby

The grinch that sold charisma

Competence and the ability to empathise are the most important leadership skills

LEADERSHIP IS A quality that is hard to define, but as a Supreme Court justice said of obscenity, you know it when you see it. Everyone can think of inspiring leaders from history but managers who think they can base their style on Nelson Mandela or Elizabeth I are suffering from delusions of grandeur.

The biggest mistake is to equate leadership entirely with charisma. Billy McFarland was just 25 when he set up the Fyre festival which promised attendees a luxury experience on a deserted island in the Bahamas. As shown by the Netflix documentary, “Fyre: The Greatest Party That Never Happened”, Mr McFarland was a preternatural salesman. He convinced investors that he was a visionary entrepreneur and persuaded talented young people to work for him.

But he lacked the skills to put his vision into practice. Festival guests arrived to find their food consisted of cheese sandwiches, rather than gourmet cuisine. They were housed not in luxury villas, but in tents left over from a hurricane-relief scheme. The saga ended with Mr McFarland being sentenced to six years in prison.

His example could have been a case study for the book by Tomas Chamorro-Premuzic—“Why Do So Many Incompetent Men Become Leaders? (and how to fix it)”. As an organisational psychologist, he points out that people tend to assume that confident individuals are competent, when there is no actual relationship between the two qualities. Those confident people are then promoted. Overconfidence afflicts both sexes, but men more so; one study

found that they overestimated their abilities by 30% and women by 15% on average.

A related trait is narcissism. Research suggests that the rate of clinical narcissism is 40% higher in men than in women. Around 5% of chief executives (a male-dominated profession) are deemed to be narcissistic, compared with just 1% of the general population. If the Fyre documentary is a guide, Mr McFarland belongs to that group, and then some.

Neither narcissism nor charisma is purely a male phenomenon. Elizabeth Holmes, the founder of Theranos, the failed blood-testing group, convinced shrewd investors and powerful men like Henry Kissinger with her messianic vision of supplying affordable health care. But the Theranos technology did not work. Charisma plus egomania minus competence is a dangerous formula.

None of which is to say that charisma does not matter at all. Theresa May, the British prime minister, got the job on the basis of her perceived competence. She has had a difficult task in pushing through Brexit. But her lack of persuasive skills has mattered at crucial moments, and she now looks set to resign. She has demonstrably failed to unite the country, paying little attention to the views of opposition parties, or to those of business or the trade unions. In an address to the nation on March 20th she managed to alienate the very MPs she needed to vote for her plan. “A leader who claims to invite views but then ignores them is no leader,” warns Stefan Stern in his new book, “How to Be a Better Leader”.

Competence is more important than charisma. Managers need enough presence to persuade their teams to follow the business plan, but they should think in terms of coaching rather than inspiration. Gallup surveys have found that employees are more likely to be engaged with their work if they get frequent feedback from their bosses, and if they are involved in

setting their own goals.

Team leadership requires having sufficient empathy to understand the concerns of others. When things go wrong, as they inevitably will, a good leader also needs the flexibility to adjust their strategy. Stubborn introverts like Mrs May lack the required flexibility; narcissists like Mr McFarland lack the necessary empathy.

Finally, Mr Stern argues that a large part of leadership success stems from the ability to set a good example. Subordinates notice what behaviour gets rewarded and which standards are set by the person at the top. Mr McFarland showed a great enthusiasm for partying, and a blithe indifference to logistics. Subordinates who doubted his vision, or questioned the detail, were told to get with the programme or get out.

Similarly, Mrs May appointed men to the top Brexit posts on the basis of their ideological positions instead of expertise. In both cases, their leadership styles got the results they deserved. ■



巴托比

兜售魅力的扫兴鬼

才干和共情能力是最重要的领导技能

领导力是一种很难定义的品质，但正如美国最高法院的一位法官对如何界定淫秽的说法一样：你看到它时就知道了。人人都能从历史长河中找到鼓舞人心的领导人作榜样，但那些自认为可以照着纳尔逊·曼德拉或伊丽莎白一世打造个人风格的主管们却犯了妄自尊大的毛病。

最大的错误就是将领导力完全等同于个人魅力。比利·麦克法兰（Billy McFarland）创立Fyre音乐节时只有25岁。这个活动向参与者承诺，他们将在巴哈马的一处荒岛上享受一次奢华之旅。正如Netflix纪录片《Fyre：国王的豪华音乐节》（Fyre: The Greatest Party That Never Happened）所展现的那样，麦克法兰是个非同一般的推销员。他使投资者信服他是个有远见卓识的企业家，并说服有才华的年轻人为他工作。

但他欠缺将远见卓识付诸实践的技能。参加音乐节的人们到达举办地后发现，这里并没有珍馐佳肴，只有奶酪三明治之类的食物。住的也不是豪华别墅，而是飓风赈灾项目留下的帐篷。这场传奇以麦克法兰获刑六年划下句点。

麦克法兰的事例或许适合用作托马斯·卡莫洛-普雷姆兹克（Tomas Chamorro-Premuzic）著述的研究案例。这本书叫《为什么这么多无能之人成了领导者？（以及如何解决此问题）》（Why Do So Many Incompetent Men Become Leaders? (and how to fix it)）。作为一名组织心理学家，作者指出，人们倾向于认为自信的人是有能力的，虽然这两种特质之间并没有实质上的联系。那些自信的人就获得了提拔。两性都会因为过度自信而吃苦头，但男性更是如此。一项研究发现，男性对自己的能力平均高估了30%，女性高估了15%。

还有一个相关的特征是自恋。研究表明，男性临床自恋的比率比女性高

40%。大约5%的首席执行官（一个由男性主导的职位）被认为自恋，而普通人群中这样的人只有1%。从Fyre音乐节的纪录片来看，麦克法兰便属于自恋这一类，而且程度还挺严重。

自恋和展现个人魅力都不完全为男性所独有。来看看伊丽莎白·霍尔姆斯（Elizabeth Holmes）。她是以失败收场的血液测验机构Theranos的创始人。当初她以她宏大的济世构想说服了精明的投资者和像亨利·基辛格这样有影响力的人物，称自己将提供让人们负担得起的医疗保健服务。但Theranos的技术行不通。个人魅力加上自大狂，再减去能力，就构成了一个危险的配方。

以上种种并不是说个人魅力一点也不重要。特蕾莎·梅之所以得到英国首相这份工作，就是因为人们觉得她能够胜任。她肩负推动英国完成脱欧的艰巨任务。但在关键时刻，她在说服技巧上的欠缺就成了短板，现在看来她很可能会辞职。她很少关注反对党、商界或工会的意见，显然未能令国家团结一心。3月20日发表全国讲话时，她又成功疏远了一些国会议员，而她明明需要这些人投票支持自己的计划。“一个声称欢迎大家提意见，然后又无视他人看法的领导者算不上领导者。”斯特凡·斯特恩（Stefan Stern）在他的新书《如何成为更好的领导者》（How to Be a Better Leader）中提醒道。

能力比个人魅力更重要。管理者需要足够强的个人影响力来说服团队遵循商业计划，但他们采用的思路应该是指导而非鼓舞。盖洛普调查发现，如果员工能经常得到老板的反馈，并能参与制定自己的任务目标，就更有可能尽心尽力地投入工作。

要领导团队，就需要有足够的同理心去理解他人关切的事。出现问题在所难免，而一旦问题出现，一个优秀的领导者就还需具备调整战略的灵活性。梅这样顽固而内向的人就缺乏必要的灵活性，而麦克法兰这样的自恋者则欠缺必不可少的同理心。

最后，斯特恩认为，要成为成功的领导者，很大程度上要靠树立良好榜样

的能力。下属会注意到哪些行为会得到奖赏，以及领导设立了哪些标准。麦克法兰展现了对派对玩乐的极大兴趣，却对物流漫不经心。那些怀疑其构想或质疑细节的下属被告知要么尽本分做事，要么走人。

同样，梅在决定脱欧工作高层职位的任命时，依据的是一个人的意识形态立场，而非专业知识。她和麦克法兰二人的领导风格得到的结果可谓种瓜得瓜，种豆得豆。 ■



Buttonwood

A basket of intangibles

Why book value has lost its meaning as a measure of a firm's intrinsic worth

BABY-BOOMERS may recall, perhaps wistfully, how the golden-arched sign outside every McDonald's restaurant would proclaim how many customers had been served by the chain. As they became adults, the number kept on climbing: 5bn in 1969; 30bn in 1979; 80bn in 1990. Jerry Seinfeld, a wry chronicler of the trivial, was moved to ask: "Why is McDonald's still counting?" Do we really need to know about every last burger? Just put up a sign that says, "We're doing very well."

The counting stopped. The signs said simply: "Billions and billions served". If this seems unhelpfully vague, that is how the counting business sometimes is. Many of America's biggest companies, including McDonald's, report a negative book value, a gauge of a firm's net assets. Many more have a book value that is small relative to their market value: their shares look dear on a price-to-book basis. Much of this is down to the complexity of valuing a firm's assets in the digital age. But the result is that price-to-book is a bad guide to a stock's true value.

Stockpickers make a distinction between the price of a share and what it is truly worth. Price is a creature of fickle sentiment, of greed and fear. Value, in contrast, depends on a firm's capabilities. There are various shorthand measures for this, but true "value" investors put the greatest store by the price-to-book ratio. It is the basis for inclusion in benchmarks such as the Russell value index. Countless studies have shown that buying stocks with a low price-to-book is a winning strategy.

But not recently. For much of the past decade, value stocks have lagged

behind the general market and a long way behind “growth” stocks, their antithesis. Perhaps this is because, as the industrial age gives way to the digital age, the intangible assets that increasingly matter are not easy to put a value on. The tangible world is easier. Factories, machines, land and office buildings count as capital assets on a firm’s books, because they will generate profits for many years. It is a fairly straightforward business to come up with a value for them: it is what the firm paid. This value is gradually written off (depreciated) over time to reflect wear and tear and obsolescence.

Such fixed capital assets, along with current assets (cash, stocks of unsold goods, and so on) typically make up the bulk of book value. The problem is what it leaves out. These days, the value of a firm lies as much in its reputation, its processes, the know-how of staff and relationships with customers and suppliers as in tangible assets. Putting an accounting value on these intangibles is notoriously tricky. By their nature, they have unclear boundaries. Not every dollar of R&D or advertising spending can be ascribed to a well-defined asset, such as a brand or patent. That is in large part why, with a few exceptions, such spending is treated as a running cost, like rent or electricity.

Increasingly price is detached from book value. The median price-to-book of S&P 500 stocks is 3.0. But plenty of well-known companies, whose competitive edge rests on brands or patents, have much higher ratios or even negative book values (see chart). McDonald’s has considerable brand value, which is not on its balance-sheet. It also has property assets that have been fully depreciated.

The effect of mergers is to make things murkier. If, say, one firm pays \$100m for another that has \$30m of tangible assets, the residual \$70m is counted as an intangible asset—either as brand value, if that can be gauged, or as

“goodwill”. That distorts comparisons. A firm that has acquired brands by merger will have those reflected in its book value, says Simon Harris, of GMO, a fund-management firm; a firm that has developed its own brands will not. Share buy-backs make things murkier still. For any firm with a price-to-book greater than one, a buy-back will diminish book by proportionately more than it lowers the value of outstanding stock. So price-to-book rises further.

Some have called for accounting rules to change. But the more leeway a company has to turn day-to-day costs into capital assets, the more scope there is to fiddle with reported earnings. Better to spur the disclosure of spending that adds to intangible value. Analysts can then make their own judgments. Mr Harris finds that adjusting book value to reflect past R&D and advertising spending makes for more useful comparisons across stocks. It is not a perfect gauge. But no single measure—whether price-to-book or billions of customers served—can ever tell the whole story. ■



梧桐

一篮子无形资产

在衡量企业内在价值时，账面价值为何已失去指标意义

婴儿潮一代可能还记得（或许还有点怅然若失），从前每家麦当劳餐厅外面的金色拱形标志上都会宣告这家连锁餐厅已经接待了多少名顾客。随着婴儿潮一代长大成人，这个数字不断攀升：1969年达到50亿，1979年300亿，1990年800亿。这让擅长吐槽各种琐事的脱口秀喜剧演员杰瑞·宋飞（Jerry Seinfeld）不禁发问：“为什么麦当劳还在算人数？”我们真的需要知道上一个卖出的汉堡是第几个吗？直接竖个牌子写上“我们生意很好”就行了嘛。

麦当劳后来不再计数了。各家店铺的标志牌上只写着：“已接待千亿计的顾客”。这也许看起来太过模糊，但计数这个事有时就是这样的。包括麦当劳在内，许多美国最大规模的企业的账面价值（衡量一家企业的净资产）都是负值。还有更多企业的账面价值相对于其市值而言较低：即按市净率来看其股价偏高。这主要是因为在数字时代评估公司资产的复杂性造成的，但结果就是市净率不能准确反应股票的真实价值。

股票高手会区别看待股票的价格和其真正价值。股价反应的是变幻无常的情绪、贪婪和恐惧。而价值取决于公司的实力。对此有各种简单的衡量方式，但真正的“价值”投资者最看重市净率，它是股票被纳入罗素指数等基准指数所需的基础数值。无数研究表明，购买市净率低的股票是一种致胜策略。

但近年来情况发生了一些变化。在过去十年的大部分时间里，价值型股票的表现逊于大市，而且远远落后于与之性质相反的“成长型”股票。这也许是因为，随着工业时代让位于数字时代，越来越重要的无形资产却难以估值。有形资产则更容易估值。工厂、机器、土地和办公楼在公司账面上算作资本资产，因为它们将在多年里产生利润。对这些资产的估值相当直接

了当：就是公司为购置它们支付的金额。随着时间的推移，这些价值会逐渐被扣减（即折旧），以反映资产的损耗和淘汰。

此类固定资本资产以及流动资产（现金、未售出货物的库存等）通常占到账面价值的大部分。问题在于那些不包含在账面价值中的东西。如今，公司的价值不仅存在于有形资产中，还取决于其声誉、工艺、员工的专业知识，以及与客户和供应商的关系。计算这些无形资产的价值非常棘手。就其性质而言，它们不易界定。并非每一美元的研发或广告支出都能归入某个明确定义的资产类别，例如品牌或专利。很大程度上，这就是为什么这类支出会和租金或电费等一道被列为运营成本，仅有少数例外。

股票价格越来越与账面价值脱节。标准普尔500股票的中位市净率为3.0。但许多依靠品牌或专利建立起竞争优势的知名公司具有高得多的市净率，账面价值甚至为负（见图表）。麦当劳的品牌价值很可观，却没有体现在资产负债表上。它还有很多已完全折旧的不动产。

企业合并会让价值更难计算。例如，如果一家公司花费1亿美元收购了另一家拥有3000万美元有形资产的公司，那么这7000万美元的差额将被视为无形资产——要么记作品牌价值（如果可以计算的话），要么记作“商誉”。这会在比较不同企业时造成扭曲。基金管理公司GMO的西蒙·哈里斯（Simon Harris）表示，一家通过合并来收购品牌的公司将在其账面价值上反映出品牌，而开发自有品牌的公司却不会。股票回购就把水搅得更浑了。对于任何市净率大于1的公司而言，回购带来的账面价值降幅将大于流通股价值的降幅。市净率因此会进一步上升。

一些人呼吁改变会计规则。但是，公司将日常成本转化为资本资产的余地越大，就越有可能在报告收益方面做文章。更好的做法是敦促公司披露那些会提升无形资产价值的支出。这样分析师就可以做出自己的判断。哈里斯发现，调整账面价值以反映过往的研发和广告支出对于比较股票更有意义。这不是一个完美的衡量标准。但无论是市净率还是已接待过的亿计顾客人数，没有任何一个衡量标准可以全面体现公司的价值。■



The world economy

Manufacturing blame

Global economic gloom is mostly confined to one sector

PESSIMISM ABOUT the world economy has grown throughout 2019. Disappointing data, tumbling bond yields, the trade war between China and America and political crisis in Britain have all played a part. The only bright spot has been mostly buoyant stockmarkets. On April 9th the IMF reported a downgrade to its forecast for global growth this year, which in January stood at 3.5%. But there has so far been only a deceleration, not a downturn, because economic weakness has been contained mostly to manufacturing, rather than afflicting the service sector (see chart). And a manufacturing rebound might soon lift the global mood.

Manufacturing's woes can be blamed primarily on falling global trade growth. That is down partly to the trade war, and partly to Chinese policymakers' attempts to reduce leverage, which slowed domestic growth late last year, curtailing demand for imports. The pain has been felt most in Europe, which is more exposed than America to emerging markets. It has been particularly acute in Germany. On April 1st a survey of German manufacturers, a preview of which buffeted bond markets in March, turned out even worse than expected. Industrial production has slowed even more sharply in Germany than in Italy, which is in recession, note economists at Goldman Sachs, a bank. Yet Germany's service sector appears to be growing strongly, as does that of the euro zone as a whole.

Service industries are less volatile than manufacturing, make up a bigger slice of rich-world GDP and, by their nature, trade less. That they remain strong largely reflects relatively buoyant labour markets and consumers (German unemployment is only 3.1%). One exception has been Britain,

where survey data released on April 1st and 3rd appear to show growth in manufacturing at its strongest in over a year and services shrinking. Both findings are Brexit-related. The British economy is suffering from falling confidence, while manufacturing appears so strong only because firms are stockpiling in case Britain soon crashes out of the EU without a deal.

In the 2000s some economists speculated that the growing weight of services in output might help explain the “great moderation”—the fall in economic volatility after the mid-1980s. Although the global financial crisis sent volatility soaring, this summer America’s economic expansion, if it continues, will become the longest ever. It will have survived peaks and troughs in manufacturing that in another era might have been more visible in aggregate data.

China has turned to stimulus lately; some economists expect its economy to rebound in the second half of this year. In March its manufacturers reported their strongest month since last summer. That, and some strong American data, buoyed markets last week. Even if this proves to be a false dawn, for China to cause a global economic downturn would require its slowdown to become infectious not just across borders, but across sectors too.

Finance internship: *The Economist* invites applications for the 2019 Marjorie Deane internship. Paid for by the Marjorie Deane Financial Journalism Foundation, the award is designed to provide work experience for a promising journalist or would-be journalist, who will spend three months at the London office of *The Economist* writing about finance and economics. Applicants are asked to write a covering letter and an original article of no more than 500 words suitable for publication in the Finance and Economics section. Applications should be sent to deaneintern@economist.com by May 3rd. For more information, see www.marjoriedeane.com ■



世界经济

制造罪过

全球经济的低迷主要限于一个部门

进入2019年至今，世界经济前景引发的悲观情绪有增无减。令人失望的经济数据、下滑的债券收益率、中美贸易战、英国政治危机都起了推波助澜的作用。唯一的亮点是各地股票市场大范围上涨。在4月9日发表的报告中，国际货币基金组织调低了对今年全球增长的预测，1月时的预测数字为3.5%。但到目前为止也只是增长减速，而非衰退，因为经济疲软只限于制造业，服务业并未受影响（见图表）。而且制造业的反弹可能很快将提振全球情绪。

制造业的困境主要应归咎于全球贸易增长下滑。下滑一部分是因为贸易战，也有一部分是因为中国政策制定者的去杠杆行动——这一因素导致去年年底国内增长放缓，进而削弱了进口需求。欧洲是重灾区，相比美国，欧洲受新兴市场的影响更大。德国受到的打击尤为严重。4月1日，一项对德国制造商的调查（其预告已在3月重创债券市场）显示，情况甚至比预期还糟糕。高盛的经济学家指出，德国工业生产增速放缓的幅度甚至超过经济衰退中的意大利。不过，德国的服务业似乎增长势头强劲，欧元区整体也是如此。

服务业的波动小于制造业，在富裕国家的GDP中所占份额也更大，而且其特性决定了贸易量较小。服务业保持强势主要反映了相对活跃的劳动力市场和消费（德国失业率仅为3.1%）。一个例外是英国，4月1日和3日公布的英国调查数据显示，制造业增长处于一年多来的最快水平，服务业却在萎缩。两项调查结果均与英国脱欧有关。英国经济正受到信心下降的困扰，制造业看似强劲不过是因为企业在囤货，以防英国即将无协议硬脱欧而导致经济崩溃。

在本世纪头十年，有些经济学家推测，服务业在产出中的比重日渐增大可

能有助于解释“大缓和”现象，即上世纪80年代中期后经济波动的大幅减少。虽然全球金融危机导致波动飙升，但如果美国当前的经济扩张持续到今年夏天，那么它将成为有史以来最长的扩张期。这轮扩张扛住了制造业的高峰与低谷，而在其他时期，这种波动在总体数据中可能体现得更为明显。

中国最近开始实施财政刺激计划；一些经济学家预计中国经济将在今年下半年反弹。今年3月，中国制造业企业报告了自去年夏天以来的最佳月度表现。再加上美国的一些强劲数据，上周市场一片欢欣。即使最终证明这只是虚幻的曙光，但若要中国引发全球经济衰退，它的经济放缓不仅要跨国界，还得跨行业“传染”才行。





The future of media

Streamlined

A wave of consolidation pits Disney, AT&T and Comcast against Netflix, Amazon and Apple. Billions are being torched. Someone will get hurt

WHO MIGHT buy Netflix? Speculation on the matter has risen in line with the streaming giant's own ascent in the past decade. Apple, with its cash hoard, was a frequently rumoured suitor. Or perhaps Amazon, or big distributors like AT&T or Comcast. At one point, industry sources say, Bob Iger of Disney directly asked Reed Hastings, the boss of Netflix, if he would welcome an offer (Mr Hastings said no).

Instead all six companies embarked on a series of massive investments that will reshape the landscape of media: who makes entertainment and how people consume it. Since June AT&T, Comcast and Disney have spent \$215bn in total on acquisitions of, respectively, Time Warner (\$104bn), Sky, a European broadcaster (\$40bn), and much of 21st Century Fox (\$71bn). Each is preparing new streaming services that will launch by early 2020.

Apple, meanwhile, has poured perhaps \$2bn into original shows with some of Hollywood's most famous directors and stars. On March 25th the company unveiled its new streaming-video service, Apple TV+, that will be available in more than 100 countries later this year. Amazon is thought to be spending more than \$5bn a year on content. And Netflix is expected to burn about \$15bn this year on original and licensed content in a bid to add to its 139m global subscribers before most of its would-be rivals get fully up and running.

The firms are chasing the same prize: recurring revenue from video subscriptions by tens of millions of Americans and, potentially, hundreds of millions of international viewers. It is unclear how many of them can thrive

at the same time. More than two, analysts reckon, but not all six. There are only so many \$10 monthly subscriptions people will pay for. They may opt once again for those bundled with something else, like a mobile service—a business model of which consumers had grown weary in America, where a single distributor sells lots of channels at one price. What forms these reimagined bundles take, and who gets to sell them, will depend on who wins the streaming battles.

In this fight, the contenders have adopted different strategies to win over subscribers. AT&T will bundle entertainment with its mobile service, which could help the company overtake Verizon as the largest wireless carrier in America. Comcast will offer an ad-supported streaming service from NBCUniversal, which it owns, to its 52m broadband and pay-TV customers (including Sky's) in America, Britain and elsewhere in Europe (it will also sell subscriptions, but its ambitions seem more modest than the others'). Disney will use its enviable collection of film franchises, including Star Wars and Marvel superheroes, to draw families to Disney+, then steer them to its consumer products and theme parks.

For the tech giants, video is a way to lure customers into their online emporiums. Amazon, with 100m Prime households, is ahead of Apple for now. But Apple TV can push its glitzy new shows to the world's 1.4bn iDevices. Apple and Amazon have deeper pockets than AT&T, Comcast or Disney, so can afford to pour billions annually into streaming-video for years to come. Their platforms are perfect for selling online services including video.

Then there is Netflix. Its head start puts it in a strong position. Its algorithms work out what viewers want and it has the infrastructure to deliver it to ever more people. A recession or rising interest rates could hurt its ability to borrow—Netflix has more than \$10bn in debt and burns through \$3bn of cash a year. But its lead is such that it could curtail spending on content and

still stay ahead of competitors.

AT&T and Disney face a more complicated challenge. To prosper in streaming, they must undermine lucrative existing businesses. In AT&T's business unit that houses DirecTV, a satellite provider acquired in 2015 at a cost of \$63bn, operating income has fallen by 20% since 2016—in part owing to aggressive marketing of DirecTV Now, a cheaper, loss-making streaming bundle of pay-TV networks. The new streaming service from AT&T (marketed under the WarnerMedia brand) will exacerbate the decline. Disney, for its part, will forgo profits of about \$1bn this year—and \$2bn annually from 2020—as it stops licensing films to Netflix and invests in original shows for its streaming platform, Disney+. New investments in Hulu, a general-interest streaming service with 25m subscribers that Disney controls, will also be costly.

Disney and AT&T are willing to sacrifice near-term profits for two reasons: the vulnerability of their underlying businesses, and hoped-for returns from streaming. With the rise of Netflix, YouTube and other internet distractions, Americans are watching less pay-TV (see chart) and dropping pricey packages which AT&T sells, and which carry Disney's TV networks. And they go to the cinema less often. That is why Rupert Murdoch wanted to sell much of his Fox empire, and Jeff Bewkes was keen to offload Time Warner. Networks bereft of “must-have” content will face demands from distributors to lower prices. Disney and AT&T viewed Fox and Time Warner studios and entertainment networks, with their libraries of hits, as valuable assets.

For Disney, which oozed popular content even before the Fox deal, the economics of streaming stack up. ESPN, Disney's sports network, generates more than \$2bn annually, according to Kagan, a research group. But its reach is declining. In 2018 the company launched ESPN+, a sports-streaming

service. It has picked up 2m subscribers in less than a year (though it is expected to lose money for years).

The real opportunity should be in Disney+. Disney's dominance of the box office will count for less as fewer people frequent cinemas. Matthew Ball, a media analyst, argues that even before the acquisition of Fox's big franchises, such as "Avatar", Disney's spectaculars were beginning to crowd each other out. Streaming provides a neat solution. Disney will release films directly online, as with the upcoming live-action version of "Lady and the Tramp", in addition to TV series from Lucasfilm, Marvel Studios and Pixar Animation. Once licences expire, it will control access to its complete library of hits. Bullish analysts at JPMorgan Chase, a bank, believe Disney+ can break even by 2022 and eventually attract 45m subscribers in America and 115m abroad. At \$8-10 per month that would equate to \$15bn-19bn in recurring sales; Disney's revenues last fiscal year totalled \$59bn. Disney would also have something new and valuable: direct relationships with its biggest fans.

AT&T and Comcast look more precarious. WarnerMedia (as Time Warner has been renamed) owns some famous superheroes, like Batman and Wonder Woman, but they are not quite so formidable as Disney's. AT&T's early handling of WarnerMedia, where several highly respected executives have resigned, most notably at HBO, its most important asset, has raised concerns about its ability to manage a giant media conglomerate. Comcast, meanwhile, lacks enough popular shows to grab subscribers' attention.

It is not clear that owners of infrastructure need to enter the battle to produce content. Craig Moffett of MoffettNathanson, a research firm, argues that the streaming boom should benefit owners of distribution pipes. They can offset falling revenue from pay-TV with broadband, which offers higher margins with less capital spending. The cost of programming has ballooned—well above \$10m an hour for "Game of Thrones"—as viewers

increasingly expect blockbuster quality from their shows. One day, a Hollywood executive predicts, the spending binge will come to a halt. The streaming market, too, will consolidate. It will be “the biggest hangover that Hollywood has ever seen”. ■



媒体的未来

迎流而上

整合潮之后，迪士尼、AT&T、康卡斯特与Netflix、亚马逊、苹果展开角逐。烧钱大战，必有所伤

谁可能收购Netflix？过去十年里，随着这家流媒体巨头的崛起，这方面的猜测不断增多。现金储备丰厚的苹果屡次被传有此意向。也可能是亚马逊，或者像AT&T或康卡斯特（Comcast）这样的大分销商。业内一度传言，迪士尼的鲍勃·伊格尔（Bob Iger）曾经直接问Netflix的老板瑞德·哈斯廷斯（Reed Hastings）是否愿意听他报个价（哈斯廷斯说“不”）。

而事实是上述六家公司全都展开了一系列大规模投资。这些投资将重塑媒体行业的格局：由谁来制作娱乐内容？人们如何消费它？自去年6月以来，AT&T、康卡斯特以及迪士尼总共斥资2150亿美元，分别收购了时代华纳（1040亿美元）、欧洲天空广播公司（400亿美元）以及21世纪福克斯的大部分股份（710亿美元）。三家公司都准备在2020年初推出新的流媒体服务。

与此同时，苹果向好莱坞一些最著名的导演和明星的原创节目投入了大约20亿美元。3月25日，苹果发布了新的流媒体视频服务Apple TV+，下半年将在100多个国家推出。据信亚马逊每年在内容上的花费超过50亿美元。预计今年Netflix将在原创和授权内容上烧掉大约150亿美元，以求在大多数未来对手全面启动相关业务之前，让自己的全球订户数量在现有1.39亿的基础上更上一层楼。

这六家公司追逐的是同一个目标：视频订阅带来的经常性收入。这里的订户除数千万美国观众外，还包括数亿潜在国际观众。它们当中有几家能一起赚到这个钱还不好说。分析人士认为不止两家，但也不会是全部六家。用户订阅费（每月10美元）这个蛋糕就只有那么大。这些公司可能会再次选择捆绑销售（比如和移动服务一起）这种美国消费者已经厌倦的商业模式（在美国，一家分销商会以一个打包价销售很多频道）。这些新设计的

捆绑销售将采取何种形式，以及销售权最终掌握在谁手里，都取决于谁能赢得这场流媒体大战。

在这场角逐中，竞争者为赢得用户各显神通。AT&T将把娱乐节目和自家的移动服务捆绑起来，这可能会帮助它超越威瑞森（Verizon）而成为美国最大的无线运营商。康卡斯特旗下的NBC环球（NBC Universal）将向美国、英国及欧洲其他地方的5200万宽带及付费电视用户（包括天空广播公司用户）提供由广告支持的流媒体服务。康卡斯特也会销售订阅服务，但它在这方面的野心似乎不像其他公司那么大。迪士尼将利用《星球大战》和漫威超级英雄等一批令人艳羡的系列电影，将千家万户吸引到其流媒体服务Disney+，然后引导他们购买迪士尼消费品，游览主题乐园。

对这些科技巨头来说，视频是一个吸引客户进入其在线商城的手段。在这方面，拥有1亿Prime付费家庭会员的亚马逊目前领先于苹果。但是Apple TV可将其酷炫的新节目推销给全球14亿苹果产品用户。比起AT&T、康卡斯特或者迪士尼，苹果和亚马逊的财力更加雄厚，因而有能力在未来几年里每年向流媒体视频投入数十亿美元。二者的平台最适合销售视频等在线服务。

还有Netflix。它因抢得先机而处于优势地位。它拥有能识别观众偏好的算法，也具备足够的基础设施来让这种算法服务更多的观众。经济衰退或利率上升可能会损害Netflix的借贷能力——它背负100多亿美元的债务，每年烧掉的现金达30亿美元。但它领先的优势非常之大，以致于它即便削减了内容支出却仍然领跑一众对手。

AT&T和迪士尼面临的挑战则更为复杂。要在流媒体领域取得成功，它们必须牺牲一些利润丰厚的现有业务。2015年，AT&T以630亿美元收购了卫星电视供应商DirecTV。而自2016年以来，DirecTV所在业务部门的营业收入下降了20%，部分原因是对DirecTV Now的大举营销。DirecTV Now是与付费电视网捆绑的流媒体，价格更低廉，一直在亏损。AT&T新推出的流媒体服务（以华纳媒体的品牌营销）将加剧营收下跌。至于迪士尼，由于停止向Netflix授权电影，并向自己的流媒体平台Disney+投资原创节目，

今年它的盈利将减少约10亿美元，从2020年起更是将每年减少20亿美元。迪士尼还是Hulu这家拥有2500万订户的大众流媒体服务公司的控股股东，对它的新投资也会很烧钱。

迪士尼和AT&T愿意牺牲短期利润，原因有二：一是自身基础业务易受冲击；二是期望从流媒体中获得回报。随着Netflix、YouTube及其他互联网娱乐的兴起，美国人看付费电视的时间逐渐减少（见图表），也更少购买AT&T的昂贵套餐，这些套餐也包含迪士尼电视网的节目。美国人去电影院的次数也少了。正因如此，鲁伯特·默多克才会想要出售其福克斯帝国的大部分资产，而杰夫·比克斯（Jeff Bewkes）急于剥离时代华纳。缺乏“必备”内容的电视网将面临分销商的降价要求。迪士尼和AT&T都视拥有大量热门内容的福克斯、时代华纳电影公司和娱乐电视网为宝贵的资产。

早在收购福克斯之前，迪士尼就产出了很多广受欢迎的内容。对它而言，流媒体的经济效益可以叠加。研究机构Kagan的数据显示，迪士尼的体育电视网ESPN年利润超过20亿美元。但它的影响力在下滑。2018年，迪士尼推出了体育流媒体服务ESPN+。在不到一年的时间里，ESPN+已经积累了200万订户（尽管预计未来数年它都会亏损）。

真正的机会应该在Disney+。随着电影院观众的减少，迪士尼在票房上的主导地位将不再那么重要。媒体分析师马修·鲍尔（Matthew Ball）指出，早在取得福克斯的《阿凡达》等热门影片之前，迪士尼自己的大制作就已经开始互相排挤了。流媒体是解决这一问题的灵丹妙药。除了卢卡斯影业、漫威影业和皮克斯动画的电视剧外，迪士尼还将把电影直接放到网上发行，比如即将上映的真人版《小姐与流浪汉》（Lady and the Tramp）。等到迪士尼影片对外授权到期，它就将控制自己整个热门电影库的使用权。摩根大通的分析师乐观地认为，Disney+到2022年能实现收支平衡，最终将吸引4500万美国订户和1.15亿海外订户。按每月8至10美元的订阅费计算，这相当于150亿到190亿美元的经常性销售额；迪士尼上一财年的总收入为590亿美元。迪士尼还将有一些宝贵的新收获，那便是与其最忠实的粉丝建立直接联系。

相比而言，AT&T和康卡斯特似乎更加脆弱。华纳传媒（原来的时代华纳）拥有蝙蝠侠、神奇女侠等一些著名的超级英雄，但他们不如迪士尼的英雄们那么所向披靡。AT&T接手华纳传媒之初，几位德高望重的高管辞职（特别是从其核心公司HBO），人们不禁担忧AT&T是否能管理好一家大型媒体集团。而康卡斯特则缺乏足够的热门节目来吸引订户。

网络基础设施的所有者们是否需要参与到内容制作的战斗中来，目前还不得而知。研究公司MoffettNathanson的克雷格·墨菲特（Craig Moffett）指出，分销管道的所有者们应该会从流媒体的繁荣中受益。他们可以用投资少、利润高的宽带来弥补收费电视的收入下滑。由于观众越发期待电视节目也能有电影大片的质量，节目的制作成本激增。《权力的游戏》的制作成本就远高于每小时1000万美元。一位好莱坞高管预测，这场挥霍的盛宴终有结束的那一天，流媒体市场也将整合。它将是“好莱坞有史以来最严重的一场宿醉”。 ■



Argentina v Japan

Exceptions and rules

How the two countries continue to confound macroeconomists

MANY PEOPLE make fun of macroeconomics. But any theory that must explain both Argentina and Japan deserves sympathy. Why, in particular, is inflation so stubbornly high in one and low in the other? In Argentina, consumer prices were 50% higher in February than a year earlier, the fastest increase since 1991. In Japan over the same period, inflation was less than 0.2%, equalling the lowest rate since 2016.

The inertia in both countries is puzzling. Inflation has stayed low in Japan despite a drum-tight labour market (unemployment has remained at 2.5% or below for over a year) and high in Argentina despite a fast-shrinking economy: its GDP contracted by more than 6% year-on-year in the fourth quarter of 2018.

The two countries, of course, have long mystified economists. In 1950 Argentina's GDP per person was three times that of Japan, according to the Maddison Project database. The Eva Perón charitable foundation, run by the president's wife, shipped 100 tonnes of relief supplies to the war-battered Japanese. Thousands of Japanese migrated in the opposite direction, creating a population of 23,000 Nipo-Argentinos by the end of the 1960s.

But the two countries' economic paths went on to cross decisively. Japan's GDP per person eclipsed Argentina's around 1970 and is now about twice as high, measured at purchasing-power parity. Its success and Argentina's failure defied predictions. Simon Kuznets, who won the Nobel prize in economics in 1971 for his work on growth, put it best: there are four types of countries in the world—developed, undeveloped, Japan and Argentina.

Policymakers in both countries have tried hard to make them macroeconomically “normal”. After Shinzo Abe became Japan’s prime minister in 2012, the central bank promised to raise inflation to 2% in about two years by expanding its asset purchases. And after Mauricio Macri won Argentina’s presidency at the end of 2015, the central bank promised to raise interest rates enough to bring inflation down below 17% in 2017 and 12% in 2018, paving the way for an inflation target of 5% thereafter.

In both cases, these bold new policy frameworks seemed to offer a decisive break with a sorry past. In Japan, previous central-bank officials had resigned themselves to mild deflation or even welcomed it, redefining failure as success. In Argentina, the previous government had responded to high inflation by simply fiddling the figures, misreporting failure as success.

But the early optimism has faltered. Both governments have been forced to revisit their targets and their instruments for achieving them. When price pressures proved more stubborn than Argentina expected in 2017, the government relaxed its unachievable inflation targets to bring them closer in line with reality. But that tweak led investors to lose faith in the authorities’ resolve to tackle rising prices. In Japan, many commentators think the central bank should lower its seemingly unreachable 2% inflation target to something more achievable. But just as investors overinterpret evidence of slackening in Argentina, they pounce on any sign of tightening in Japan. Any tweak in the central bank’s target will probably be misinterpreted as a change in its policy, rather than an acknowledgment of reality. Given their track records, neither central bank enjoys the benefit of the doubt.

Indeed, memories of the past create self-fulfilling prophecies. The holders of Argentine currency bear many scars, including hyperinflation, devaluation, redenomination, and the *corralito* that froze their deposits in

2001. The yen, by contrast, is seen as a safe haven. When trouble strikes, investors are quick to flee from Argentina's currency, whereas the Japanese are quick to flee into theirs. Recent drops in the peso, which has fallen by over 10% so far this year after plunging by 50% last year, are one cause of inflation's recent resurgence. Periodic appreciations of the yen have had the opposite effect in Japan.

The sorry track records of each central bank also diminish their influence over wage negotiations. In both countries, workers demand that their pay keeps pace with the price pressures they feel, not the inflation the central bank promises. During the spring *shunto* (or wage offensive), Japan's big companies and unions thrash out wage deals that set a benchmark for other parts of the economy. Companies like Panasonic, Hitachi and Toshiba have this year offered increases in base pay of only 0.3%, according to Capital Economics, a research firm.

Argentina has a similar set of negotiations known as *paritarias*. Some economists expect them to yield wage increases of 30-35% this year, which will help keep inflation uncomfortably high. In parts of Argentina the school year, which begins in March, was delayed by striking teachers demanding salary increases to offset last year's inflation and this year's, whatever it turns out to be.

Argentina's inflationary tendencies reflect its long struggle to live within its means. Japan's deflationary bent reflects a struggle to live up to them. Argentina's national saving rate has averaged only 17% of GDP over the past 30 years, too low to meet its ambitions for investment. As a consequence, it has recorded a deficit in its current account with the rest of the world in 30 of the past 40 years. Japan, on the other hand, has run a surplus since 1981 and is now the world's biggest net international creditor. Despite some signs of change, Japan's corporations still hoard cash and other financial assets, rather than splashing out on the higher wages or dividends a rich economy

can afford.

There are four types of countries in the world: developed, undeveloped—and economies in each of those two categories who think they are in the other. ■



阿根廷对阵日本

例外与规则

这两个国家就是这样一直令宏观经济学家困惑不已

许多人取笑宏观经济学。但任何必须同时解释阿根廷和日本的状况的理论都值得同情。特别是，为什么通胀在一国居高不下，在另一国却持续低迷？阿根廷2月的消费价格比去年同期高出50%，是自1991年以来的最快涨幅。而同期日本的涨幅不到0.2%，相当于2016年以来的最低水平。

这两个国家的惯性通胀问题都令人费解。尽管日本的劳动力市场吃紧（失业率保持在2.5%或以下已超过一年），通胀却一直保持在低位。而阿根廷经济迅速萎缩（其GDP在2018年第四季度同比萎缩超过6%），通胀却依然高企。

当然，两国长期以来一直都令经济学家困惑。麦迪森计划（Maddison Project）的数据库显示，1950年阿根廷的人均GDP是日本的三倍。由总统妻子贝隆夫人管理的慈善基金会向饱受战争蹂躏的日本人运送了100吨救援物资。成千上万的日本人移民阿根廷，到上世纪60年代末，日裔阿根廷人的数量达到2.3万。

但此后两国的经济却开始反向交叉。按购买力平价计算，日本的人均GDP在1970年左右超过阿根廷，现在大约是阿根廷的两倍。日本的成功和阿根廷的失败出乎预料。因经济增长方面的研究于1971年获诺贝尔经济学奖的西蒙·库兹涅茨（Simon Kuznets）说得再好不过了：世界上有四类国家——发达国家、不发达国家、日本和阿根廷。

两国的政策制定者都在努力让各自的宏观经济变“正常”。2012年安倍晋三成为日本首相后，日本央行承诺在两年内通过扩大购买资产将通胀提高至2%。2015年底毛里西奥·马克里（Mauricio Macri）赢得阿根廷总统大选后，阿根廷央行承诺提高利率，在2017年把通胀率降至17%以下，到2018

年降至12%，为此后5%的通胀目标铺平了道路。

两国这些大胆的新政策框架似乎都能让它们与令人遗憾的过往一刀两断。在日本，之前的央行官员们已经接受了轻微通缩的现实，甚至对此表示欢迎，把失败重新定义为成功。在阿根廷，前任政府直接通过玩弄数据来应付高通胀，把失败谎报为成功。

但早期的乐观情绪已开始动摇。两国政府都被迫重新审视自己的目标和实现目标的工具。2017年，当价格压力比阿根廷预期的更难以对付时，政府放松了无法实现的通胀目标，将之调整至更契合现实的水平。但这一调整导致投资者对政府解决价格上涨问题的决心失去了信心。在日本，许多评论人士认为央行应将2%这个看起来无法实现的通胀目标降至更现实的水平。但正如投资者过度解读阿根廷放松通胀目标的证据一样，他们对日本任何的紧缩迹象也反应强烈。央行对目标的任何调整都可能会被误解为其政策发生了变化，而不是它们更加认清现实了。鉴于它们过往的记录，投资者对两家央行都疑虑重重。

事实上，对过去的记忆制造了自我应验的预言。阿根廷货币的持有者经历过重重磨难，包括恶性通胀、货币贬值、重新计价，以及2001年冻结存款的“小畜栏”政策。相比之下，日元被视为避险货币。遇到麻烦时，投资者会连忙脱手阿根廷的货币，而日本人会迅速入手本国的货币。比索继去年暴跌50%之后，今年迄今又下跌了10%以上，这是近期通胀抬头的原因之一。而日元的定期升值则在日本产生了相反的作用。

两国央行过往令人遗憾的表现还削弱了它们在工资谈判中的影响力。在这两个国家里，工人都要求薪酬与他们感受到的价格压力保持同步，而不是和央行承诺的通胀水平同步。在“春斗”（*shunto*，即薪资谈判）期间，日本的大公司和工会谈成的薪资协定为其他经济部门设定了基准。根据调研公司凯投宏观（Capital Economics）的数据，今年松下、日立和东芝等公司的基本工资增幅仅为0.3%。

阿根廷也有类似的薪资谈判，叫作“联合”（*paritarias*）。一些经济学家预

计今年的谈判将把薪资推高30%至35%，而这又会在一定程度上令通胀保持在令人不适的高位。在阿根廷部分地区，教师举行罢工，要求加薪以抵消去年和今年的通胀影响（不论今年通胀多少），本应在3月开始的学年被迫推迟。

阿根廷的通胀倾向反映该国长期以来一直难以做到量入为出。日本趋向通缩则反映出支出的疲软。阿根廷的国民储蓄率在过去30年中平均仅为GDP的17%，无法满足其投资需求。因此，在过去40年里，阿根廷对世界其他地区的经常账户有30年都是逆差。而日本自1981年以来经常账户一直是顺差，如今是世界上最大的净国际债权国。尽管出现了一些变化的迹象，日本企业仍然囤积了大量现金和其他金融资产，而不会大手笔开支去提高薪资或股息——这在一个富裕经济体中明明是可以负担的。

世界上有四类国家：发达国家、不发达国家，以及这两类国家中分别认为自己属于另一类的国家。 ■



Saudi Aramco

Open Sesame

A glimpse into the finances of the world's most profitable company

FOR YEARS investors dreamed of peering into the books of Saudi Aramco, the oil colossus wholly owned by Saudi Arabia. On April 1st they got their wish. A 469-page bond prospectus revealed \$111bn in net income last year, more than the five oil majors—Royal Dutch Shell, ExxonMobil, Chevron, Total and BP—managed combined. The document also highlighted Aramco's constraints.

Like rivals, it faces swinging oil prices and uncertain long-term demand. The bond will help finance the acquisition of 70% of SABIC, a petrochemical company, from the kingdom's sovereign wealth fund, for \$69bn. This will diversify Aramco's revenues—and give the state cash to invest in sectors beyond oil (especially now that a planned listing of 5% of Aramco's shares has been postponed).

Aramco looks better prepared than rivals for a less fossil-hungry future. It is less indebted and produces roughly four times as much oil, at about one-third the cost per barrel (see chart). Yet Aramco also bears an unusual burden. In 2018 it paid Saudi income tax of \$102bn, more than the combined profits of Apple and Samsung, the world's most profitable listed firms. That is on top of royalties of \$56bn and a dividend of \$58bn. Credit raters at Fitch note that taxes limit Aramco's funds flow from operations, a measure of profitability, to \$26 a barrel, less than Shell's \$38 or Total's \$31. Ghawar, a giant field, was believed by some to pump 5m barrels a day, but only manages 3.8m. Fitch and Moody's, another agency, rated Aramco A+ and A1, respectively—below ExxonMobil, Shell or Total. ■



沙特阿美

芝麻开门

一窥全球最吸金公司的财务状况

多年来，投资者一直梦想着有朝一日能仔细查看沙特阿美（Saudi Aramco）这家完全由沙特阿拉伯持有的石油巨头的账目。4月1日，他们终于得偿所愿。一份469页的债券招股说明书显示，该公司去年实现税后净利润1110亿美元，超过荷兰皇家壳牌、埃克森美孚、雪佛龙、道达尔和英国石油（BP）五大石油公司的总和。说明书还强调了沙特阿美所受的约束。

与其竞争对手一样，沙特阿美也面对油价波动和长期需求的不确定性。发债所得资金将用于从沙特主权财富基金手中收购石化公司沙特基础工业公司（SABIC）70%的股份，收购总价为690亿美元。此举将使沙特阿美的收入多元化，并为沙特政府投资石油以外的行业提供资金（尤其是因为沙特阿美5%的股份上市的计划延期了）。

面对全球对化石燃料依赖降低的前景，沙特阿美看起来比竞争对手准备得更加充分。它负债较少，石油产量是对手的四倍左右，每桶开采成本却只是对手的约三分之一（见图表）。但它也承受着非同寻常的负担。2018年，它向沙特缴纳了1020亿美元的所得税，超过了全球盈利最高的上市公司苹果和三星的利润总和。除此之外，它还要缴纳560亿美元的油田土地使用费和580亿美元的股息。惠誉（Fitch）的评级人员指出，税收将沙特阿美的运营资金流（衡量盈利能力的指标）限制在每桶26美元，低于壳牌的38美元和道达尔的31美元。一些人认为巨型油田加瓦尔（Ghawar）油田的日产量能达到500万桶，但实际产量只有380万桶。惠誉和另一家评级机构穆迪对沙特阿美的信用评级分别为A+和A1，低于埃克森美孚、壳牌和道达尔。 ■



Mass extinctions

Day of reckoning

Stony evidence of the hellfire that drove dinosaurs to extinction

WHEN, IN 1980, Luis Alvarez, a physicist, and his son Walter, a geologist, made public their theory that the dinosaurs were killed by a massive asteroid strike, it came as a curveball to palaeontologists, who believed dinosaurs had gradually died out through other means. The father-and-son team from the University of California, Berkeley, argued that evidence of the catastrophe was hiding in plain sight, the world over, as a thin layer of sediment enriched in iridium, a metal commonly found in asteroids but rare on Earth. They pointed out that no dinosaurs, with the exception of birds, were ever found beyond this critical layer and suggested a devastating impact was responsible.

The only piece of the puzzle that has been missing is evidence of what actually happened when the asteroid struck. Now, almost 40 years later, an American fossil bed is revealing details of the raging hellstorm that followed just minutes after the asteroid impact, and eventually drove the dinosaurs to extinction.

Under most circumstances, fossils form when animals die in places like river deltas where fine sediment slowly covers up their bones and ultimately encases them in rock. Not so at the aptly named Hell Creek formation of Tanis in North Dakota. Here, Robert DePalma, a PhD student at the University of Kansas, and a team of colleagues that includes Walter Alvarez are reporting the discovery of a 1.3-metre-thick sedimentary layer that was catastrophically dumped in a single day.

The layer is loaded with the bodies of marine and freshwater fish. This

alone struck Mr DePalma as odd since Hell Creek is not known for the preservation of brackish ecosystems where such animals could mingle. But what proved truly unnerving was the fact that all of the bodies were intact, faced the same direction and were scattered among felled tree trunks. That hinted at a sudden surge of water: the streamlined shape of fish means they automatically orient themselves with their heads pointing into a current of fast-moving water. That the bodies were all intact suggests that they were rapidly buried. Moreover, only the most powerful of currents can knock trees down, so the assemblage must have formed during a single devastating event.

Wedged between a 66m-year-old layer of Cretaceous sediment, and another dating from the subsequent Tertiary period, when mammals came to dominate Earth, the Hell Creek fossils are in the perfect position to record the moments that immediately followed the asteroid impact.

Supporting this, spheres of what was once molten glass and fragments of quartz generated under exceptionally high pressures and blasted into the air are scattered throughout the site. Some of it was lodged inside the gills of fossilised fish. Presumably, they sucked it in with their last desperate gasps. The bottom layer of the site contains burrows that appear to have been dug by mammals and are filled with coarse sand brought in over land at great speed, the signs of which are seen in the ripples left in the sand. Dusting the top of the formation is an ominous layer of iridium.

Other fossil finds, yet to be confirmed, include fish impaled on the spines of one another, wasp nests, flooded ant hills, ancient primates and the leaves of plants probably related to the modern banana tree. The team are studying these but their findings have yet to be peer-reviewed and so are not included in the discovery's scientific announcement, which was published by *Proceedings of the National Academy of Sciences* last month.

What is clear already from the confirmed evidence is the sequence of events that unfolded in the minutes and hours after the asteroid hit. It struck the Mexican coast, sending enormous volumes of gas and molten material into the atmosphere, and igniting a firestorm that would have engulfed much of the planet. Its impact crater, located beneath the Yucatan peninsula and the southern Gulf of Mexico, has been a focus of scientific interest for many years. Undoubtedly, this would have created an enormous tsunami, but Mr DePalma suspects that the Tanis fossils, located thousands of kilometres to the north, were killed by a different phenomenon, triggered by the impact: a seiche wave.

Also known as standing waves, seiche waves form in large bodies of water that are either steadily blown by strong winds or shaken by tremors. Mr DePalma and his colleagues propose that the asteroid impact shook Earth so forcefully that seiche waves as tall as 100 metres rose up in every large body of water across the planet, including the shallow sea near Tanis.

Further fossil evidence will be needed to prove the theory, but if Mr DePalma is correct then the inferno initiated by the impact was made worse by devastating walls of water everywhere. No wonder the dinosaurs threw in the towel. ■



大规模物种灭绝

清算日

导致恐龙灭绝的是一场末日浩劫，有化石为证

物理学家路易斯·阿尔瓦雷斯（Luis Alvarez）和他的儿子、地质学家沃尔特在1980年公开了他们的理论，称恐龙是因一次小行星强烈撞击地球事件而灭绝的。这令古生物学家们甚感意外。他们认为恐龙是以其他方式逐步消亡的。而来自加州大学伯克利分校的父子档指出，这场灾难的证据就隐藏在世界各地，并且不难发掘，那就是薄薄一层富含铱的沉积物。铱这种金属常见于小行星，但在地球上很罕见。他们指出，在这个关键的沉积层之外从来没发现任何恐龙化石（鸟类化石除外）。他们认为一场毁灭性的撞击是罪魁祸首。

只是始终还缺少唯一一块拼图：能证明小行星撞击时究竟发生了什么的证据。近40年后的今天，美国一处化石床正在揭示出种种细节，可据此还原出小行星撞击地球短短几分钟后带来的灭顶之灾，以及它最终如何将恐龙逼向灭绝的境地。

在大多数情况下，动物在河流三角洲等地方死亡后逐渐形成化石。细小的沉积物会慢慢覆盖它们的骨骼，最终将它们包裹在岩石中。不过位于北达科他州塔尼斯（Tanis）遗址的“地狱溪”（Hell Creek，名字真是恰如其分）地层的情况却不是这样。堪萨斯大学的博士生罗伯特·德帕尔玛（Robert DePalma），以及由沃尔特·阿尔瓦雷斯及同事组成的团队报告称，他们在这里发现了一个1.3米厚的沉积层，是在一天之内因为某场天灾而骤然积聚起来的。

这个沉积层中满是海水鱼和淡水鱼的尸体。单是这一点就让德帕尔玛感到奇怪，因为地狱溪并非以保存能让这些动物共生的半咸水生态系统闻名。但真正令人不安的是，所有鱼尸都完好无损，且朝向同一个方向，分散在倒伏的树干间。这暗示当时水流是突然间奔涌而至：鱼身呈流线型，因此

鱼会自动调整方向，使头部迎向快速流动的水流。尸骸完好无损表明它们被迅速掩埋。此外，只有最强大的水流才能将树木冲倒，因此这个化石组合必定是在单次的毁灭性事件中形成的。

地狱溪的化石被挤在两个沉积层之间，一个在6600万年前形成于白垩纪，另一个可追溯到白垩纪之后哺乳动物开始主宰地球的第三纪。这些化石所处的位置很好地揭示了小行星撞击后的那些时刻。

可佐证这场灾难的是，熔融态玻璃形成的玻璃珠和在超高压力下产生并迸溅至空中的石英碎片散落于遗址各处。其中一些嵌入了已成为化石的鱼的鳃内，想必它们是在临死前奋力喘息时吸入这些物体的。遗址的底层有一些似乎是由哺乳动物挖出的洞穴，里面注满了粗沙，从沙纹可以看出这些沙子是以极快的速度从陆地上灌下来的。覆盖地层上部的则是一层让人感觉不妙的铱。

还有其他一些化石发现，不过尚待证实，包括被身上的刺“串”在一起的鱼、黄蜂的巢、被淹没的蚁丘、古灵长类动物，以及可能与现代香蕉树有亲缘关系的植物的叶子。该团队正在研究这些发现，但研究结果尚未经过同行评审，因此未收录在上月发表于《美国国家科学院院刊》有关这项发现的论文中。

能够根据已确认的证据摸清的，是在小行星撞击地球后的几分钟和几小时内发生的一系列事件。小行星撞击了墨西哥海岸，导致大量气体和熔融物质被喷射至大气中，引燃了一场可能席卷了地球大部分地区的火焰风暴。这个撞击坑位于尤卡坦（Yucatan）半岛底端和墨西哥湾南部，多年来一直是科学探索的焦点。撞击无疑会引发巨大的海啸。但德帕尔玛怀疑，造成位于撞击坑以北数千公里处的塔尼斯化石动物死亡的是另一种现象，即由撞击引发的湖震。

湖震也被称为驻波，形成于持续受强风吹拂或因地震晃动的大型水体。德帕尔玛及同事提出，小行星撞击导致地球强烈震动，地球上所有的大型水体——包括塔尼斯附近的浅海在内——都掀起了高达100米的湖震巨浪。

要证明这一理论需要更多的化石证据。但如果德帕尔玛是对的，那么无处不在的要命的水墙真是给撞击引发的冲天火海又浇了一层油。难怪恐龙没挺过这场末日浩劫。 ■



Market power

On the mark

The IMF adds to a chorus of concern about falling levels of competition

PHYSICISTS' QUEST for a "theory of everything" is well-known. The equivalent in economics is the hunt for common causes for the rich-world macroeconomic trends of the past decade or so: a shrinking share of the economic pie for workers, disappointing investment and lacklustre productivity growth. These must be reconciled with low interest rates, pockets of technological advance and juicy returns for investors willing to take risks.

The leading economic theory of everything is that competition has weakened as markets have become more concentrated. Unlike firms in competitive markets, monopolies limit production in order to keep prices and profits high. They can therefore be expected to restrain their investment, too. They might still be innovative—with monopoly profits up for grabs, why not be?—but market power usually makes economies less productive overall. And monopolies have many opportunities to take bites out of labour's share of the pie. Their high profits typically flow to investors, not workers. Their high prices eat into the purchasing power of wages. Their bargaining clout may even allow them to suppress pay directly.

On April 3rd the IMF provided the latest evidence for parts of this theory. In a new study the fund's economists examined the markups over marginal cost—one proxy for market power—charged by over 900,000 firms in 27 countries. They found that markups rose by 8% on average between 2000 and 2015. In findings consistent with earlier analyses by *The Economist*, the fund concluded that market power has risen notably in America and by a smaller amount in Europe, and largely affected industries other than

manufacturing (kept fiercely competitive by trade).

Case closed? Not so fast. Those who doubt that competition has weakened attribute such findings to the rise of “superstar” firms. They argue that economic activity is becoming concentrated in the best firms because of technology, network effects and globalisation. This “winner-takes-most” pattern could explain rising average markups, if pricey but brilliant products are capturing more market share, or if superstar firms are unusually reliant on spending on intangible assets that is not included as a cost in gross margins. Given the growing importance of intellectual property and brand value to obvious superstars such as Apple and Google, this objection is worth taking seriously.

The IMF study confirms that in most places a small share of firms are responsible for rising markups, which have soared among the best and are flat among the rest (see chart). The 10% of firms with the highest markups are 50% more profitable than their peers, more than 30% more productive and rely more on intangibles. The fund did not find that rising markups slowed innovation, at least using the (admittedly dubious) proxy of patent registrations.

Yet market power that grows organically is still market power. The fund found evidence of some of the pernicious consequences of less competition. Higher markups are associated with less investment in physical capital—enough to have lopped a percentage point off GDP in the average advanced economy, it estimates. Top firms with higher markups pay a smaller share of the economic value they create to workers. And the fund warns that market power could yet put a brake on innovation, should incumbent firms get too cosy.

That might happen if regulators are slow to respond to structural shifts in

the economy, or too lax in policing mergers that allow incumbents to pick off potential competitors. The fund found that mergers and acquisitions were, on average, followed by significantly higher markups by the firms involved. Economists are sometimes accused of having “physics envy”—that is, of coveting the precision of the hard sciences. But if economics has a law worthy of the name, it is that firms prefer to merge than to compete. ■



市场支配力 精确的理论

国际货币基金组织也加入了担忧竞争减弱的行列

众所周知，物理学家追求的是一种“可解释万物的理论”。在经济学界也有类似的求索，探寻是哪些共同原因导致了富裕世界在过去十年左右的时间里出现了这样的宏观经济趋势：经济大饼中劳动者分得的那一块在缩小、投资状况令人失望、生产率增长乏力。它们还与低利率、技术进步不均、敢于冒险的投资者回报丰厚等现象共存。

一种解释这一切的主导经济理论是，随着市场变得更集中，竞争被削弱。垄断企业与高度竞争市场中的公司不同，它们会限制生产以保持高价格和利润。因此，它们的投资应该也有限。它们可能仍在创新（既然有垄断利润可攫取，为什么不创新呢？），但市场支配力通常会降低经济整体的生产率。而且，垄断企业大有机会在经济大饼中分给劳动者的那一块咬上一口。它们所获的高利润通常都流向了投资者，而非劳动者。其产品的高定价侵蚀了工资购买力。它们甚至可以凭借自身的议价权直接压低劳动者的薪资。

本月3日，国际货币基金组织（IMF）为这种理论的某些部分提供了最新的佐证。在一项新研究中，IMF的经济学家审视了27个国家的90多万家公司的边际成本加成（衡量市场支配力的一个指标）。他们发现，2000年至2015年间，加成平均上涨了8%。基于与本刊之前的分析相一致的一些发现，IMF得出结论称，美国的市场支配力显著上升，欧洲的升幅相对较小，而且受影响的主要是制造业（通过贸易保持激烈竞争）以外的其他行业。

就此定论了？且慢。对“竞争已弱化”持怀疑态度的人会把上述发现归因于“超级明星”企业的崛起。他们认为，由于技术发展、网络效应和全球化，经济活动向最佳企业集中。如果高价但优秀的产品获得了更大的市场份额

额，或者超级明星公司异乎寻常地依赖不计入毛利率成本的无形资产支出，那么平均加成的上升是可以通过“赢家主导”的模式解释的。对苹果和谷歌等公认的超级明星企业来说，知识产权和品牌价值的重要性正日益增加，所以这种异议值得认真考虑。

IMF的研究证实，在大多数地方，加成上升是由少数公司造成的，最顶尖企业的加成呈飙升之势，其余公司则保持平稳（见图表）。加成最高的前10%的公司在利润上比同行高出50%，生产率高30%以上，对无形资产的依赖程度更高。IMF没有发现加成上升导致创新放缓，至少以专利注册数量作为指标（当然确实不够严谨）来看是这样。

然而，有机增长的市场支配力仍是市场支配力。IMF已发现证据，可证明竞争弱化带来的某些致命后果。它估计，高加成与实物资本投资减少相关——足以使发达经济体的GDP平均减少一个百分点。加成更高的顶尖公司所创造的经济价值中向工人支付的份额更小。IMF警告称，假如在位企业过得过于舒服，市场支配力甚至会阻碍创新。

如果监管机构对经济的结构性变化反应迟缓，或者在监管并购的问题上过于宽松，让在位企业得以通过并购铲除潜在的竞争对手，那么阻碍创新的情况就可能发生。IMF发现，平均而言，在并购之后，相关公司的加成幅度明显上升。人们有时会说经济学家心怀“物理嫉妒”，也就是羡慕硬科学的精确性。但是，如果经济学真有什么实打实的定律，那就是企业更愿意合并而不是竞争。■



Turkish Airlines

Soaring ambition

A new home helps Turkey's flag carrier challenge Gulf rivals

AIRPORT MEGAPROJECTS are ten a penny these days. China is building Beijing Daxing International Airport, a new hub airport near its capital, with a total capacity up to 100m passengers a year. Construction has begun on a vast new airport for Dubai, which its government hopes will eventually draw 130m flyers annually. Abu Dhabi and Qatar plan to erect cavernous new terminals. Yet perhaps none is as ambitious as Istanbul's New Airport, on Europe's eastern fringe in Turkey. It became fully operational on April 6th, and aims not just to impress visitors but also to help the country's flag carrier, Turkish Airlines, wrest the skies from its successful Gulf rivals.

It is easy to dismiss the endeavour as a white elephant erected by Turkey's sultan-like president, Recep Tayyip Erdogan. Everything about it is huge. Turkish, which is by far the new airport's biggest user, had to move 10,000 pieces of equipment weighing over 47,000 tonnes 40km (25 miles) from its old home at Ataturk airport. In less than five years a forested valley the size of Manhattan has been transformed into a facility with enough room for 3,000 flights a day carrying 90m flyers a year. That could make it one of the world's largest airports by international passenger numbers. If all goes to plan, by 2028 the airport will have six runways and capacity for 200m passengers a year.

Its \$11bn price tag, too, is gargantuan, especially when Turkey's economy is shrinking and inflation is more than 20%. Delays and cost overruns forced the grand opening to be postponed by six months. In the rush to get the airport finished at least 52 builders have died, sparking protests.

Foreign airline executives see more than a prestige project, however. Compared with many of those in the Gulf, this one presents a sounder business case, thinks Mark Martin, an aviation consultant based in Dubai. Turkish is growing at an annual rate of 30%, unlike its Gulf rivals, whose expansion has stalled or gone into reverse (see chart). While it was fast running out of room at Ataturk airport, the threat it posed was limited. No longer.

Over the past decade the Gulf's three biggest carriers—Emirates of Dubai, Etihad of Abu Dhabi and Qatar Airways—redefined air travel. Most international carriers transport passengers to and from the airlines' home countries. Emirates, Etihad and Qatar used their "super-connector" home bases as places where flyers changed planes en route to elsewhere. The focus on higher-margin long-haul routes allowed them to charge less for superior service, luring passengers away from hub airports in America and Europe, and from the Western airlines that use them.

Now they risk being disrupted in turn by Turkish. The new airport is designed to turn Turkish into a fully fledged super-connecting airline. Fees that airlines, including Turkish, are charged for every passenger favour those in transit over those who start or end their journey there. Kadri Samsunlu, chairman of IGA, the new airport's operator, also says that its shopping areas were designed to be more attractive even than Dubai's and Qatar's.

The falling value of Turkey's currency has also proved beneficial. Analysts at CAPA, an aviation consultancy, calculate that Turkish earns 14% of its revenue in Turkish lira, but incurs 26% of its expenses in the currency. A weaker lira therefore lets it undercut rivals in the Gulf, which do not enjoy a similar advantage.

Finally, Istanbul is helped by its proximity to Europe. Turkish can use smaller narrow-body aeroplanes, which are cheaper to operate, on its routes to Europe. The Gulf carriers have to use bigger, more expensive wide-body jets that are great for long-haul flights but less efficient for middling distances. Smaller aircraft, including long-haul ones, allow Turkish to offer more flights to most destinations each day. Business travellers are willing to pay a premium for such flexibility.

The Gulf carriers are not giving up without a fight. In February Emirates cancelled most of its remaining orders for the Airbus A380 super-jumbo, the world's biggest passenger plane, in favour of smaller models. Sir Tim Clark, the president of Emirates, hopes that a partnership with flydubai, another Emirati airline that flies only narrow-body jets, will help it to preserve market share. If imitation is the sincerest form of flattery, Gulf carriers are reciprocating Turkish's earlier compliments. ■



土耳其航空

壮志凌云

新机场助力土耳其的国家航空公司挑战海湾对手

如今，巨型机场工程项目已不再稀罕。中国正在其首都附近建设一个新的枢纽机场——北京大兴国际机场，年旅客吞吐量可达一亿人次。在迪拜，一个规模巨大的新机场已投入建设，政府希望最终每年可吸引1.3亿旅客。阿布扎比和卡塔尔也在计划建造庞大的新航站楼。然而，最壮志凌云的要数位于欧洲东端的土耳其伊斯坦布尔的新机场。它于4月6日全面投入运营，目标不仅是争取游客的青睐，还要帮助该国的国家航空公司土耳其航空从客源丰沛的海湾对手那里抢夺一片天空。

人们很容易对此嗤之以鼻，认为这是土耳其那位新“苏丹”总统埃尔多安建造的一个昂贵摆设。这个机场方方面面都规模庞大。土航绝对是新机场的最大用家，公司须把一万件总重超过4.7万吨的设备从原来的阿塔图尔克机场搬运到40公里外的新机场。在不到五年的时间里，一片原本树木丛生、面积相当于曼哈顿的山谷被建成了一座每天可进出3000趟航班，每年旅客吞吐量达9000万人次的机场。它可能成为以国际乘客人数计全球最大的机场之一。如果一切顺利，到2028年，该机场将拥有六条跑道，每年可吞吐旅客两亿人次。

机场110亿美元的造价数额巨大，尤其考虑到土耳其的经济正在萎缩，通胀超过20%。工程延误和成本超支迫使揭幕日期推迟了六个月。在赶工的过程中，至少52名建筑工人死亡，引发了抗议。

然而，在外国航空公司高管的眼中，它可不只是一项面子工程。迪拜的一位航空业顾问马克·马丁（Mark Martin）认为，与海湾地区的许多机场相比，土耳其的新机场更具商业价值。土航正以每年30%的速度增长，而它的海湾竞争对手们已经停止扩张或出现倒退（见图表）。尽管它先前正快速耗尽阿塔图尔克机场的容量，但造成的威胁也有限。现在已非如此。

过去十年里，海湾三大航空公司——迪拜阿联酋航空、阿布扎比阿提哈德航空、卡塔尔航空——重新定义了航空旅行。大多数国际航空公司只是运送乘客往返它们所在的国家。而海湾三大航空公司则把自己所在的“超级枢纽”城市作为乘客转机去往其他地方的基地。它们专注于利润率较高的长途航线，因而能以较低的价格提供更好的服务，吸引乘客舍弃位于欧美的枢纽机场，以及使用这些机场的西方航空公司。

现在，可能又轮到这些海湾航空公司感受土航的威胁了。新机场的目标是把土航变成一家成熟的超级枢纽航空公司。机场对包括土航在内的航空公司收取的乘客人均费用中，转机旅客的费率低于以当地为始发地或目的地的旅客。土耳其新机场的运营商IGA的总裁卡德利·萨姆苏鲁（Kadri Samsunlu）还表示，新机场购物区的设计甚至会比迪拜和卡塔尔的更吸引人。

土耳其货币的贬值也成为一大助力。据航空业咨询公司CAPA的分析师计算，土航有14%的收入以土耳其里拉结算，但有26%的支出以里拉支付。因此，里拉贬值有利于土航以低价与海湾对手竞争，毕竟后者没有类似的优势。

最后，伊斯坦布尔毗连欧洲，这又是一个优势。土航可以在飞往欧洲的航线上使用运营成本较低的小型窄体飞机。海湾的航空公司则必须使用较大型的、成本更高的宽体客机，这些客机适合长途飞行，但在中等距离上较为低效。使用较小型飞机（包括在长途航线上），土航就可以每天为大多数目的地安排更多航班。商务旅客愿意为这种灵活性额外支付费用。

海湾的航空公司也没有不战而退。今年2月，阿联酋航空取消了全球最大客机空客A380巨无霸的大部分剩余订单，转而购买较小型的飞机。其总裁蒂姆·克拉克爵士（Sir Tim Clark）希望与阿联酋一家只使用窄体客机的航空公司迪拜航空（flydubai）建立合作伙伴关系，这将帮助它守住市场份额。如果说模仿是最诚挚的恭维，那么海湾的航空公司正在以同样的方式回敬之前土航的称许。 ■



AI at Amazon

The learning machine

The online commercial empire rests on a low-key approach to artificial intelligence

AMAZON'S SIX-PAGE memos are famous. Executives must write one every year, laying out their business plan. Less well known is that these missives must always answer one question in particular: how are you planning to use machine learning? Responses like “not much” are, according to Amazon managers, discouraged.

Machine learning is a form of artificial intelligence (AI) which mines data for patterns that can be used to make predictions. It took root at Amazon in 1999 when Jeff Wilke joined the firm. Mr Wilke, who today is second-in-command to Jeff Bezos, set up a team of scientists to study Amazon's internal processes in order to improve their efficiency. He wove his boffins into business units, turning a cycle of self-assessment and improvement into the default pattern. Soon the cycle involved machine-learning algorithms; the first one recommended books that customers might like. As Mr Bezos's ambitions grew, so did the importance of automated insights.

Yet whereas its fellow tech titans flaunt their AI prowess at every opportunity—Facebook's facial-recognition software, Apple's Siri digital assistant or Alphabet's self-driving cars and master go player—Amazon has adopted a lower-key approach to machine learning. Yes, its Alexa competes with Siri and the company offers predictive services in its cloud. But the algorithms most critical to the company's success are those it uses to constantly streamline its own operations. The feedback loop looks the same as in its consumer-facing AI: build a service, attract customers, gather data, and let computers learn from these data, all at a scale that human labour could not emulate.

Consider Amazon's fulfilment centres. These vast warehouses, more than 100 in North America and 60-odd around the world, are the beating heart of its \$207bn online-shopping business. They store and dispatch the goods Amazon sells. Inside one on the outskirts of Seattle, packages hurtle along conveyor belts at the speed of a moped. The noise is deafening—and the facility seemingly bereft of humans. Instead, inside a fenced-off area the size of a football field sit thousands of yellow, cuboid shelving units, each six feet (1.8 metres) tall. Amazon calls them pods. Hundreds of robots shuffle these in and out of neat rows, sliding beneath them and dragging them around. Toothpaste, books and socks are stacked in a manner that appears random to a human observer. Through the lens of the algorithms guiding the process, though, it all makes supreme sense.

Human workers, or “associates” in company vernacular, man stations at gaps in the fence that surrounds this “robot field”. Some pick items out of pods brought to them by a robot; others pack items into empty pods, to be whirred away and stored. Whenever they pick or place an item, they scan the product and the relevant shelf with a bar-code reader, so that the software can keep track.

The man in charge of developing these algorithms is Brad Porter, Amazon's chief roboticist. His team is Mr Wilke's optimisation squad for fulfilment centres. Mr Porter pays attention to “pod gaps”, or the amount of time that the human workers have to wait before a robot drags a pod to their station. Fewer and shorter gaps mean less down time for the human worker, faster flow of goods through the warehouse, and ultimately speedier Amazon delivery to your doorstep. Mr Porter's team is constantly experimenting with new optimisations, but rolls them out with caution. Traffic jams in the robot field can be hellish.

Amazon Web Services (AWS) is the other piece of core infrastructure. It underpins Amazon's \$26bn cloud-computing business, which allows

companies to host websites and apps without servers of their own.

AWS's chief use of machine learning is to forecast demand for computation. Insufficient computing power as internet users flock to a customer's service can engender errors—and lost sales as users encounter error pages. "We can't say we're out of stock," says Andy Jassy, AWS's boss. To ensure they never have to, Mr Jassy's team crunches customer data. Amazon cannot see what is hosted on its servers, but it can monitor how much traffic each of its customers gets, how long the connections last and how solid they are. As in its fulfilment centres, these metadata feed machine-learning models which predict when and where AWS is going to see demand.

One of AWS's biggest customers is Amazon itself. And one of the main things other Amazon businesses want is predictions. Demand is so high that AWS has designed a new chip, called Inferentia, to handle these tasks. Mr Jassy says that Inferentia will save Amazon money on all the machine-learning tasks it needs to run in order to keep the lights on, as well as attracting customers to its cloud services. "We believe it can be at least an order-of-magnitude improvement in cost and efficiency," he says. The algorithms which recognise voices and understand human language in Alexa will be one big beneficiary.

The firm's latest algorithmic venture is Amazon Go, a cashierless grocery. A bank of hundreds of cameras watches shoppers from above, converting visual data into a 3D profile which is used to track hands and arms as they handle a product. The system sees which items shoppers pick up and bills them to their Amazon account when they leave the store. Dilip Kumar, Amazon Go's boss, stresses that the system is tracking the movements of shoppers' bodies. It is not using facial recognition to identify them and to link them with their Amazon account, he says. Instead, this is done by swiping a bar code at the door. The system ascribes the subsequent actions of that 3D profile to the swiped Amazon account. It is an ode to machine

learning, crunching data from hundreds of cameras to determine what a shopper takes. Try as he might, your correspondent could not fool the system and pilfer an item.

AI body-tracking is also popping up inside fulfilment centres. The firm has a pilot project, internally called the “Nike Intent Detection” system, which does for fulfilment-centre associates what Amazon Go does for shoppers: it tracks what they pick and place on shelves. The idea is to get rid of the hand-held bar-code reader. Such manual scanning takes time and is a bother for workers. Ideally they could place items on any shelf they like, while the system watches and keeps track. As ever, the goal is efficiency, maximising the rate at which products flow. “It feels very natural to the associates,” says Mr Porter.

Amazon’s careful approach to data collection has insulated it from some of the scrutiny that Facebook and Google have recently faced from governments. Amazon collects and processes customer data for the sole purpose of improving the experience of its customers. It does not operate in the grey area between satisfying users and customers. The two are often distinct: people get social media or search free of charge because advertisers pay Facebook and Google for access to users. For Amazon, they are mostly one and the same (though it is toying with ad sales). Where regulators do raise concerns is over Amazon’s dominance in its core business of online shopping and cloud computing. This power has been built on machine learning. It shows no signs of waning. ■



亚马逊的人工智能

一台学习中的机器

这家在线商业帝国建基于低调发展人工智能之上

亚马逊六页纸的备忘录名声在外。高管们每年都得写一份，列出他们的商业计划。不太为人所知的是，一直以来这些长文都必须回答一个问题：你打算如何利用机器学习？据亚马逊的主管们说，公司不希望看到“没什么打算”这样的回答。

机器学习是人工智能（AI）的一种，它挖掘数据，识别其中的模式用于预测。1999年杰夫·威尔克（Jeff Wilke）加入亚马逊后，机器学习开始在这家公司生根。威尔克现在是杰夫·贝佐斯的副手。当年他组织了一个科学家团队来研究亚马逊的内部流程以提高效率。他把科学家安排进各个业务部门，将自我评估和改进的循环变成默认模式。很快，这个循环就用上了机器学习算法；第一个算法推荐了客户可能会喜欢的书籍。随着贝佐斯的雄心日渐高涨，自动化洞察的重要性也日益彰显。

其他科技巨头一有机会就会炫耀自己的AI实力，如Facebook的面部识别软件、Apple的Siri数字助理，或者Alphabet的无人驾驶汽车和围棋大师。而亚马逊在机器学习上很低调。诚然，它的Alexa与Siri是竞争关系，而且亚马逊还通过云计算提供预测服务。但对于公司的成功至关重要的是它用来不断精简自身运营的算法。这一反馈回路看上去和面向消费者的AI一样：构建服务、吸引客户、收集数据、让计算机从这些数据中学习，其规模之大，非人力所及。

去亚马逊的物流中心看一看。该公司在北美有100多个这样庞大的仓库，在其他地区有60多个。这些仓库负责存储和配送亚马逊销售的商品，是其2070亿美元网购业务的心脏。在西雅图郊区的一间仓库里，包裹以轻型摩托车的速度在传送带上快速移动。噪音震耳欲聋，整间仓库似乎一个人也没有。而在一个围栏围起来的足球场大小的区域里，堆叠着成千上万个黄

色长方体货架单元，每个高1.8米。亚马逊管它们叫货舱。成百上千个机器人穿梭在一排排整齐排列的货舱之间，滑进货舱底部把它们拖来拖去。在人类眼中，牙膏、书籍和袜子等货品似乎是随机摆放的；而在控制分拣过程的算法面前，一切都井然有序。

至于人类员工（在亚马逊内部叫“搭档”），他们的工位安排在“机器人区”围栏四周的间隔位置。一些人从机器人拖来的货舱上拣货，另一些人把货物填进空货舱，再由机器人拖走存放。他们每次拣货或摆货都会扫描产品及所属货架的条形码，以便软件进行跟踪。

负责开发这些算法的是亚马逊首席机器人专家布拉德·波特（Brad Porter）。威尔克指派他的团队优化物流中心。波特关注的是“货舱间歇”，即工作人员等待机器人把货舱拖至其工位的时间。等待的间歇越短、次数越少，员工的停工时间就越少，货物在仓库的流通就越快，最终亚马逊就可以更快地将货物配送到顾客家门口。波特的团队正不断试验新的优化措施，但在实施时很谨慎。机器人区一旦交通堵塞，麻烦可就大了。

亚马逊网络服务（AWS）是亚马逊的另一个核心基础设施。它支撑着亚马逊价值260亿美元的云计算业务，让企业无需自备服务器就能运营网站和应用。

AWS主要是利用机器学习来预测对计算的需求。当互联网用户涌向某个客户的服务时，计算能力不足可能就会导致出错，并在页面打不开时错失销售机会。AWS的主管安迪·加西（Andy Jassy）说，“我们不能说缺货。”为了确保永远不必说缺货，加西的团队要处理海量客户数据。亚马逊无法看到其服务器上托管的内容，但可以监控每个客户的流量、在线连接的时长及其稳定性。与亚马逊的物流中心一样，这些元数据会输入到机器学习模型中，由模型来预测AWS何时何处会面临需求上升。

AWS最大的客户之一就是亚马逊自己。而其他亚马逊业务想要的一项主要功能就是预测。由于对预测的需求极大，AWS设计了一款名为Inferentia

的新芯片来处理这些任务。加西表示，在所有维持公司运转所需运行的机器学习任务中，Inferentia都能为亚马逊省钱，同时还会吸引客户使用其云服务。他说：“我们相信，它在成本控制和效率上至少可以实现一个数量级的提升。”Alexa中识别语音和理解人类语言的算法就将大大受益。

亚马逊在算法方面的最新尝试是无人便利店Amazon Go。店内安装了数百个摄像头，从高处观察购物者，将视觉数据转换为3D人体形貌，进而追踪购物者挑选商品时的手臂动作。这样，系统就能看到购物者挑选了哪些商品，并在他们离店时通过他们的亚马逊帐户结账。Amazon Go的主管迪里普·库玛尔（Dilip Kumar）强调，他们的系统跟踪的是购物者的肢体动作。他说，系统并非利用面部识别来识别客户身份，再将他们与亚马逊帐户相关联。事实上，它是让顾客在店门口扫一个条形码。而后系统再将所建构的3D人体形貌接下来的行为动作都算在这个扫过码的账户上。这是一曲机器学习的颂歌，处理数百台摄像头的数据以确定购物者拿取了什么。就算本文作者再怎么尝试，也没法蒙骗系统，顺手牵羊。

AI肢体跟踪也开始运用于亚马逊的物流中心。亚马逊正在测试一个内部代号为“Nike意图检测”（Nike Intent Detection）的系统。该系统用Amazon Go追踪购物者行动的方法来追踪物流中心人类员工在货架上拣货和摆货的动作。其目的是摆脱手持条形码扫描器。手动扫描耗费时间，对工人来说也是个麻烦。理想情况下，工人可以将货物放在任意货架上，系统会自动监测跟踪。与以往一样，此举的目的是提高效率，尽量提高货物流通速度。波特说：“员工们觉得这样做很自然。”

亚马逊在收集数据方面态度谨慎，这让它免于Facebook和谷歌近年受到的一些政府审查。亚马逊收集和处理客户数据仅仅是为了改善客户体验。它没有在满足用户和满足客户之间的灰色地带钻营。用户和客户往往截然不同——用户免费使用社交媒体或搜索，是因为广告主会向Facebook和谷歌付费以接近目标用户。而对亚马逊来说，用户和客户大体上是一回事（尽管它正在考虑广告业务）。监管机构真正担忧的是亚马逊在网购和云计算这两个核心业务上的主导地位。这种主导力建基于机器学习之上，丝毫没有显示出减弱的迹象。■



Schumpeter

Rebooting Airbus

With Boeing in trouble, the other half of the aerospace duopoly risks losing its competitive thrust

NO AIRCRAFT BETTER sums up the quaint absurdity of Airbus's origins than the Beluga. The cargo jet, which resembles a winged whale, carries aerofoils, tails and bits of fuselage from production sites across Europe to be turned into aeroplanes in Toulouse and Hamburg. In a normal company, it would be redundant. Like the Beluga, Airbus is far from normal. Started in 1967 as a jumble of aerospace firms from Germany, France, Britain and, later, Spain, it needs the ungainly plane to make it function smoothly.

As one of Europe's biggest industrial firms, though, Airbus is neither quaint nor absurd. It has stood out for its innovation, competitiveness and, sometimes, inspired leadership. Under Tom Enders, an outspoken former German paratrooper, it has achieved its mission of becoming (Beluga notwithstanding) a more "normal" company. Mr Enders managed to reduce the influence and ownership of the French and German states. Airbus's share price quadrupled in his seven-year tenure. Its American former head of sales, John Leahy, who retired last year, was a salesman extraordinaire, racking up, he claims, \$1.6trn of aircraft sales at Airbus, making him the nemesis of its arch-rival, Boeing. With such men, it was harder to argue that the aerospace industry was a lazy duopoly.

But in the past year Airbus has acquired a controlling stake in the C Series jet, designed by Bombardier of Canada, while Boeing has joined forces with Embraer, Bombardier's Brazilian rival, making the fortress in single-aisle commercial-aircraft manufacturing even more impregnable. Meanwhile, Boeing is in disarray following two air disasters since last October that have

grounded its bestselling jet. On the face of it, both developments are good for Airbus. In fact they could be the biggest potential traps for Guillaume Faury, the 51-year-old Frenchman who replaced Mr Enders on April 10th, because they risk dulling Airbus's competitive edge.

From an operational point of view, Mr Faury takes over at an ideal time. Like everyone at Airbus, he will lament the crashes of Boeing's 737 MAX aircraft in Ethiopia and Indonesia, which killed 346 people. Undeniably, though, the longer that plane is grounded, the stronger the outlook for Airbus's own highly successful narrow-body, the A320neo. Airbus may already be reaping the benefits: a bumper deal for 290 A320s from China last month was a further kick in the teeth for Boeing. In February Airbus took the tough decision to scrap its loss-making A380 super-jumbo. That will bolster margins on commercial aircraft, which hit 9% last year, according to Bloomberg—short of Boeing's 13% but an improvement.

One of the curiosities of the Airbus-Boeing duopoly is how restrained those margins were—especially at Airbus. In his recent book about the global jetliner business, "AeroDynamic", Kevin Michaels, an aerospace analyst, notes that between 2011 and 2017 both firms delivered more than 6,600 A320s and 737s between them. Normally, a duopoly and sky-high barriers to entry would have allowed them to jack up prices. Instead, they offered big discounts. The competition for orders was cut-throat, partly owing to the "John Leahy factor", Mr Michaels writes.

As operating margins at both firms have crept up recently, however, both have reduced the share of sales they spend on research and development of commercial aircraft. This is partly because the experience of building complex and costly new planes, such as Boeing's 787 Dreamliner and Airbus's A380, has been chastening. Such "moonshots" have gone out of fashion. Excessive re-engineering also played a part. Boeing's 737 series dates back to 1967, the same year Airbus was conceived, and has been

tinkered with extensively. As Boeing grapples with the two disasters, the prospect of deciding swiftly to build a new mid-sized aircraft, known as NMA, is receding. That takes more pressure off Airbus to innovate.

Meanwhile, Airbus's shareholders are clamouring for it to follow Boeing in handing back more cash through dividends and buy-backs. That is common across the capital markets. But it would make both companies keener than ever to milk their duopoly status. Richard Aboulafia of the Teal Group, a consultancy, describes Boeing dismissively as a "legacy jet manufacturer and distributor of shareholder returns". Its rising payouts may be one reason Boeing's shares have not fallen more steeply, despite the firm's admission this month that its software contributed to the crashes. Airbus will be tempted to move in the same direction.

The European firm would be wise to resist this urge and instead consider ploughing money back into the business. For a start, Mr Faury's must contend with Brexit, which risks disrupting Airbus supply chains in Europe but may provide an opportunity to expand its operations beyond the continent. Then there is the long-running stand-off with Boeing over subsidies and tax breaks. On April 8th the Trump administration threatened tariffs on \$11bn worth of European goods, including aircraft and helicopters, which would hurt Airbus. The European Union immediately threatened retaliation. Nothing will be decided until the World Trade Organisation sets the level of damages this summer. But one thing is clear: it will be harder for either firm to rely on state support in the future.

Meanwhile, Mr Faury has a chance to take advantage of a coming wave of technological change. Acknowledging this, he talks of innovation over the next decade and beyond that could match anything in the history of aviation. That includes engine electrification, artificial intelligence and advanced connectivity that would change how aircraft are developed, manufactured, flown, powered and serviced. It means increased use of new

materials and 3D printing, and greater efforts to reduce greenhouse-gas emissions. Airbus may be slow to embrace these long-term opportunities, given its cosy position. Gingerliness may even bring short-term gains. But technology could lower barriers to entry. In the end, ambition will pay off—even if it endangers the Beluga. ■



熊彼特

重启空客

波音麻烦缠身，航空业双寡头中的另一个可能会失去竞争动力

最能集中体现空中客车公司古老而荒谬的起源的莫过于它的货运飞机“大白鲸”（Beluga）了。这款货机形似一头长着翅膀的巨鲸，负责把空客新制成的机翼、机尾及机身从欧洲各地的制造工厂运送到图卢兹和汉堡，组装成飞机。在一般的公司那里，这可能是多此一举。但就和这款大白鲸一样，空客远非“一般公司”。它始于1967年，由德国、法国、英国加上后来西班牙的航空航天企业整合而成。它需要大白鲸这样笨拙的飞机来保证顺利运作。

但作为欧洲最大的工业企业之一，空客既不古板，也不荒谬。它拥有杰出的创新力和竞争力，有时还因鼓舞人心的领导力而与众不同。在直言不讳的前德国伞兵汤姆·恩德斯（Tom Enders）的领导下，空客已达成使命，变成了一家更为“一般”的公司，尽管还是需要大白鲸。恩德斯成功减少了法国和德国对公司的影响力和股权。在他的七年任期里，空客的股价翻了两番。去年退休的前销售主管、美国人约翰·莱希（John Leahy）是一位非凡的销售员，他声称自己在空客累计卖出了价值1.6万亿美元的飞机。这令他成为头号竞争对手波音公司的克星。这些人的存在使人们更难指称航空业是一个懒散的双寡头市场。

但过去一年里，空客收购了加拿大庞巴迪公司（Bombardier）设计的C系列喷气飞机项目的控股权，而波音公司则与庞巴迪的巴西竞争对手巴西航空工业公司（Embraer）合作，令单通道商用飞机制造的堡垒更加牢不可破。与此同时，去年10月以来的两起空难导致波音的热销机型停飞，这家公司眼下阵脚大乱。表面上看，这两方面的变化都对空客有利。但实际上，这却可能有损空客的竞争优势，成为51岁的法国人傅里（Guillaume Faury，于4月10日接替恩德斯担任首席执行官）最大的潜在陷阱。

从运营的角度看，傅里接手的时机很理想。与空客的每个人一样，他会为两架波音737 MAX飞机在埃塞俄比亚和印尼发生的、共造成346人死亡的坠毁事件感到悲痛。但不可否认的是，该型号飞机被禁飞的时间越长，空客大热的窄体机型A320neo的前景就越强劲。空客可能已经从中得益：上个月，空客收到了中国的一份大订单——290架A320飞机，这对波音公司来说又是一记重击。今年2月，空客做出了停产亏损的A380巨无霸的艰难决定。据彭博估计，这将会为空客提高商用飞机的利润率——去年它的数字为9%，低于波音的13%，但已有所提升。

空客-波音双寡头的一大奇特之处是它们的利润率并不高，特别是空客。航空业分析师凯文·迈克尔斯（Kevin Michaels）在有关全球喷气客机产业的近作《航空动态》（AeroDynamic）中指出，2011年至2017年间，空客和波音共交付了6600多架A320和737。通常情况下，双寡头和高不可攀的准入壁垒本该能令它们大幅抬高价格。但相反，两家公司却提供了大幅折扣。迈克尔斯在书中写道，订单竞争激烈，部分原因是“约翰·莱希因素”。

不过，随着近年两家公司运营利润率的缓步攀升，它们都降低了商用飞机研发投入占销售收入的比例。部分原因是打造复杂而昂贵的新型飞机（如波音787梦想飞机和空客A380）带来的教训。这种“壮志凌云”的计划已经过时。过度改造也是原因之一。波音的737系列最早可追溯到1967年，也就是成立空客的想法萌生的那一年，之后又经历了大量修修改改。现在波音忙于应对两场空难的影响，迅速拍板建造新式中型客机（名为NMA）的可能性愈加渺茫。这进一步减少了空客创新的压力。

同时，空客的股东们还叫嚷着要求公司效仿波音，通过股息和回购给予股东更大的回报。这在各个资本市场是常见操作，但会导致两家公司变本加厉地利用其双寡头地位。咨询公司蒂尔集团（Teal Group）的理查德·阿布拉菲亚（Richard Aboulafia）语带轻蔑地把波音形容为一家“老式喷气机制制造商和股东回报分发者”。尽管波音本月承认是软件缺陷导致了坠机事故，但其股价并没有大幅下跌，股东回报增加可能是原因之一。空客会受到走同一条路的诱惑。

对于空客这家欧洲公司来说，明智的做法是按捺住这种冲动，转而考虑将资金重新投入到业务发展中。首先，傅里必须应对英国脱欧。这个问题可能会破坏空客在欧洲的供应链，但也可能是个机遇，让它能扩大在欧洲大陆以外的业务。然后是空客在政府补贴和税务减免问题上与波音的长期对峙。4月8日，特朗普政府威胁对价值110亿美元的欧洲货物（包括飞机和直升机）加征关税，这将对空客造成伤害。欧盟随后立即威胁要采取报复行动。在世贸组织今年夏天评定损失的程度以前，一切将暂无定论。但有一点很明确：两家公司未来都将更难依赖政府的支持。

与此同时，傅里有机会利用即将到来的技术变革浪潮。他认同这一点，罗列了未来十年及以后可能将媲美航空史上一切成就的创新，包括发动机电气化、人工智能和先进的联网能力，它们将改变飞机的开发、制造、飞行、动力及维护。这意味着进一步普及新材料和3D打印，以及更努力地减少温室气体排放。面对这些长远机遇，目前养尊处优的空客也许动作缓慢。而谨慎迟疑的态度甚至在短期内会带来好处。但技术可能会降低准入门槛。最终，雄心壮志会换回来报，即便是危及到大白鲸的生存。 ■



The World Bank

Malpass v Malpass

The new boss will find that the job is harder to do than it was to get

WHEN HE WAS nominated to lead the World Bank by President Donald Trump, David Malpass, a former Treasury official, faced no rival for the position. He was approved unanimously by the bank's board, which represents its 189 member governments, and began work promptly earlier this month. The process could not have been easier. But stiffer resistance lies ahead. Chances are that nothing in the job will become him like the entering it.

The institution he now leads is dedicated to eradicating poverty and fighting inequality. By its estimates, 10% of the world's population (736m people) lived below the global poverty line in 2015 and perhaps 8.6% did in 2018. It aims to lower that share to 3% by 2030.

Because poverty is falling quickly in India and Bangladesh, most of the people living so uncomfortably now reside in sub-Saharan Africa, especially Nigeria and the Democratic Republic of Congo. They are harder to reach, concentrated in "fragile" regions, afflicted by violence. They would benefit greatly from sound economic policies and rapid GDP growth. But in these settings, the bank cannot always count on governments using its money and advice well. It therefore tends to back tightly monitored projects that benefit the poor directly. A big initiative in Congo, for example, helps women giving birth and vaccinates children against tuberculosis, hepatitis B and other diseases.

Mr Malpass no doubt applauds such efforts. But his animating passions lie elsewhere. He wants the bank to focus on promoting economic growth:

"breakthroughs that materially raise median incomes", as he wrote in the *Financial Times* shortly after his nomination. Bank insiders say he has shown a close interest in the world's ten biggest emerging markets. Understanding their paths to growth may yield lessons for others. And improving their growth prospects would benefit both their own large populations and the world economy, in which they now weigh heavily.

The bank's influence on such countries is small. But the potential gains are so great that even a small nudge can yield a magnificent return. Lant Pritchett of Harvard University cites the example of the Indian Council for Research on International Economic Relations. This think-tank, based in Delhi, got started in the early 1980s with the help of \$857,000 from the Ford Foundation (almost \$3m measured using 2005 purchasing-power-parity rates). Mr Pritchett reckons that its research helped shape India's successful response to its balance-of-payments crisis in 1991. Those reforms, in turn, set the stage for faster growth in a country hosting a sixth of humanity. Mr Pritchett has calculated that the 1991 response and later reforms added \$3.6trn to India's output from 1991 to 2010. Even if Ford's money increased the chances of reform by only 1%, that represents a 12,000-fold return on its investment (ignoring the lag between outlay and the reforms).

But this kind of thinking is out of fashion at the bank. The ten largest emerging markets are not necessarily its biggest clients. Nor, India aside, are they where many of the world's poorest people live. Improving median incomes in these ten would not necessarily reduce poverty in Nigeria or Congo. Nor would it ensure that the incomes of the bottom 40% rise faster than the rest (which is one way the bank monitors its fight against inequality). Mr Malpass's instincts may therefore fail to mesh with the bank's institutional priorities.

His interest in engaging with the world's big emerging markets also sits uneasily with his other preoccupation: disengaging from the biggest

emerging market of all. In his previous role at America's Treasury he expressed worries about China's "inroads" into the multilateral lenders. America agreed to an increase in the World Bank's capital only on condition that in future it devoted a smaller share of its lending to countries as prosperous as China, charged them higher interest rates and encouraged them to "graduate" out of World Bank borrowing altogether.

China's income per person already exceeds the threshold for graduation (\$6,795 in 2017). But it is not alone: 31 other eligible clients exceed that level, including some large countries with considerable clout (Brazil, Mexico, Turkey). Efforts to usher them off the bank's books would meet insurmountable opposition. China and its peers will instead insist they do not meet the bank's vaguer criteria for graduation, which include progress in institution-building. Thus China's backers will highlight its shortcomings even as its critics, like Mr Malpass, tout its accomplishments.

The duties Mr Malpass inherits from his predecessor, Jim Yong Kim, are lighter than those bequeathed to previous presidents. Mr Kim's managerial failings prompted the bank to appoint a capable chief executive, Kristalina Georgieva, to handle day-to-day operations. By some estimates, she does 75-80% of the job that fell to previous presidents. Mr Malpass may therefore struggle to impose himself on the bank. Some powerful constituencies stand in opposition to his ideas—and some of his ideas stand in tension with each other. ■



世界银行

马尔帕斯左右互搏

这位新行长的工作得来不难，做起来却不易

美国前财政部官员戴维·马尔帕斯（David Malpass）被总统特朗普提名为世界银行行长时，没有遇到任何竞争对手。代表189个成员国政府的世行董事会一致通过了对马尔帕斯的任命，他旋即于本月稍早时走马上任。整个过程毫不费力，但前路艰难。这份工作很可能是得来顺风顺水，做起来却诸事不顺。

他所领导的世行致力于消除贫困，对抗不平等。据世行估计，2015年全球有10%的人口（7.36亿人）生活在全球贫困线以下，2018年的数字可能是8.6%。世行的目标是到2030年将这一比例降至3%。

由于印度和孟加拉国的贫困程度正在迅速减轻，现在大多数生活在贫困线以下的人都居住在撒哈拉以南非洲地区，特别是尼日利亚和刚果（金）。他们集中在暴力肆虐的“脆弱”地区，扶贫举措难以触及。健全的经济政策和快速的GDP增长能让这些贫困人口受益匪浅。但在这些地区，世行没法总是指望当地政府能妥善利用其资金和建议。因此，它倾向于资助那些它能严密监控、直接惠及穷人的项目。例如世行在刚果（金）实施的一项重大举措就是帮助妇女安全分娩，以及为儿童接种结核病、乙肝等疾病的疫苗。

马尔帕斯无疑对此类项目表示赞赏。但他的工作热情不在于此。他希望世行专注于促进经济增长，要像他在被提名后不久在《金融时报》撰文所写的那样，实施“可切实提高收入中位数的突破性举措”。世行内部人士表示，他对全球十大新兴市场表现出浓厚兴趣。了解它们的发展道路或许能为其他发展中国家提供经验。另外，这些新兴市场如今在世界经济中占有重要地位，改善它们的增长前景会令其自身的庞大人口和世界经济双双受益。

世行对这些国家的影响很小。但由于潜在效益巨大，即使是轻微的推动也能产生可观的回报。哈佛大学的兰特·普里切特（Lant Pritchett）以印度国际经济关系研究委员会（Indian Council for Research on International Economic Relations）为例来说明这一点。这个智库位于德里，上世纪80年代初由福特基金会出资85.7万美元（按2005年购买力平价计算接近300万美元）成立。普里切特认为，该委员会的研究在1991年帮助印度成功应对了国际收支危机。而当时的改革又为这个人口占全球六分之一的国家奠定了快速增长的基础。据普里切特计算，1991年的应对措施及后来的改革在1991年到2010年之间让印度的经济产出增加了3.6万亿美元。即使福特基金会的资助仅令发起改革的可能性提高了1%，它的投资回报高达1.2万倍（忽略资金支出和改革之间的时间差）。

但这样的想法在世行已经过时。十大新兴市场不一定是世行最大的客户。除了印度之外，它们也不是全球贫困人口聚集的地方。提高这十个国家的收入中位数并不一定能减少尼日利亚或刚果（金）的贫困人口，也不能确保底层40%人口的收入增速超过其他人群（这是世行监测其抗击不平等的努力的一种方式）。因此，马尔帕斯的直觉与世行的工作重点可能并不匹配。

他对加强与各大新兴市场联系的兴趣也与他十分关心的另一个问题格格不入：摆脱新兴市场中最大的那一个。在美国财政部工作期间，他表达了对中国“侵占”多边贷款机构资源的担忧。美国同意对世行增加注资，但条件是未来世行缩减对中国这样的繁荣国家的贷款，调高对它们的利率，促使它们彻底“毕业”，不再享受世行的优惠贷款。

中国的人均收入已超出世行的“毕业线”（2017年的标准为6795美元）。但这种情况不独中国一家：还有31个贷款国的人均收入超过了这条线，其中包括一些具有相当影响力的大国（巴西、墨西哥、土耳其）。将它们从世行的优惠贷款名单中剔除将遭遇巨大的阻力。但世行的毕业标准划分模糊（其中包括制度建设的进展），中国及类似国家会坚称自己未达到标准。因此，在马尔帕斯这样的批评者认为中国成就巨大之时，中国的支持者会强调它的不足。

相比历任世行行长，马尔帕斯从前任金墉（Jim Yong Kim）那里接过来的担子要轻一些。金墉的管理失误促使世行任命了一位能力很强的首席执行官克里斯塔利娜·格奥尔基耶娃（Kristalina Georgieva）来负责日常运营。有人估计，她承担了75%到80%以往由行长主管的工作。因此，马尔帕斯可能很难将自己的观点加诸于世行。一些强大的成员国反对他的观点——而他自己的一些想法也在左右互搏。 ■



Buttonwood

The diversification illusion

Reserve managers are locked in an unhealthy relationship with the dollar

JAMES M. CAIN'S novel "The Postman Always Rings Twice" portrays a violent love affair between Frank Chambers, a drifter, and Cora Papadakis, a former beauty queen now married to a man she despises. Their romance is doomed from the beginning. Every attempt to find happiness fails. Any attempt at being apart is equally hopeless. "Why did you have to come back?" she hisses after one break-up. "I had to, that's all," he replies.

The story comes to mind when contemplating the fate of the managers of the world's \$11trn-worth of foreign-exchange reserves. This is not to say they are obsessives wracked with guilt and paranoia (though a few might be). But rather that, like Frank and Cora, it has probably occurred to them that their dominant relationship, which is with the dollar, may not be entirely good for them.

The latest figures from the IMF show that the share of dollars in global reserves fell to 62% at the end of last year. Reserve managers seem to be for a cooler, less intense affair with the dollar. But eventually, they will find that it is hard to break free. That is not so much because the alternatives to the dollar have flaws (though they do); rather, it is because the pain of a weaker dollar will become too much to bear.

The dollar is the closest thing to a world currency. Commodities that are traded globally are quoted in dollars. So are other currencies. A lot of cross-border trade is invoiced and settled in dollars, too. Dollars are the unit by which the world of finance keeps score. So there is logic to countries keeping stores of them in reserve. It is generally dollars that you need in an

emergency.

But money is also a store of value. There is no guarantee that the dollar will hold its value better than other currencies. So like other portfolio managers, reserve-holders seek to diversify. That means fewer dollars.

There are other reasons for breaking free of the greenback. Its global role gives America the means to impose financial sanctions to great effect. Its use of such powers has steadily grown. In response, Russia has slashed the share of dollars in its currency reserves. It is not hard to imagine that some other countries have weighed the odds of at some stage being caught in a dispute with America.

Changes in the market value of currencies can mask underlying shifts in the mix of assets within reserves. For instance, if the euro falls sharply against the dollar, its share in reserves would also fall without any change in the stock of assets held. Steven Englander of Standard Chartered, a bank, applies a constant exchange rate to the IMF data to adjust for this valuation effect. What emerges is a clearer long-term trend downwards in dollar holdings and a sharp sell-off last year (see chart). What kept the dollar strong was the strength of private-sector purchases.

Reserve managers appear to be countercyclical investors, selling when others are buying. This is rather cheering. The dollar looks overvalued on many benchmarks. And if anyone can take a long-term view, it ought to be reserve managers. Even so, Mr Englander suspects that some of them are waiting for signs of dollar weakness before selling.

By then it may be too late. Once private-sector demand for dollars wanes, the combination of this downward pressure and selling by reserve managers might mean that the dollar has to fall a long way to balance supply and demand. That would be a big headache for reserve managers. In one regard

they are not like other portfolio managers. They are also charged with keeping their own currency at a competitive level to support exports.

Reserve managers who start off wanting to sell dollars often end up buying them back when they see competitiveness is at risk, says Mr Englander. Their attempts to diversify by, say, selling those dollars for euros is doomed to fail. It is hard to induce private-sector investors to buy dollars for euros when they, too, are trying to diversify away from them. The outcome, says Mr Englander, is that both dollar and non-dollar reserves increase, with the dollar share not much changed.

In Cain's novel, the star-crossed lovers are joined by a dark passion and by complicity in a murder. What tethers reserve managers to the dollar is not quite as sinister. For a while they can achieve a little distance: if they want to get out of dollars, they can do so while everyone else is trying to get into them. But if the dollar falls hard enough, they will be buyers. Ask a reserve manager, then, why he ever went back, and he may tell you: "I had to, that's all." ■



梧桐

多元化幻觉

外汇储备管理机构深陷与美元的不健康关系

詹姆斯·M·凯恩（James M. Cain）的小说《邮差总敲两次门》（The Postman Always Rings Twice）讲述了流浪汉弗兰克·钱伯斯（Frank Chambers）和曾是选美皇后的科拉·帕帕达基斯（Cora Papadakis）之间一场激烈的情事。科拉当时已嫁给了一个她嫌弃的男人。两人的罗曼史从一开始就注定要失败。任何试图让这段关系圆满的努力都无济于事。而任何分开的尝试也同样无望。“你干嘛非得回来呢？”一次分手后，她生气地低语。他回答：“不回来不行，就这么回事儿。”

一想到世界上11万亿美元外汇储备的管理机构的命运，脑海中就会浮现这个故事。并不是说它们都是被罪恶感和偏执折磨的强迫症患者（虽然有几家可能是），而是说它们像弗兰克和科拉一样，可能已经意识到它们与美元的那种主导关系可能并不完全对自己有益。

国际货币基金组织（IMF）的最新数据显示，去年年底美元在全球外汇储备中所占的份额下降到了62%。外汇储备管理机构似乎倾向于要和美元保持一种更冷静、不那么激烈的关系。但最终它们会发现很难挣脱束缚。主要不是因为美元的替代品都有缺陷（尽管的确有），而是因为美元走弱带来的痛苦将变得令人难以承受。

美元是最接近世界货币的货币。全球交易的大宗商品都以美元计价。其他货币也是如此。许多跨境贸易也是用美元开具费用清单和结算的。美元是金融世界的记分单位。因此，各国储备美元合乎逻辑。紧急情况下你需要的通常是美元。

但货币也是一种保值手段。美元不能保证比其他货币更保值。因此，与其他投资组合管理者一样，外汇储备持有者也在寻求多元化。这就要减少持有美元。

想摆脱美元还有其他原因。美元的全球地位为美国提供了极为有效的金融制裁手段。而美国运用这些力量的情形已稳步增多。作为回应，俄罗斯大幅削减了美元在其外汇储备中的比重。不难想象，其他某些国家也权衡过在某个阶段与美国发生争端的可能性。

货币的市场价值的变化可能掩盖外汇储备中资产组合的潜在转变。例如，如果欧元兑美元汇率大幅下跌，它在外汇储备中所占的份额也会下降，但所持资产的存量并没有什么变化。渣打银行的史蒂文·英格兰德（Steven Englander）将一个恒定的汇率用于国际货币基金组织的数据，以更好地修正这种估值效应。由此呈现出了更清晰的美元持有量长期下降的趋势，以及去年的大幅抛售（见图表）。令美元保持坚挺的是私营部门的购买力度。

外汇储备管理机构似乎是反周期投资者，在其他人买入时卖出。这相当令人振奋。以许多基准来看美元都被高估了。如果有谁能从长远看问题，那应该就是储备管理机构。即便如此，英格兰德怀疑，它们当中的一部分仍在等待美元疲软的迹象，然后才卖出。

到那时可能就太晚了。一旦私人部门对美元的需求减弱，这种下行压力加上储备管理机构的抛售，可能意味着美元必须大幅贬值才能平衡供需。这对外汇储备管理机构来说会是个大麻烦。在一个方面，它们和其他投资组合管理机构不一样。它们还要负责把本国货币维持在有竞争力的水平上以支撑出口。

英格兰德指出，一开始想卖出美元的外汇储备管理机构在发现出口竞争力面临风险时，往往最终又买进了美元。比如，它们想通过把美元换成欧元实现多元化，但这样的尝试注定要失败。说服私营部门的投资者把欧元换成美元很难，毕竟他们也在试图分散投资。英格兰德说，到最后美元和非美元储备都有所增加，而美元所占比重没有太大变化。

在凯恩的小说中，那对不幸的恋人因见不得光的激情和同谋杀人而紧紧相连。外汇储备管理机构和美元之间的羁绊倒没那么邪恶。在短暂的一段时

间内，它们可以保持一定的距离：如果它们想卖出美元，可以在其他人都想买进时这么做。但如果美元跌幅足够大，它们就会成为买家。那么，问问储备管理者为什么要回头，他也许会跟你说：“不回来不行，就这么回事儿。”■



China's GDP

Growth in train

As lending surges in China, an economic rebound is in sight

JUST OVER 25 years ago Shanghai launched its metro with a single, stubby line. Since then it has added 15 lines and some 700km, making it the world's longest metro system. It is far from done. The city recently unveiled plans for another 300km, including overland rail, within five years. Much of the work proceeds unseen as machines bore tunnels beneath the surface. But excavation holes around the city offer clues about the activity deep underground.

They are part of a nationwide push. The Chinese government has, in the words of state media, hit the “fast-forward button” on infrastructure spending, a tried and tested way to pep up the economy. In the first quarter China's GDP grew by 6.4% compared with a year earlier, level with the final quarter of 2018—its slowest in a decade. That would still be enviably fast for most countries. But Chinese officials have been unnerved by the possibility that it could herald the start of a steeper slide.

Last year such fears were widely heard. The trade war with America seemed destined to get nastier. China's stockmarket was slumping. Entrepreneurs complained that state-owned firms, already powerful, were elbowing them aside. A regulatory campaign to rein in debt levels sent tremors through the financial system, making banks much warier about lending cash.

So in mid-2018 China's government shifted gears. It cut taxes on personal incomes and corporate profits. Authorities ordered banks to lend more to small businesses. And planners cranked up the infrastructure machine again. For months they had held off from approving metro projects, mindful

of the campaign to control debt. But in July they started things moving again, with half a dozen cities, including Shanghai, among the beneficiaries. Sales of excavation equipment, a proxy for construction, soared to an eight-year quarterly high in the first three months of 2019 (see chart).

Yet there are still doubts about how far China will go to juice the economy. Li Keqiang, the prime minister, has repeatedly sworn off any major stimulus, fearful of undoing the progress made in slowing the growth of debt. Benefits from cutting taxes have been blunted by efforts to collect them more stringently.

Meanwhile the infrastructure push shows how China has reached such a size that its growth faces clear limits. It aims to build 3,200km of high-speed rail lines this year. That is nearly as much as Spain, the country with the second-largest high-speed rail network, has in total; for China, though, it is down from an average of 3,600km annually over the past five years. Nor need the government worry about a slightly weaker economy causing unemployment: with the labour force shrinking as the population ages, help-wanted ads are popping up in shops across the country.

Given all the reasons for restraint, many observers have therefore been taken aback by the strength of credit growth this year. Total social financing, a measure that consists mainly of bank loans and bond issuance, hit 8.2trn yuan (\$1.2trn) in the first quarter, up by 40% from the same period last year, well above most forecasts. A quarter of the financing has been short-term corporate loans. In China that is usually a sign that pliant state-owned banks are heeding the government's call to pump out credit, ahead of demand from borrowers. Growth could thus rebound by mid-year, says Larry Hu of Macquarie Securities.

So are expectations of only a limited stimulus wide of the mark? More likely

is that the change is one of timing rather than magnitude. The government seems to be front-loading its plans to prop up growth.

Two political calculations may help explain this. The first is the trade war with America. China appeared to be on the back foot last year as its stockmarket tumbled. A rally this year, fuelled by the pro-growth policy tilt, has boosted China's confidence as negotiations enter the home stretch. The second is the 70th anniversary of Communist Party rule on October 1st, which the government will mark with a flurry of festivities. It does not want them marred by grumbles about the economy. The subway-diggers can count on a busy summer. ■



中国的GDP

等待发车

随着贷款激增，中国经济复苏指日可待

上海地铁25年前开通时，只有短短一条线路。此后陆续增加了15条，开通里程约700公里，由此成为世界上运行线路最长的地铁系统。然而这还远不是全部。最近，上海公布了五年内再建300公里地铁（含地面线路）的计划。由于机器是在地下挖掘隧道，所以大部分工程都是悄然推进。但城里随处可见的挖掘坑洞透露了地下深处的繁忙。

而这只是全中国大兴基建的一个缩影。用官方媒体的话来说，中国政府按下了基建投入的“快进键”——用这个办法来提振经济可谓屡试不爽。今年一季度，中国GDP同比增长6.4%，与2018年第四季度持平。尽管这一增速为中国近十年来的最低水平，但对大多数国家来说还是快得令人羡慕。不过中国官员对此却忧心忡忡，担心这预示着经济开始更急剧地下滑。

这样的担忧在去年比较普遍。当时，与美国的贸易战似乎注定愈演愈烈。中国股市暴跌。私营企业家们抱怨自己正在被本就强势的国有企业排挤出局。一场旨在控制债务水平的监管风暴在整个金融体系中引发震动，使得银行在放贷上变得谨慎了许多。

因此，到2018年年中，政府改变了策略，减轻了个人所得税和企业所得税，同时要求银行向中小企业提供更多贷款。而规划部门重新启动了基础建设。受控制债务水平行动的影响，此前数月规划部门一直在推迟地铁项目的审批。但到了7月，审批工作重新启动，包括上海在内的六个城市成为受益者。今年头三个月，作为基建行业风向标的挖掘设备销量飙升至八年来的季度新高（见图表）。

不过，对于中国在提振经济方面将走多远，人们仍抱怀疑态度。由于担心在减缓债务增长方面的进展白费，李克强总理曾多次誓言不会采取任何重

大刺激措施。减税带来的红利已经被更严厉的征税措施所削弱。

与此同时，大举推进基建的举措表明，中国的经济规模之大已令其增长明显受限。中国的目标是今年投产高铁3200公里。尽管这一数字几乎相当于拥有世界第二大高铁网络的西班牙的总里程，却仍低于中国过去五年来平均每年3600公里的建设里程。随着人口老龄化带来的劳动力减少，全国各地的招聘广告层出不穷，因此政府也不必担心经济小幅下滑会导致失业。

鉴于所有这些抑制因素，许多观察人士对今年信贷的强劲增长感到惊讶。一季度社会融资总量（主要是银行贷款和债券发行）达8.2万亿元（1.2万亿美元），同比增长40%，远超大多数预期。其中四分之一的融资是企业短期贷款。在中国，这通常表明唯命是从的国有银行正在响应政府号召，在贷款人需求出现之前大量发放贷款。麦格理证券（Macquarie Securities）的胡伟俊表示，照这样下去，中国经济增长到年中就能回弹。

那么，那些认为中国只会做有限刺激的预期错得离谱吗？更有可能的是，发生变化的是时机而非力度。政府似乎是提前实施了其“保增长”计划的大头。

之所以这样做可能与两方面的政治考量有关。首先是与美国的贸易战。去年股市暴跌时，中国似乎是处于劣势的一方。在向“促增长”倾斜的经济政策的刺激下，今年的经济反弹在谈判进入最后阶段时提振了中国的信心。其次，今年10月1日是中国共产党执政70周年纪念日，届时政府将举行一系列庆祝活动。政府不希望出现对经济的抱怨而使庆祝活动蒙上阴影。今年夏天，地铁挖掘机肯定有得忙了。 ■



Evolution and psychiatry

The wisdom of sorrow

After centuries of discredited quackery, evolution may suggest a way to understand mental illness

“YOUR WHOLE field is confused. You know that, right?” The patient who delivered this parting shot had a perpetual knot in the pit of her stomach. She had lost interest in everything, was anxious, irritable and nauseous, and struggled to sleep. Her family doctor had told her it was “nerves”. A psychotherapist asked about sexual feelings in childhood for her father. A psychiatrist offered drugs to fix what he said was a chemical imbalance in her brain.

Confused and desperate, she had found her way to yet another doctor, an assistant professor of psychiatry. Anxiety can be useful, he told her, but most people experience more than they need—because whereas too much merely makes you miserable, too little can make you dead. She was stuck in a cycle of worry, heightened vigilance and more worry. Cognitive behavioural therapy, which teaches people to break corrosive thinking patterns, would help. She brightened up—and offered a few home truths about the psychiatrist’s profession.

Randolph Nesse, now of Arizona State University, cites that encounter in his fascinating book to illustrate why he has spent his career studying the evolutionary roots of mental illness. Though doctors who treat physical ailments do not routinely refer to evolution, their theories about bodies are based on the fact that humans, and the pathogens that afflict them, are the product of aeons of natural selection. Disorders are defined by comparison with normal functioning. Symptoms such as rashes, fevers and pain are understood to be consequences of, or defences against, illness, not the

illness itself. Treating an ailment like diabetes, in which a complex system malfunctions, means knowing how that system is supposed to work—and what it evolved to do.

Mental-health specialists lack such solid foundations. In general, they neither study the feelings of the well, nor consider what feelings are for. Of the 4,500 pages in America's most popular psychiatry textbook, normal emotions get half a page. Moreover, when it comes to diagnosis, they fail to consider underlying causes. The current version of the American "Diagnostic and Statistical Manual for Mental Disorders" (DSM-5) defines hundreds of disorders solely by their symptoms. Depression, for example, means at least two weeks experiencing five or more of eight symptoms, such as loss of pleasure in life, loss of appetite and feelings of worthlessness. The diagnosis is the same if you have just been bereaved or divorced or lost your job.

In Dr Nesse's definition, "specialised states that...increase the ability to meet adaptive challenges" constitute normal emotions. They are experienced as positive or negative because only situations containing opportunities or threats affect evolutionary fitness. A negative emotion may be just as evolutionarily useful as physical pain. A depressed patient's low mood, for example, may result from his realisation that a major life project is sure to fail. It feels terrible, but makes sense in evolutionary terms. People who do not suffer when pursuing unachievable goals may waste their energies on pointless effort, thereby harming their chances of reproduction. That insight taught Dr Nesse to ask the depressed: is there something very important that you are trying and failing to do, but can't bring yourself to give up?

Evolution has equipped people for a world very different from the one they now inhabit. They are obese because their appetites are adapted to scarcity, not superabundance. Similarly, some mental illnesses may be the result

of having to negotiate situations they are not fit for. Others may be side-effects of selection for desirable traits. Dr Nesse draws an analogy with racehorses, bred for speed with the unfortunate result that their cannon bones are brittle. For every 1,000 that start a race, he says, one breaks a leg and has to be put down. It may have slightly weaker bones than the rest. Or it may simply be unlucky and stumble. Humans may have “minds like the legs of racehorses, fast but vulnerable to catastrophic failures”.

When it comes to doctoring the body, you have to go back to the 19th century to find a time when the theories were baseless (infections were caused by miasmas, for instance) and the treatments often harmful (bloodletting, purging and the like). For doctoring the mind, as Anne Harrington’s fine history of psychiatry shows, that point is much more recent. In 1949 a Nobel prize went to the Portuguese inventor of the lobotomy, an operation intended to sever the “worry nerves” of the brain. In 1952 the technique was sufficiently honed for an American acolyte to launch “Operation Ice-pick”—a 12-day road trip during which 228 patients were strapped down and anaesthetised, before he or an assistant slipped an ice-pick-shaped knife under each eyelid and into their brains, and gave a twist.

What ended that practice was not an outbreak of compassion, but the arrival of thorazine, a drug that caused such mental deadening that it was nicknamed the “chemical lobotomy”. It was the start of the age of blockbuster drugs for mental illness. By the end of the 1950s one in three prescriptions in America was for meprobamate, which dampened anxiety. By 1990, 1m Americans received Prozac prescriptions each month. Pharmaceutical companies popularised the notion that anxiety, depression and so on were caused by chemical imbalances. Right them and you could become not just well, but better than well.

Under the influence of Freud, psychiatrists had sifted their patients’ life histories for repressed emotions and memories. But in the 1980s

psychiatrists declared a post-Freudian world, with mental illnesses ascribed to brain biochemistry and neuroanatomy. They expected to discover the genes that caused mental illnesses, and bespoke drugs that could heal them.

That revolution never happened. Instead pharmaceutical firms are pulling back, as stricter testing rules reveal how little good many of their products do. The evidence linking mental illnesses to defects of brain architecture or chemistry, or to specific genes, is scanty. With its checklist approach to diagnosis, DSM-5 is under attack. Ms Harrington's history ends with today's crisis in the psychiatric profession. If Dr Nesse is right, evolutionary thinking could provide a fruitful new direction. ■



进化与精神病学

悲伤中的智慧

在经过几个世纪不足信的游医骗术后，进化论也许为理解精神疾病指出了一条明路
【《不良情绪存在的充分理由》书评】

“你们整个领域都毫无头绪。你清楚这一点，对吧？”一位病人在离开时撂下这么一句话。她郁结于心，终年难解。她对一切事情都失去了兴趣，并感到焦虑、烦躁和恶心，还难以入眠。她的家庭医生说她这是“神经紧张”。一位心理治疗师询问了童年时她对父亲在性方面的感受。一位精神科医生说她的问题出在脑内化学物质失衡，给她开了药。

在困惑与绝望中，她又设法找到了一位医生——一位精神病学的助理教授。他告诉她，焦虑可能有其用处，但大多数人体验的焦虑都超过了他们需要的程度，因为过多的焦虑还只会让你痛苦，太少却会置你于死地。她陷入了一个“忧虑-高度警觉-更多忧虑”的循环中。认知行为疗法将会有所帮助：它能教人们打破那些有着慢性破坏作用的思维模式。她心情振奋了些，并对这位精神病学家说出了几句有关他的专业的不中听的大实话。

目前任教于亚利桑那州立大学的伦道夫·奈斯（Randolphe Nesse）在他引人入胜的著作中讲述了这次经历，以此说明为什么他花了整个职业生涯研究精神疾病的进化根源。虽然那些治疗身体疾病的医生并不常提到进化，但他们有关身体的理论都是基于这样一个事实：人类以及折磨他们的病原体都是漫长的自然选择的产物。疾病是通过与正常功能作比较来定义的。皮疹、发烧和疼痛等症状被认为是疾病的后果，或防御疾病的手段，而不是疾病本身。像糖尿病这样的疾病意味着一个复杂的系统出现了故障，要治疗它就要了解这个系统本该如何工作，以及它进化成这样是为了什么。

心理健康专家们缺乏这样坚实的基础。一般来说，他们既不研究健全者的感受，也不仔细考虑感受的功用是什么。美国最受欢迎的精神病学教科书篇幅有4500页，但关于正常情绪的内容只有半页。而且，在诊断方面，心理健康专家也不考虑疾病的潜在原因。当前版本的美国《精神疾病诊断

和统计手册》（DSM-5）定义了数百种精神疾病，但根据的仅是其症状。例如，抑郁症就是指一个人出现了八种症状中的五种或更多，且至少持续两周，例如失去生活的快乐、食欲不振和无价值感。如果你刚刚失去亲人，或离婚、失业，得出的诊断都是一样的。

在奈斯的定义中，那些“可增强人们应对适应性挑战的能力的特化状态”构成了正常情绪。它们之所以给人积极或消极的体验，是因为只有蕴含机遇或威胁的状况才会影响人的进化适应度。消极情绪也许和身体疼痛一样具有进化意义。例如，一名抑郁症患者情绪低落，原因可能是他意识到某个人生大计肯定会失败。这让人感觉很糟糕，但从进化的角度看这种感受是有其道理的。那些在追求无法实现的目标时不会感到痛苦的人可能只会付出无谓的努力，浪费精力，进而损害自身繁殖的机会。这一洞见让奈斯学会问抑郁的人这样一个问题：你是否正在尝试做什么非常重要的事情，不过没有胜算，但又不能让自己放弃？

进化让人类有能力去面对一个与他们如今生活的世界截然不同的环境。人之所以肥胖，是因为他们的食欲适应的是食物的不足，而不是过剩。同样，某些精神疾病可能是因为人们不得不捱过他们不适应的状况而产生的结果。其他一些可能是进化选择了理想性状而产生的副作用。奈斯拿赛马来做类比：人们繁育出了跑得更快的赛马，然而不幸的结果就是这些马的炮骨很脆弱。他说，每1000匹参赛的马中就有一匹因跑断腿而不得不接受安乐死。原因也许是这匹马的骨骼可能比其他马稍脆弱，或者纯粹就是它不走运，蹄子绊了一下。人类的头脑可能“就像赛马的腿一样，快是快，但难以承受灾难性的失败”。

就治疗身体疾病而言，你得穿越到19世纪才能找到那些毫无根据的理论（例如感染是由瘴气引起的），以及往往于人体有害的治疗手段（放血、灌肠等）。而在医治心灵方面，你不用回溯那么久远就能找到这些。安妮·哈灵顿（Anne Harrington）有关精神病学历史的精妙著作揭示了这一点。1949年，一个发明了脑白质切除术的葡萄牙学者获得了诺贝尔奖，这项手术的目的是切断大脑的“忧愁神经”。1952年，这项技术经过了充分的打磨，足以使得美国的一名追随者推出“冰锥疗法”。他在12天里行至各

处，实施手术。期间有228名患者被捆绑起来，实施了麻醉，再由他或一名助手从患者每只眼睛的眼睑下方插入一把形似冰锥的刀，直伸向大脑，然后再做一个搅动的动作。

结束这种手术的并不是人们同情心爆发，而是氯丙嗪的问世。这种药物会让人精神萎靡，死气沉沉，因而获名“化学的脑白质切除术”。那之后开启了治疗精神疾病的畅销药大行其道的时代。到上世纪50年代末，美国有三分之一的处方开出了可减轻焦虑的眠尔通。到1990年，每个月有100万美国人被开出了百忧解。制药公司令“焦虑、抑郁等是由化学物质失衡引起的”的看法广为流传。只要纠正了这些状况，你就可能变得健康，而且不是一般的健康。

在弗洛伊德的影响下，精神病学家细查患者的人生历程，发掘他们压抑的情绪和记忆。但到上世纪80年代，精神病学家宣告了一个后弗洛伊德世界的到来，认为精神疾病是脑生物化学和神经解剖学领域的问题。他们期望发现导致各种精神疾病的基因，以及可以治愈它们的定制药物。

这场革命从未发生。而制药公司正在退却，因为更严格的检验规则显示它们的许多产品并没有多少好处。显示精神疾病与大脑结构缺陷或化学物质方面的缺陷有关、或与特定基因有关的证据很少。DSM-5因采用参照对照表做诊断的方法受到猛烈抨击。哈灵顿讲述的精神病学史以这一专业如今深陷危机收尾。如果奈斯是对的，那么进化这一思路可以提供一个富有成效的新方向。 ■



The future of cars

Charging ahead

Big carmakers are placing vast bets on battery power

IN 1900 ONE in three cars on American roads ran on volts. Then oil began gushing out of Texas. Cheaper than batteries, and easier to top up, petrol fuelled the rise of mass-produced automobiles. Cost and worries about limited range have kept electric vehicles (EVs) in a niche ever since. Tesla, which has made battery power sexy again in the past decade, produced just 250,000 units last year, a fraction of what Volkswagen or Toyota churn out annually. For every one of the 2m or so pure EVs and plug-in hybrids, which combine batteries and internal-combustion engines (ICEs), sold in 2018, the world's carmakers shifted 50 petrol or diesel cars.

EV sales are, however, accelerating as quickly as electric motors themselves. Some industry-watchers reckon that they will account for nearly 15% of the global total by 2025. By then, one in five new cars in China will run on batteries, according to Bloomberg New Energy Finance, a consultancy. The chief reason such optimistic forecasts no longer look outlandish is the entry into the electric race of the car industry's juggernauts. A survey by Reuters in January put the industry's total planned EV-related spending worldwide (including on batteries) at around \$300bn over the next five to ten years. From GM and Geely to Mercedes and Nissan, big carmakers all want to turn out millions of such cars—and turn a profit doing so. Their strategies range from cautious to headstrong.

Making a profitable, mass-produced EV has proved elusive. A battery powertrain can be three times the price of an ICE. But a combination of better technology and greater scale may soon allow EVs to compete on price with petrol vehicles, and enable motorists to drive long distances without

the fear of running out of juice.

They had better, carmakers are hoping. Worries about climate change and air pollution are prompting authorities around the world to consider phasing out new petrol and diesel engines in the coming decade. In the absence of federal regulations under America's climate-sceptical president, Donald Trump, some progressive cities and states there are tightening local rules. Fiat Chrysler (whose chairman, John Elkann, sits on the board of *The Economist*'s parent company) has just agreed to pay Tesla hundreds of millions of euros to count the Californian marque as part of its fleet, and thus avoid steep fines for exceeding average CO₂-emissions standards for carmakers due to come into force in the European Union next year. In China, where half the world's EVs are already sold, the government sees the electrification of transport as a way to combat choking urban smog—and to overtake the West technologically.

Western premium brands appear best positioned to take an early lead. While batteries remain pricey, fancy marques can offset the cost with the higher prices that their vehicles command. Jaguar and Audi have already broken Tesla's monopoly at the lucrative top end of the market. Daimler, which owns Mercedes, has committed €10bn (\$11.3bn) to its EQ range and wants 20% of its cars to be fully electric by 2025.

Daimler and BMW, which has been bruised by losses on its poorly selling i3 electric hatchback, are hedging their bets by backing platforms—the basic architecture of a car—that are able to accommodate petrol and diesel engines as well as electric motors. This should help them contain costs, by avoiding duplication, but involves compromises over battery size and layout. Sacrificing range and interior space in this way may dent brands built on luxury and technological prowess, says Patrick Hummel of UBS, a bank.

Many mass-market firms are likewise proceeding cautiously. Their thinner margins leave less room to absorb the cost of batteries. Renault of France and South Korea's Hyundai are nevertheless toying with the idea of a dedicated electric-only platform. PSA Group has said it plans to electrify more Peugeots, Citroëns and Opels. Fiat Chrysler has made similar noises, though the Tesla tie-up suggests its near-term plans are less ambitious. Toyota's early bet on hydrogen fuel cells, which lag behind batteries on the road to widespread adoption, had long been a distraction. The Japanese giant has now acknowledged that buyers want battery power. It is planning ten models by the early 2020s.

The most daring by a long way is VW. The German group's heft—it produces 10m cars a year—affords it economies of scale only Toyota could hope to match. The €30bn VW plans to spend on developing EVs over the next five years, plus €50bn to fit them with batteries, leaves all other carmakers in the dust. In March Herbert Diess, its chief executive, promised 70 new electric models by 2028, rather than 50 as previously pledged, and 22m EVs delivered over the next ten years. The company is contemplating a huge investment in a “gigafactory” to supply its own batteries rather than depending on outside suppliers.

VW is already developing a dedicated platform and converting entire factories to EV production. The first, at Zwickau in Germany, will eventually turn out 330,000 cars a year for the VW brand as well as Audi and SEAT. Its medium-sized ID hatchback, to be shipped next year, will cost around €30,000, similar to an equivalent diesel-powered Golf, and travel 400-600km (250-370 miles) on a single charge. On April 14th in Shanghai Mr Diess unveiled a sport-utility vehicle to compete with Tesla's snazzy Model X in China from 2021. Once the range of EVs reaches full production in 2022, VW believes, such models will start breaking even. By 2025, when it hopes one-quarter of its output will be electric, they should be as profitable as petrol cars.

As Mike Manley, boss of Fiat Chrysler, observes, it is no longer a question of whether carmakers can supply a fleet of EVs but whether people will pay for them. If governments withdraw generous subsidies which EV-owners have enjoyed, charging infrastructure fails to materialise or electric cars' pitiful resale value does not increase, motorists may be reluctant to switch to battery power. Poor sales, combined with the large upfront investments, would hit carmakers' margins, which for mass-market brands are already about as exciting as a Soviet-era Trabant in mud brown. The financial consequences could be "ugly", warns Bernstein, an equity-research firm.

At the same time, the big carmakers can expect more competition from rivals unburdened by complex ICE supply chains and large workforces. VW has 40,000 suppliers worldwide and directly employs 660,000 people. Lower capital intensity, and the relative simplicity of EVs, which use many fewer parts than petrol vehicles and are easier to assemble, is drawing in upstarts. They include Dyson, a British maker of vacuum cleaners, and a series of Chinese Tesla-wannabes, such as NIO and Byton. Bigger Chinese carmakers, such as Geely and JAC, have also developed expertise in EVs. With domestic sales stalling, they are beginning to eye export markets.

Other technological bumps are meanwhile starting to test the industry's chassis. Self-driving cars and ride-sharing are forcing companies to rethink their established business model. Investing in EVs now leaves them with less to spend on adapting to everything else. They may be hoping that the electric race will serve as a practice lap for wider oncoming disruption. ■



汽车的未来

充好电，向前冲

大型汽车制造商对电动汽车押下重注

一九〇〇年，美国道路上行驶的汽车中有三分之一用电驱动。后来德克萨斯州开采出了大量石油。汽油比电池便宜，加油也比充电方便，这推动了汽车的大规模生产。自那以后，成本高加之对有限续航里程的顾虑，使得电动汽车一直都只是个利基市场。过去十年，特斯拉令电动车再度风靡，但它去年的产量仅为25万辆，只是大众或丰田年产量的一个零头。2018年，全球纯电动车和插电式混合动力车（既使用电池也使用内燃机）的销量约为200万辆，而汽油和柴油车的销量是它们的50倍。

然而，电动车销售的增速就像电动机加速那般迅猛。行业观察人士认为，到2025年，电动车将占全球汽车总销量的近15%。据咨询公司彭博新能源财经（Bloomberg New Energy Finance）称，届时中国五分之一的新车都将是电动车。这种乐观预测已不再显得荒谬，主要是因为汽车巨头也加入了这场电动车的竞赛。路透社1月的调查显示，未来五到十年，全球汽车行业在电动车方面（包括电池）的计划投入约为3000亿美元。通用汽车、吉利、梅赛德斯、日产等大型汽车制造商都希望能量产出数百万辆电动车，并从中盈利。它们的策略不尽相同，有的小心谨慎，有的大胆激进。

事实证明，通过量产电动车盈利是件难事。电池动力总成的价格可能高达内燃机的三倍。但是，通过提升技术和加大生产规模相结合，电动车可能很快就能在价格上与燃油车一较高下，而且还能长距离行驶而不必担心没电。

汽车制造商希望情况最好是这样。出于对气候变化和空气污染的担忧，世界各地的政府都在考虑未来十年逐步停止生产新的汽油和柴油汽车。在美国，总统特朗普对全球气候变化持怀疑态度而使得联邦监管欠缺，但一些进步的城市和州正在收紧地方法规。菲亚特-克莱斯勒（其集团董事长约

翰·埃尔坎[John Elkann]是《经济学人》母公司的董事)刚与特斯拉达成协议，将支付数亿欧元把这一加州电动车品牌的产量计入本集团，避免自己因排放超标而招致高额罚款——针对汽车制造商的欧盟排放新标准将于明年生效。在中国(占全球电动汽车销量的一半)，政府把交通电气化作为对抗城市雾霾的手段之一，同时也希望借此在技术上赶超西方。

西方高端汽车品牌似乎最有条件在电动车上先人一步。虽然目前电池仍旧昂贵，但高档品牌可凭借自家汽车的较高售价抵消这一成本。捷豹和奥迪已经打破了特斯拉在利润丰厚的高端市场上的垄断地位。梅赛德斯的母公司戴姆勒已投入100亿欧元(113亿美元)打造EQ系列车型，并希望到2025年自己生产的汽车中有20%是全电动车。

戴姆勒以及因i3电动掀背车销量惨淡而受挫的宝马目前都在开发能兼容汽油、柴油发动机和电动机的平台(即汽车的基本架构)来对冲押注电动车的风险。这应该能通过避免重复投入来帮助控制成本，但要在电池尺寸和布局上妥协。瑞银的帕特里克·胡梅尔(Patrick Hummel)表示，像这样牺牲续航里程和车厢内部空间可能会影响基于豪华体验和技术实力的品牌形象。

许多面对大众市场的汽车制造商也在谨慎摸索。这些公司的利润较薄，承担电池成本的空间也更小。尽管如此，法国雷诺和韩国现代正考虑开发纯电动车专用平台。标致雪铁龙集团表示旗下品牌标致、雪铁龙和欧宝计划推出更多电动车型。菲亚特-克莱斯勒也有类似表态，但这次与特斯拉的合作显示短期内其野心不大。丰田早前押注氢燃料电池，无暇顾及常规电池，然而氢燃料电池不如常规电池受欢迎，未得到广泛应用。这家日本汽车巨头已接受现实，承认买家要的是常规电池车型。它计划在2020年之后的几年内推出十款电动车型。

最大胆出击、远远冲在前头的是大众。这家德国汽车集团实力强大，年产1000万辆汽车，其规模经济只有丰田有望匹敌。大众计划在未来五年投资300亿欧元开发电动车，此外还要投入500亿欧元给这些汽车配备电池，令其他汽车制造商望尘莫及。今年3月，其首席执行官赫伯特·迪斯

(Herbert Diess) 承诺在2028年之前推出70款新电动车型，而非之前说的50款，并承诺在未来十年内交付2200万辆电动车。大众正考虑投入巨资建一家“超级工厂”，直接为自家汽车供应电池，而无须依靠外部供应商。

大众汽车已经在开发专用平台，并将多座工厂改为专门生产电动车。首个这样的工厂位于德国的茨维考 (Zwickau)，这里最终将年产33万辆大众、奥迪和西亚特品牌的汽车。大众ID系列中型掀背车将于明年发售，售价约为三万欧元，与同等级柴油车型高尔夫售价相仿，一次充电可行驶400到600公里。4月14日，迪斯在上海车展上介绍了一款SUV，将于2021年在中国推出，对撼特斯拉的新潮车型Model X。大众认为，只要电动系列车型在2022年实现满负荷生产，这类车型就能开始实现盈亏平衡。大众希望到2025年电动车能占其总产量的四分之一，届时电动车应该能像汽油车那样盈利。

菲亚特-克莱斯勒的老板迈克·曼利 (Mike Manley) 指出，现在问题不在于汽车制造商能否推出电动车型，而在于人们是否愿意为之掏腰包。如果政府取消对电动车车主的高额补贴，充电基础设施又无法落实，或电动车低得可怜的二手售价不见起色，那车主们可能就不会愿意改用电动车。销售低迷加上前期投资巨大，都会影响汽车制造商的利润，而对于大众市场品牌来说，利润本来就已经像苏联时代那款泥褐色的“卫星” (Trabant) 轿车那样让人意兴阑珊了。资产研究公司盛博警告称，如此导致的财务后果可能会相当“难看”。

与此同时，大型汽车制造商可能面临更大的竞争——来自那些没有复杂的内燃机供应链和大批员工牵累的对手。大众在全球拥有四万家供应商，直接雇用66万名员工。电动车的资本密集度较低，构造相对简单，部件比燃油车少很多，更容易组装，吸引了一些新贵企业加入市场。其中就有英国真空吸尘器制造商戴森和一群中国的特斯拉效仿者，如蔚来和拜腾。吉利和江淮汽车等大型中国汽车制造商也发展了电动车方面的专业能力。鉴于国内销售停滞不前，它们开始关注出口市场。

其他技术障碍也开始考验该行业的“底盘”。无人驾驶汽车和网约车正迫使

车厂反思原有的商业模式。投资于电动车后，它们就没有太多资金可用于应对其他方面的变化了。也许，它们希望这场电动车竞赛可作为一圈赛道练习，为未来更广泛的变革热身。 ■



Imports and exports

Everything to gain by their chains

Is the world economy still slowbalising?

PROTONS POP up in every atom. Proton cars are not quite so ubiquitous. Founded in 1983 by Malaysia's government, the Proton company strove to build a truly "national car", but its parent lost over 1bn ringgit (\$280m) in the two financial years before it sold a stake to Geely, a Chinese carmaker, in 2017. Neighbouring Thailand, in contrast, lacks a national car, but boasts a thriving car industry. Carmaking took off in the late 1980s after Japanese multinationals flocked to the country, importing whatever they could not make or buy within its borders. Foreign parts still account for 56% of the value of Thailand's car exports, according to the most recent data from the World Trade Organisation (WTO). But the remaining home-grown value exceeds the total worth of Malaysia's car exports several times over.

Thailand's cosmopolitan car industry illustrates the potential of "global value chains", which link several countries in the production of a good or service. Unfortunately, these chains declined relative to world GDP between 2011 and 2016, contributing to what has been dubbed "slowbalisation". But a new report by the WTO (and a long chain of partners, including the University of International Business and Economics in Beijing and the China Development Research Foundation, a Chinese government think-tank) finds that value chains recovered a little in 2017.

Meanwhile, the political salience of value chains has shot up, thanks to tax battles and trade wars. In tax debates, trade along chains is often conflated with a narrower phenomenon: trade within multinationals (ie, when one of a firm's outposts buys something from another in a different country). As a result, many commentators (including this newspaper on occasion) have

claimed that 60% of world trade takes place within multinational firms.

That figure would alarm tax authorities, because multinationals sometimes charge themselves contrived prices to shift profits out of high-tax jurisdictions. But the true percentage is about half that, as Maya Forstater, an independent researcher, and, more recently, Nick Shaxson of the Tax Justice Network, have pointed out. The rest is trade in which a multinational stands at one end of the transaction but not both.

China's position near the end of many chains has also inflamed the trade war. America's prodigious imports from China contain many parts created elsewhere, including in America itself. This mongrel merchandise quickly penetrated America's markets after China joined the WTO in 2001, inflicting what some scholars call a "China shock" on blue-collar workers. But the new report argues, in effect, that a \$100 manufactured import from China does not represent \$100-worth of Chinese manufacturing competition. Some of that value will have been counted already (if, for example, a phone casing had been imported to America, stuffed with components and returned to China for final assembly). Some represents the non-manufacturing inputs (including services and metals) required to make the product. And some of that \$100 will have been created outside China by its foreign suppliers, including American firms. Properly measured, the report argues, the "China shock" looks less bad, hitting a third fewer jobs and ending in 2008 rather than persisting indefinitely.

China may have had a bigger impact on Mexico. Back in 2000, the lucrative bits of its information and communication technologies industry were clustered close to either end of the value chain: upstream, in components and chemicals, or downstream, close to the customer in retail. The pattern thus resembled the "smile curve" invented by Stan Shih, a Taiwanese electronics magnate: value-added turns up at each corner (see chart). But

China's entry into the industry has transformed that expression. Ferocious competition in some of the upstream links of the chain has turned the smile curve into something considerably less cheerful. ■



进出口

有价值链，有一切

世界经济还在“慢球化”吗？

每一个原子里都有质子（proton）。但宝腾（Proton）汽车可远没这么普及。宝腾于1983年由马来西亚政府创立，一直在为打造真正的“国民汽车”而努力。但其母公司在连续两个财年亏损了10亿林吉特（2.8亿美元）后，于2017年将一部分股权卖给了中国汽车制造商吉利。相比之下，邻国泰国并没有自己的国民车，却拥有欣欣向荣的汽车产业。日本跨国公司涌入泰国后，它们进口任何不能在泰国国内生产或买到的东西，促成了泰国汽车制造业自上世纪80年代后期起腾飞。根据世贸组织的最新数据，外国部件仍占到泰国出口汽车价值的56%，但其余国产部件的价值比马来西亚的汽车出口总值高出几倍。

泰国世界性的汽车工业显示了“全球价值链”的潜力。这种链条把多个国家串联在一起共同生产一种商品或服务。遗憾的是，从2011到2016年，这些价值链相比全球GDP出现下滑，这是造成所谓的“慢球化”（slowbalisation）的原因之一。但世贸组织的一份新报告（该研究的一长串合作方包括北京的对外经贸大学和中国官方智库中国发展研究基金会）发现，这些价值链在2017年略有复苏。

与此同时，由于税收战和贸易战，价值链的政治意义大大增强。在有关税收的争论中，价值链上的贸易往往和一个更小范围的现象混合在一起：跨国公司内部的贸易，即一家公司设在某个国家的分支从它位于另一个国家的分支采购。因此，很多评论人士（本刊有时也在内）宣称全球贸易有60%发生在跨国公司内部。

这一数字可能让税务机构警觉，因为跨国公司有时会在内部以不正常的价格交易，从而将利润转出高税率的司法辖区。但独立研究者玛雅·福斯塔特（Maya Forstater）以及税收正义网络（Tax Justice Network）的尼克·萨

克斯森（Nick Shaxson）先后指出，实际比例大概只有这个数字的一半。在其余的交易中，跨国公司只是交易中的一方，而非把持两方。

中国在很多价值链中的位置都接近末端，这也激发了贸易战。美国从中国进口大量商品，其中包含很多在其他地方生产的部件，包括美国自己。2001年中国加入世贸后，这种“混血”商品快速占领了美国市场，对蓝领工人造成了一些学者所说的“中国冲击”。但世贸组织的新报告认为，从中国进口100美元的制成品并不代表带来了100美元中国制造的竞争。其中一些价值已经被计算过了（例如，一个手机壳由美国进口，装上部件后再运回中国做最后的组装）。还有一些则是制造产品所需的非制造业投入（包括服务和金属）。而且这100美元中有一部分是中国的外国供应商在中国之外的地方生产的，其中包括美国公司。报告认为，合理计算的话，“中国冲击”应该没那么严重，冲击的岗位数量要比原先认为的少三分之一，并且在2008年结束，并没有无限延续。

中国对墨西哥产生的影响可能要更大。在2000年，墨西哥信息和通信技术产业中能赚钱的那些部分聚集在价值链的两端：生产零部件和化学品的上游，或者是贴近客户的零售下游。这种模式就好像台湾电子大亨施振荣提出的“微笑曲线”：增值主要集中在价值链的两端（见图表）。但中国进入这个行业后改变了这种情况。一些上游环节的激烈竞争已经让微笑曲线变形，远没有从前那么笑意盈盈了。 ■



Costs and benefits

Howdy, partner

Private education can complement the public sort

“WE WANTED TO pop champagne when they said they were opening Spark Soweto,” said Ntebogeleng Malevu. Before the new branch of a fast-growing chain of low-cost South African schools opened in the township on the outskirts of Johannesburg in January, Ms Malevu, a nurse, would wake her six-year-old daughter Qhawe at 4am to travel to another Spark school in the city’s northern suburbs. The transport cost nearly as much as the tuition (2,310 rand, or \$158, a month for primary-school pupils).

Parents prefer private schools. A global survey in 2017 found that they were a lot more likely to give the teaching at their children’s school a positive rating if it was private than if it was public; parents in Chile have voted with their children’s feet in favour of the private sector.

Governments are often less keen on private education. Some of the reasons for their hostility are bad ones: a reluctance to cede power, the opportunity for patronage, the influence of teachers’ unions. But some are entirely in order: governments need to promote quality, access to schooling and equity. The private sector is good at some, but not all, of those.

The evidence on quality is ambiguous. Private institutions dominate the upper ranks of the global higher-education leagues. Seven of the top ten places in the *Times Higher Education* ranking are taken by American private non-profit universities and three by British institutions, which although regarded as public in Britain, are privately run and funded largely by user fees. The most highly rated clearly public institution, ETH Zurich, which is, ultimately, run by the state, is in 11th place.

But these rankings depend almost entirely on the universities' research performance. The standard of education they deliver is hard to measure. The only useful proxy is earnings, but a study of alumni of America's most selective colleges by Stacy Dale and Alan Krueger found that their higher earnings were explained by background and intellect. Top universities provided a boost only to blacks and Hispanics—presumably because they gained a useful network to which many white students already had access.

At the bottom of the market, America's for-profit colleges—largely vocational outfits that take students who cannot get into the state system—do poorly. A study of their alumni's employment history showed not just that they performed worse in the labour market than similar people who went to (much cheaper) public colleges, but also that they barely earned more than those who did not go to college at all. On average, in other words, the time and money that they spent on their education had been largely wasted.

In some countries private schools do exceptionally well. According to *Varsity*, Cambridge University's student newspaper, Westminster got an average of 79 pupils a year into Oxford and Cambridge in 2006-16, more than any other school in the world. But Westminster is one of Britain's most selective schools, attracts bright pupils from all over the world and spends four and a half times as much per child as the public sector does. Educating the world's cleverest children with vast resources is not the biggest challenge in teaching.

A better test of schools is whether they add value—in other words, produce outcomes better than would be expected given where children started. In the OECD's latest PISA test private-school pupils did a lot better than public-school ones in reading and science, but after controlling for economic background they did little better in reading and worse in science. An American study concluded that private schools added no value, a British one

the opposite: the university and labour-market outcomes of two cohorts of people, born in 1958 and 1970, who attended private schools were considerably better than those of government-school alumni, even when ability and background were taken into account. The gap was bigger in the younger cohort, presumably because private schools have come to focus more on academic achievement.

In poor countries, the evidence tends to favour the private sector. Out of 21 studies in Africa and South Asia surveyed for Britain's Department for International Development (DFID), 14 found that children learned more at private schools and seven found no difference. In none of the studies did government schools come out on top, but the private-schools' margin was not overwhelming. In the most rigorous study, carried out in the Indian state of Andhra Pradesh, pupils' scores in most subjects were the same in both types of schools, though they did better in Hindi at private schools. The maths scores of the private schools that taught in the local language, Telugu, were higher than those taught in English, suggesting that while private schools confer an advantage, being taught in English is a disadvantage.

Opponents of private schools often argue that they undermine public schools, but the evidence does not support that claim. A review of studies from America, Canada and Sweden concludes that virtually all of them showed that public schools do better when they are up against voucher schools; the few studies of the issue in the DFID review, from India, Pakistan and Kenya, found the same.

The qualitative differences between private and public schools are marginal, though. More strikingly, private schools cost less. Of seven studies in the DFID review, none found government schools to be cheaper. A study comparing the cost-effectiveness of public and private schools in eight Indian states found that the private sector did better in all of them; the differential ranged from 1.5 times in Bihar to 29 times in Uttar Pradesh.

The private sector's efficiency is one reason why it does well at providing access to education. Another is its speed: in fast-growing cities, governments struggle to provide schools, but wherever there are people, schools spring up. A worldwide review of voucher schemes has shown that governments that cannot provide enough capacity can increase access by enabling children to attend private schools. "Kids are being born every day," says Murad Raas, education minister in Pakistan's Punjab province, where 2.6m children are in private schools on voucher schemes and 11m in government schools. "We don't have the funds to accommodate them all. I'm very open to anything that can benefit them."

The main reason for the private sector's superior efficiency seems to be teachers, who are paid less and are more likely to turn up for work than at government schools. Politics has a lot to do with that. Teachers' unions have huge bargaining power—in India, for instance, they man polling stations and have reserved seats in state assemblies—and can therefore protect their members from being held to account for poor performance. An Indian study found that in 3,000 government schools, only one principal had ever dismissed a teacher; among 600 private schools, 35 had.

The other explanation for better performance in the private sector could be competition, but it does not seem to be working all that well. One problem with the market is that parents often lack information. Researchers in Pakistan tried providing parents with cards showing their child's test scores and the average scores of the schools in the village. Where this was done, children learned substantially more, fees were lower, enrolment went up and bad private schools were more likely to close down.

A second problem is parental priorities. Parents want their children to go to schools with the best outcomes, but those establishments may achieve good results not because they add more value but because their intake is richer and cleverer. A Chilean study showed that parents presented with data on

both outcomes and value added were interested in the former, not the latter.

They are being perfectly rational. Parents want to ensure not just that their children get a good education, but also that their classmates come from “good” families, because the company they keep will shape their behaviour and provide their network. Employers, too, are likely to favour the products of schools with good exam results. But the incentive for parents to choose outcomes over value added limits the efficacy of parental choice as a mechanism for improving schools.

It also helps explain why the market tends to increase inequality. Whereas governments promote social integration, parents actively seek stratification. Furong Ren, a parent at Dehong, Dulwich College International’s bilingual sister school in Shanghai, explains that “when parents get together, all they talk about is how China is developing a class system, and they want their children to be on top.” Fees and selective admissions, which favour rich kids, encourage schools and families to sort themselves by income. For governments concerned about social mobility, that is a problem.

As private education grows, its strengths and weaknesses are becoming increasingly apparent. It is good at providing access where the state does not have capacity; in poor countries, the education it offers is slightly better than the government variety. But it also encourages inequality and discourages social mobility.

Many teachers’ unions and left-wing politicians favour getting rid of private schools. That would solve the equity problem, but there would be a cost in terms of both access and quality. Without the private sector, many children in fast-growing cities in the developing world would be in worse schools or on the streets.

Another approach is to regulate private education, by, for instance, setting stringent standards for facilities and teaching. That is a reasonable thing to do in countries where the state works well, but a state that cannot provide decent education is unlikely to be a good regulator. DFID looked at 19 studies to see whether developing-country governments were any good at regulating schools; 14 concluded that they were not, three that they were, and two were not sure. Bribery is a common problem.

A third approach is for governments to partner with the private sector, through vouchers or subsidies. The idea is to allow society to benefit from the private sector's virtues while mitigating the inequality it fosters.

Such partnerships are spreading, but their performance so far has been mixed. They suffer from the same problem as regulation does: governments that cannot provide education are unlikely to be good at commissioning it. India's reservation of 25% of private-school places for poorer children has not been a great success. The government has been slow to pay its bills, the initiative has got bogged down in legal action, ten years after launch only 16% of private schools are taking part, and a study in Karnataka found that most of the families taking up the vouchers had been sending their children to private school anyway. And where schools charge fees or set admissions tests, such partnerships can become vehicles for subsidies to the better-off and encourage stratification, as Chile's original voucher system did.

Yet well-designed public-private partnerships can work. Two of the world's best education systems—those of the Netherlands and Hong Kong—are based on them. In both places, schools get public funding, a lot of autonomy and hefty state regulation to raise standards and limit inequity. Chile's voucher-based education system, despite its flaws, outperforms those of its neighbours. They are especially good for countries whose governments struggle to provide access to education: in Pakistan's Punjab province 2.6m children go to school thanks to vouchers; a PPP in Uganda enrolled 400,000.

Design and monitoring are crucial, says Harry Patrinos of the World Bank: “performance has to be measured, rigorously and often, and schemes adjusted accordingly.”

Above all, governments should stop regarding private education as an enemy. Its growth is the result of people’s deepest urge—to look after their children. Whether through buying expensive houses near the best government schools or by forking out for private-school fees, they will find a way to do that. The private-education boom may be fostering inequality but it is also causing unprecedented amounts of money and energy to be spent on improving humanity’s brains. Governments should encourage that—but spread the benefits as widely as possible. ■



成本和收益

搭档你好

私立教育可以成为公立教育的补充【专题报道《私立教育》系列之四】

“当他们说要设立星火（Spark）索维托校区时，我们简直想要开香槟了。”内特波格朗·马列夫（Ntebogeleng Malevu）说。这个快速扩张的低成本南非连锁学校1月在约翰内斯堡郊区开张了新分校。在这之前，当护士的马列夫得在凌晨4点把她六岁的女儿卡维叫醒，赶往市北郊区的另一所星火学校。交通费都快抵得上学费了（小学生每月2310兰特，相当于158美元）。

父母们更喜欢私立学校。2017年的一项全球调查发现，如果孩子就读于私立而非公立学校，家长对学校教学做出正面评价的可能性要高得多。智利的父母用他们孩子的脚投票支持私立学校。

政府往往不那么热衷于私立教育。它们的敌意有一部分是出于不良动机：不愿放弃权力、利益交换的机会、教师工会的影响力。但另一些完全有其道理：政府需要提升教学质量、增加入学机会和促进公平。私营部门擅长这其中的某些方面，但不是全部。

关于质量的证据并不明确。私立机构在全球高等教育联盟的顶端部分占据主导地位。《泰晤士高等教育》大学排名的前十位中有七席是美国私立非营利性大学，三所是英国院校——虽然这些学校在英国被视为公共机构，但它们由私人经营，并主要依靠向使用者收费。明确是公立身份的院校中排名最高的是苏黎世联邦理工学院，它归根结底是由国家管理的，排在第11位。

但这些排名几乎完全取决于大学在学术研究上的表现。它们提供的教育水平很难衡量。唯一有用的替代指标是毕业生收入。但斯黛茜·戴尔（Stacy Dale）和艾伦·克鲁格（Alan Krueger）调研了美国选拔最严格的大学的校友，发现他们的高收入可由家庭背景和智力来解释。顶尖大学只给黑人和

西班牙裔帮了忙——大概是因为他们接触到了许多白人学生本已拥有的有用的人际关系网络。

在这个市场的最底层，美国的营利性大学表现很差。它们主要是职业性院校，吸收那些无法进入州立系统的学生。对它们的校友就业历史的调查表明，他们在劳动力市场上的表现要比去（便宜得多的）公立大学的类似学生差得多，而且他们的收入几乎和那些根本没上过大学的人一样。换句话说，平均而言，他们在教育上花费的时间和金钱在很大程度上被浪费掉了。

在一些国家，私立学校的表现非常杰出。根据剑桥大学的学生报《Varsity》的报道，2006年至2016年，西敏公学平均每年有79名学生升入牛津大学和剑桥大学，比世界上任何其他学校都要多。但西敏公学是英国选拔最严格的学校之一，吸引了来自世界各地的聪明学生，在每个孩子身上的花费是公立学校的四倍半。用大量资源教育世界上最聪明的孩子算不上是最重大的教学挑战。

评估学校的更好标准是它们是否增加了价值，也就是说，最后的结果应好于儿童入学时的预期。在经合组织最新的PISA测试中，私立学校的学生在阅读和科学科目上比公立学校的学生表现好得多，但在控制了经济背景后，他们在阅读方面做得并没有好多少，在科学科目上表现还更差。美国的一项研究得出的结论是私立学校没有增加价值，而英国的研究结论相反：对于1958年和1970年出生的两批人，入读私立学校者进入大学和劳动力市场的结果都远远优于公立学校校友，哪怕把自身能力和背景因素考虑在内也是如此。在较年轻的那批人中差距要更大，这可能是因为私立学校变得更关注学业成就了。

在贫穷国家，证据往往有利于私营部门。在为英国国际发展部（以下简称DFID）针对非洲和南亚进行的21项研究中，有14项发现儿童在私立学校学到更多，其余7项没有发现差异。公立学校在任何一项研究中的表现都未能占优，但私立学校的优势也不是很大。最严格的一项研究是在印度的安得拉邦进行的，两种类型学校的学生在大多数科目上的成绩都相同，但私

立学校的学生印地语的成绩更好些。以当地语言泰卢固语授课的私立学校的数学分数高于用英语授课的学校，这表明私立学校虽然有优势，但用英语授课是不利的。

私立学校的反对者经常指控私校挖了公校的墙角，但证据并不支持这种说法。对美国、加拿大和瑞典的研究的综述得出结论，几乎所有这些研究都表明公立学校对比“学券制学校”时表现更好；DFID综述的来自印度、巴基斯坦和肯尼亚的研究也有同样的发现。

不过，私立学校和公立学校之间的质量差异微不足道。更为突出的差异是私立学校的成本更低。在DFID综述的七项研究中，没有一项研究发现公立学校更便宜。一项比较印度八个邦公立和私立学校成本效益的研究发现，私营机构在所有这些邦中都表现更好；差异范围从比哈尔邦的1.5倍到北方邦的29倍。

私营部门的效率是它在提供教育机会方面占优的一个原因。另一个优势是它的速度：政府要在发展迅速的城市设立学校往往力不从心，但不管哪里，只要有人就会有学校。对全球学券制度的回顾表明，政府若无法提供足够多的学校容量，可通过资助儿童上私立学校来增加入学机会。“每天都有孩子出生。”巴基斯坦旁遮普省的教育部长穆拉德·拉斯（Murad Raas）说。这个省有260万儿童利用学券计划入读私立学校，1100万人在公立学校就读。“我们没有资金来容纳所有人。我对任何可以使他们受益的事情都持开放态度。”

私营部门效率出色的主要原因似乎是教师，他们拿到的报酬低于公立学校，而且出勤率还更高。政治对此有很大影响。教师工会拥有巨大的议价能力——比如在印度，他们派人管理投票站，还在州议会中有保留席位——因此可以保护其成员不为业绩不佳负责。印度的一项研究发现，在3000所公立学校中，只有一名校长曾解雇过教师；而在600所私立学校中，这样做过的有35所。

私营部门表现更好的另一个解释也许是竞争，但效果似乎也并不总是很

好。教育市场上的一个问题就是父母经常缺乏信息。巴基斯坦的研究人员尝试向父母提供卡片，显示他们孩子的考试成绩和村里学校的平均分数。在这样做的地方，儿童学到的东西要多得多，费用更低，入学人数增加，差劲的私立学校也更容易倒闭。

第二个问题是父母优先考虑什么。父母希望他们的孩子去成绩最好的学校，但这些机构取得好成绩可能不是因为它们增加了更多的价值，而是因为入学的学生更富有、更聪明。智利的一项研究表明，向父母同时展示结果和增值数据时，他们都对前者感兴趣，而不是后者。

他们的做法完全合理。父母们不仅要确保孩子接受良好的教育，还要确保他们的同学来自“好”家庭，因为孩子的同伴将塑造他们的行为，并为他们提供人际网络。雇主也可能偏爱来自考试成绩优异的学校的毕业生。但这些鼓励父母看重结果而非增值的因素限制了利用父母的选择来促进学校改进的效力。

它也有助于解释为何教育市场会加剧不平等。政府促进社会融合，而父母则积极寻求分层。上海德闳学校是德威国际学校在上海的双语姊妹学校，家长任芙蓉（音译）解释说，“当父母们聚在一起时，他们谈论的就是中国正在如何形成阶级体系，他们希望自己的孩子能够站在最顶层。”学费和选拔都有利于富家子弟，这让学校和家庭按收入分出了级别。这对于关注社会流动性的政府来说是个问题。

随着私立教育的发展，其优势和劣势日益明显。它擅长在国家没有能力的地方提供入学机会；在贫穷国家，它提供的教育往往略好于政府提供的教育。但它也助长了不平等，阻碍了社会流动性。

许多教师工会和左翼政客都倾向于废除私立学校。这将解决公平性问题，但在入学机会和质量方面都要付出代价。没有私营部门，发展中国家快速发展的城市中有众多儿童将身处更糟糕的学校，或干脆混迹于街头。

另一种方法是规范私立教育，比如设立严格的设施和教学标准。在政府运作良好的国家这很合理，但一个无法提供像样教育的国家不太可能成为好

的监管者。为了解发展中国家政府是否善于管理学校，DFID查阅了19项研究，其中14项研究的结论是否定的，3项是肯定的，2项不确定。贿赂是个常见问题。

第三种方法是政府通过学券或补贴与私营部门合作。其思路是让社会从私营部门的优点中受益，同时减轻其助长的不平等。

这种合作关系正变得越来越广泛，但迄今为止表现参差不齐。它们遇到了与监管相同的问题：不能提供教育的政府不太可能擅长委托。印度为贫困儿童保留25%私校名额的做法并不怎么成功。政府支付账单的速度很慢；该项目陷入了法律诉讼的泥潭；在启动十年后只有16%的私立学校参与。而在卡纳塔克邦的一项研究发现，大部分拿学券的家庭本来也会把孩子送进私立学校。而在学校收取费用或设置入学考试的地方，这种合作关系可能会成为向富人提供补贴的工具，并让阶级分层愈演愈烈，就像智利最初的学券制度所做的那样。

然而，精心设计的公私合作可以奏效。世界上最好的两个教育体系——荷兰和香港的——就都是基于这样的合作。在这两个地方，学校都得到了公共资金、大量自治权和严格的政府监管，以提高标准并限制不公平。尽管存在缺陷，智利基于学券的教育体系表现优于邻国。这类系统特别适合政府在提供教育机会上有困难的国家：在巴基斯坦的旁遮普省，260万儿童因有了学券才得以上学；乌干达的一个公私合作系统有40万人入学。世界银行的哈里·帕特里诺斯（Harry Patrinos）说，设计和监控至关重要：“必须严格、经常性地衡量绩效，并对计划做相应调整。”

最重要的是，政府不该再视私立教育为敌。它的扩张源于人们最深切的愿望——照顾子女。无论是购买最好的公立学校附近的昂贵房屋，还是为私立学校的高昂学费大把掏钱，他们都会找到办法来做这件事。私立教育的繁荣可能在助长不平等，但也让前所未有的金钱和精力被用于提升人类的头脑。政府应该鼓励这样做——但要让尽可能多的人享受到它的好处。■



Synthetic biology

Redesigning life

The promise and perils of synthetic biology

FOR THE past four billion years or so the only way for life on Earth to produce a sequence of DNA—a gene—was by copying a sequence it already had to hand. Sometimes the gene would be damaged or scrambled, the copying imperfect or undertaken repeatedly. From that raw material arose the glories of natural selection. But beneath it all, gene begat gene.

That is no longer true. Now genes can be written from scratch and edited repeatedly, like text in a word processor. The ability to engineer living things which this provides represents a fundamental change in the way humans interact with the planet's life. It permits the manufacture of all manner of things which used to be hard, even impossible, to make: pharmaceuticals, fuels, fabrics, foods and fragrances can all be built molecule by molecule. What cells do and what they can become is engineerable, too. Immune cells can be told to follow doctors' orders; stem cells better coaxed to turn into new tissues; fertilised eggs programmed to grow into creatures quite unlike their parents.

The earliest stages of such “synthetic biology” are already changing many industrial processes, transforming medicine and beginning to reach into the consumer world. Progress may be slow, but with the help of new tools and a big dollop of machine learning, biological manufacturing could eventually yield truly cornucopian technologies. Buildings may be grown from synthetic wood or coral. Mammoths produced from engineered elephant cells may yet stride across Siberia.

The scale of the potential changes seems hard to imagine. But look back

through history, and humanity's relations with the living world have seen three great transformations: the exploitation of fossil fuels, the globalisation of the world's ecosystems after the European conquest of the Americas, and the domestication of crops and animals at the dawn of agriculture. All brought prosperity and progress, but with damaging side-effects. Synthetic biology promises similar transformation. To harness the promise and minimise the peril, it pays to learn the lessons of the past.

Start with the most recent of these previous shifts. Fossil fuels have enabled humans to drive remarkable economic expansion in the present using biological productivity from ages past, stored away in coal and oil. But much wilderness has been lost, and carbon atoms which last saw the atmosphere hundreds of millions of years ago have strengthened the planet's greenhouse effect to a degree that may prove catastrophic. Here, synthetic biology can do good. It is already being used to replace some products made from petrochemicals; in time it could replace some fuels, too. Burger King recently introduced into some of its restaurants a beefless Whopper that gets its meatiness from an engineered plant protein; such innovations could greatly ease a shift to less environmentally taxing diets. They could also be used to do more with less. Plants and their soil microbes could produce their own fertilisers and pesticides, ruminants less greenhouse gas—though to ensure that synthetic biology yields such laudable environmental goals will take public policy as well as the cues of the market.

The second example of biological change sweeping the world is the Columbian exchange, in which the 16th century's newly global network of trade shuffled together the creatures of the New World and the Old. Horses, cattle and cotton were introduced to the Americas; maize, potatoes, chilli and tobacco to Europe, Africa and Asia. The ecosystems in which humans live became globalised as never before, providing more productive agriculture all round, richer diets for many. But there were also disastrous consequences. Measles, smallpox and other pathogens ran through the New

World like a forest fire, claiming tens of millions of lives. The Europeans weaponised this catastrophe, conquering lands depleted and disordered by disease.

Synthetic biology could create such weapons by design: pathogens designed to weaken, to incapacitate or to kill, and perhaps also to limit themselves to particular types of target. There is real cause for concern here—but not for immediate alarm. For such weaponisation would, like the rest of cutting-edge synthetic biology, take highly skilled teams with significant resources. And armies already have lots of ways to flatten cities and kill people in large numbers. When it comes to mass destruction, a disease is a poor substitute for a nuke. What's more, today's synthetic-biology community lives up to ideals of openness and public service better than many older fields. Maintained and nurtured, that culture should serve as a powerful immune system against rogue elements.

The earliest biological transformation—domestication—produced what was hitherto the biggest change in how humans lived their lives. Haphazardly, then purposefully, humans bred cereals to be more bountiful, livestock to be more docile, dogs more obedient and cats more companionable (the last a partial success, at best). This allowed new densities of settlement and new forms of social organisation: the market, the city, the state. Humans domesticated themselves as well as their crops and animals, creating space for the drudgery of subsistence agriculture and oppressive political hierarchies.

Synthetic biology will have a similar cascading effect, transforming humans' relationships with each other and, potentially, their own biological nature. The ability to reprogram the embryo is, rightly, the site of most of today's ethical concerns. In future, they may extend further; what should one make of people with the upper-body strength of gorillas, or minds impervious to sorrow? How humans may choose to change themselves

biologically is hard to say; that some choices will be controversial is not.

Which leads to the main way in which this transformation differs from the three that came before. Their significance was discovered only in retrospect. This time, there will be foresight. It will not be perfect: there will certainly be unanticipated effects. But synthetic biology will be driven by the pursuit of goals, both anticipated and desired. It will challenge the human capacity for wisdom and foresight. It might defeat it. But carefully nurtured, it might also help expand it. ■



合成生物学

生命再设计

合成生物学的希望与风险

在过去大约40亿年的时间里，地球生命生成基因这种DNA序列的唯一方法就是复制自身已有的遗传DNA序列。有时基因会被破坏或扰乱，复制也会出现缺陷或重复。正是基因这种原材料成就了物竞天择的伟业。但归根结底，基因源自基因。

而这已发生改变。如今，基因就像文字处理软件中的文本，可以被从无到有地编写出来并反复编辑。这样就能改变生物的基因结构，并从根本上改变人类与地球上其他生命的互动方式。过去各种难以甚至不可能制造出来的东西都能被制造，药品、燃料、织物、食品和香水等现在都可以一个分子一个分子地构造出来。还可以通过改变细胞的基因结构来决定细胞的功能和生长结果。可以让免疫细胞听从医生的指令；可以更好地引导干细胞生成新组织；可以编辑受精卵，使之成长为与亲本大不相同的生物。

这种“合成生物学”的初级阶段已经在改变很多工业生产过程，变革医学，并开始影响消费领域。进步可能缓慢，但在各种新工具和大量机器学习的帮助下，生物制造最终可能会带来变幻无穷的技术。合成木材或珊瑚也许可被用来建造房屋。或许还可通过编辑大象细胞的基因结构让猛犸象“复活”，阔步穿过西伯利亚。

似乎难以想象未来究竟会有怎样翻天覆地的变化。但是回顾历史，人类与生物世界的关系经历了三次重大转变：化石燃料的开采、欧洲人征服美洲后世界生态系统的全球化，以及农业发端时期对农作物和动物的驯化。三次转变都带来了繁荣和进步，同时也带来了破坏性的副作用。合成生物学预期将带来类似的转变。为把握好机遇并将风险降到最低，有必要汲取前车之鉴。

先从三次转变中距今最近的一次说起。化石燃料的使用释放了过去存储在

煤和石油中的生物生产力，大大推动了当令人类经济的发展。但大片荒野不复存在，碳原子上一次充斥于大气是在亿万年前，如今它们的存在大大加重了地球的温室效应，甚至可能导致灾难性后果。在这方面，合成生物学可以有所贡献。它已被用来取代一些石油化工产品，假以时日可能还会取代一些燃料。最近，汉堡王在其部分餐厅推出了一款无牛肉皇堡，其中的肉味来自一种转基因植物蛋白。此类创新可以让人类向更环保饮食方式的转变变得轻松许多。同时，创新还有事半功倍的效果。植物及其土壤微生物可以制造出自身所需的肥料和杀虫剂，反刍动物可以减少排放温室气体。当然，要确保合成生物学达成如此值得称道的环境目标，还需要公共政策以及市场的指引。

生物变化席卷世界的第二个例子是哥伦布大交换——16世纪新生成的全球贸易网络将新旧大陆的生物糅合到了一起。马、牛和棉花被引入美洲；玉米、土豆、辣椒和烟草被引入欧洲、非洲和亚洲。人类赖以生存的生态系统前所未有地实现了全球化，为各地提供了更高产的农业，为许多人提供了更丰富的食物。但它也带来了灾难性的后果。麻疹、天花和其他一些病原体像森林大火一样在新大陆肆虐，夺走了数千万人的生命。欧洲人将这场灾难当作武器，用以征服因疾病而衰乱的土地。

合成生物学可能会被利用来蓄意制造这样的武器：能使人衰弱的、致残或致命的病原体，或许还能被限定于攻击特定目标。这确实值得担忧，但眼下还不必恐慌。因为研制这样的武器就像其他前沿合成生物技术那样，需要高技能团队和大量资源。再者，军队已经有很多方式来夷平城市和实施大规模杀戮。疾病在大规模杀伤方面很难匹敌核武器。更重要的是，相比很多旧领域，如今的合成生物学界更符合开放和公共服务的理想原则。若能加以维系和培育，这种文化应该能成为抵御破坏分子的强大免疫系统。

最早的生物大转变，即驯化，带来了迄今为止人类生活方式的最大变化。从无心到有意，人类将谷物培育得更丰产，让牲畜更温顺，狗更听话，猫更友善（这最后一项充其量只算取得了部分成功）。这促成了更高的聚居密度和新的社会组织形式：市场、城市和国家。人类不仅驯化了农作物和动物，也驯化了自己，让自给型农业的苦役和压迫性的政治等级制度成为

可能。

合成生物学将产生类似的级联效应，改变人类彼此之间的关系，还有可能改变人类自身的生物学特性。对胚胎重新编辑的能力是如今大多数伦理担忧之所在，对此确实也有担忧的理由。未来，这些担忧可能进一步蔓延：我们该如何看待那些拥有像大猩猩般上肢力量的人，或者那些不知悲伤为何物的人？很难说人类会以何种方式改变自身的生物学特性，但毫无疑问有些选择会引发争议。

这就引出了此次转变与上述三次转变的主要不同。前三次转变的意义都只是事后的发现。而这一次，我们可以事先预见。这次转变不会完美无缺——肯定会有出人意料的影响。但对预期和期望目标的追求将驱动合成生物学的发展。合成生物学将挑战人类的智慧和远见。或许它会超出人类的能力。但如果精心发展它，却也可能提升人类的这些能力。 ■



Public administration

Capital flight

Many governments dream of moving civil servants out of the capital. Making a success of it is harder than it looks

IN AN OLD music classroom in the Culture Palace in Tlaxcala, two hours' drive east of Mexico City, sits Alejandra Frausto, Mexico's culture minister. She hopes her new office's bare walls will soon sport a screen for video-conferencing with Mexico City and beyond. Hers is one of the first two ministries to move under a policy of President Andrés Manuel López Obrador, usually known as AMLO, elected last year. Resurrecting an idea first mooted in the 1980s, he wants to move a big central-government body to each of 30 Mexican states. Tlaxcala's state capital has 85,000 people, only eight times more than the culture ministry's staff in Mexico City. Ms Frausto dreams of one day having thousands of workers in the state.

Revolutionary as AMLO's plan sounds, it is part of a global trend. Around the world, capital cities are disgorging bureaucrats.

In the post-colonial fervour of the 20th century, coastal capitals picked by trade-focused empires were spurned for “regionally neutral” new ones, such as Brasilia (Brazil), Islamabad (Pakistan) and Dodoma (Tanzania); more recently, Kazakhstan built Nursultan (née Astana) and Myanmar Naypyidaw. But decamping wholesale is costly and unpopular; governments these days prefer piecemeal dispersal.

Take Norway, which since 2006 has shifted 1,600 civil-service jobs out of Oslo. The competition authority is in Bergen, the second city. The polar institute was packed off to a town not far short of the North Pole. And last year the Norwegian peace corps, Norec, an agency that oversees programmes in 25 poorer countries, moved to Forde, a settlement of 13,000

people nestled between mountains, rivers and fjords.

Mexico and Norway are just two of many. South Korea has moved two-thirds of its government agencies away from Seoul, many of them to the newly built Sejong City. Since 2015 Denmark has moved thousands of government jobs to scores of cities. Malaysia shifted many of its paper-pushers in 1999 from Kuala Lumpur to a new city called Putrajaya. Indonesia is mulling moving its capital from Jakarta.

The trend reflects how the world has changed. In past eras, when information travelled at a snail's pace, civil servants had to cluster together. But now desk-workers can ping emails and video-chat around the world. Travel for face-to-face meetings may be unavoidable, but transport links, too, have improved. Forde, Norec's new base, is 400km from Oslo but offers five hour-long flights to the capital a day.

Proponents of moving civil servants around promise countless benefits. It disperses the risk that a terrorist attack or natural disaster will cripple an entire government. Wonks in the sticks will be inspired by new ideas that walled-off capitals cannot conjure up. Autonomous regulators perform best far from the pressure and lobbying of the big city. Some even hail a cure for ascendant cynicism and populism. The unloved bureaucrats of faraway capitals will become as popular as firefighters once they mix with regular folk.

Beyond these sunny visions, dispersing central-government functions usually has three specific aims: to improve the lives of both civil servants and those living in clogged capitals; to save money; and to redress regional imbalances. The trouble is that these goals are not always realised.

The first aim—improving living conditions—has a long pedigree. After the second world war Britain moved thousands of civil servants to “agreeable

English country towns” as London was rebuilt. But swapping the capital for somewhere smaller is not always agreeable. Attrition rates can exceed 80%. Even the footloose youngsters Norec tends to employ bridled. One, Magnhild Bogseth, recalls: “When I moved to Paraguay or Nicaragua, my friends never asked: ‘Are you sure you want to do this?’ But when I came to Forde, they all said: ‘Will you really be happy there? Your social life will be destroyed!’” Many locals also struggle to adjust. When a Norec worker convinced her Colombian boyfriend to move with her from Oslo, the town newspaper reported his arrival on its front page.

As for those left living in the capital, a review in 1962 in Britain urged further dispersal to improve their “health and welfare”. Similarly, the Netherlands pointed to congestion and a housing shortage when moving government jobs in the late 1960s. Egypt’s generals cite congestion and pollution in Cairo to justify building a new, still unnamed capital in the desert.

The second reason to pack bureaucrats off is to save money. Office space costs far more in capitals. When London’s property market stagnated in the late 1970s the government lost enthusiasm for relocation. Agencies that are moved elsewhere can often recruit better workers on lower salaries than in capitals, where well-paying multinationals mop up talent.

The third reason to shift is to rebalance regional inequality. In Mexico AMLO laments the “tragedy” of those who have to move to big cities to make a living. The day the culture ministry opened in Tlaxcala, 70 locals turned up with their CVs. When Britain moved 20% of London’s civil servants between 2003 and 2010, it often picked areas with high unemployment, such as Newport, a Welsh city hit by industrial decline that now houses the headquarters of the Office for National Statistics (ONS). Norway treats federal jobs as a resource every region deserves to enjoy, like profits from oil.

Where government jobs go, private ones follow. A study of Berlin after Germany's federal workforce was moved from Bonn in 1999 found that the arrival of 100 government jobs in an area helped create 55 private-sector jobs. A review of Britain's relocations in the 2000s found the same ratio. The jobs created tend to be in services, often the law or consultancy.

Sometimes the aim is to fulfil the potential of a country's second-tier cities. Unlike poor, remote places, bigger cities can make the most of relocated government agencies, linking them to local universities and businesses and supplying a better-educated workforce. The decision in 1946 to set up America's Centres for Disease Control in Atlanta rather than Washington, DC, has transformed the city into a hub for health-sector research and business.

The dilemma is obvious. Pick small, poor towns, and areas of high unemployment get new jobs, but it is hard to attract the most qualified workers; opt for larger cities with infrastructure and better-qualified residents, and the country's most deprived areas see little benefit.

Whatever the motives, relocations are difficult. Norec's move to Forde prompted 34 of its 42 staff to resign—and that 20% stayed was, boasts its director, a record high for Norway. When the civil-aviation authority moved to the Arctic Circle, almost all its flight inspectors quit. The loss of expertise took years to replace. Similarly, Denmark's 465-strong environmental protection agency is moving from Copenhagen to Odense, Denmark's third city. Of its 16 toxicologists, 12 intend to resign.

Staff disgruntlement is not the only problem. Places are often chosen for political reasons. Forde scored worst on a three-town shortlist for hosting Norec. A local politician is credited with swaying the final call. In 2016 Australia's then deputy prime minister, Barnaby Joyce, helped move the pesticides and veterinary authority to a town in his own constituency. More

brazen still was Augusto Pinochet's displacement of Chile's congress from Santiago to his hometown of Valparaíso, where it remains.

Others contend that decentralisation begets corruption by making government agencies less accountable. Egypt's new capital will be far from the residents of Cairo, whose protests overthrew a dictator in 2011. A study in America found that state-government corruption is worse when the state capital is isolated—journalists, who tend to live in the bigger cities, become less watchful of those in power.

But resistance can be formidable and relocation plans are often aborted. Workers and unions oppose them. Ministers incur the short-term costs of disruption and unpopularity but rarely reap the benefits of greater regional equality. In Japan in 2014 Shinzo Abe, the prime minister, proposed a relocation drive to free up space in Tokyo, which has faced concerted opposition.

Washington, DC, a town designed as a humble alternative to bigger cities that has since become America's sixth-largest economic area, is another stage for this battle. Two cabinet secretaries, Ryan Zinke at Interior (who resigned in December) and Sonny Perdue at Agriculture, proposed moving agencies from the capital. Mr Zinke eventually backed down. Mr Perdue, who did not, faces acrimony from his own staff. Three bills that order the moving of agencies from the capital are stuck in congressional committees.

Norway once saw similar lethargy. Piecemeal proposals floated in the 1970s were never implemented. But in the early 2000s politicians, hoping for new jobs in their own backyard, all mobilised behind a single policy, says Rune Dahl Fitjar of the University of Stavanger. The government hid its plans from public-sector unions, who had little time to oppose it and no right to strike against it, says John Leirvaag, a union leader. Most vital was political

leadership—a prime minister determined to make it happen.

In Mexico AMLO should in theory find decentralisation less arduous. He was elected with a huge mandate on a promise to fix the country's regional disparities, the widest in the OECD, a club of mostly rich countries. But his dream of moving all or even most government workers is a long way off, if it is even to happen at all. Unlike their Norwegian counterparts, Mexican bureaucrats have no obligation to leave the capital. A promise to move several offices on his first day was dropped. Each dispersed ministry will begin as a kind of satellite office for the main one in Mexico City. The ministers will show up once a week. "We cannot stop having a base in the capital," says Victor Manuel Villalobos, whose agriculture ministry opened an office in Sonora, in Mexico's north, in March.

Tlaxcala offers a reasonably reassuring precedent. Life there is quiet. In 2017 journalists sardonically reported the installation of the state's first escalator. But it also lacks the capital's traffic, pollution and violence, and boasts the best corn tortillas in Mexico. One of the few new arrivals says she is happier working here. "We used to live in an apartment in Mexico City. No flowers, nothing green," she says. "Now my daughter has a garden."

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公共行政

首都外逃

许多政府都梦想将公职人员迁出首都，只是要做成这件事比看起来更难

在墨西哥城以东两小时车程的特拉斯卡拉州（Tlaxcala）文化宫，墨西哥文化部长亚历杭德拉·芙拉乌斯多（Alejandra Frausto）坐在一间旧音乐教室里办公。她希望这间新办公室光秃秃的墙壁上很快能装上屏幕，以便与墨西哥城及其他地区的官员开视频会议。根据去年当选总统的奥夫拉多尔（人们多叫他“AMLO”）的政策，她所在的文化部和另一个部率先迁出了首都。AMLO重新提出了一个最早出现于上世纪80年代的想法，把庞大的中央政府机构分散转移至墨西哥的30个州。特拉斯卡拉州首府的人口为8.5万，仅为文化部在墨西哥城员工数量的八倍。芙拉乌斯多梦想有一天该州能有数千名文化部员工。

AMLO的计划听起来很有革命性，不过却是全球趋势的一部分。世界各地的首府城市都在把政府机构往外迁。

在20世纪的后殖民热潮中，那些着力发展贸易的殖民帝国所选择的沿海首都被摒弃，取而代之的是“区域中立”的新首都，如巴西利亚（巴西）、伊斯兰堡（巴基斯坦）和多多马（坦桑尼亚）；距今更近的还有哈萨克斯坦的新都努尔苏丹（Nursultan，原名阿斯塔纳）和缅甸的内比都（Naypyidaw）。但整体迁都的成本高且不受欢迎，如今政府更喜欢将各部门分批外迁。

以挪威为例，2006年以来该国已将1600个公务员岗位迁出奥斯陆。公平竞争管理局现在位于第二大城市卑尔根（Bergen）；极地研究所被迁到一个距离北极不远的小镇。去年，负责在25个较贫穷国家监督项目的挪威和平队Norec搬到了小镇福德（Forde），那里有山有水有峡湾，人口仅1.3万。

墨西哥和挪威只是一众队伍中的两个。韩国已将三分之二的政府机构迁出

首尔，很多迁到了新建的世宗特别自治市（Sejong City）。2015年以来，丹麦已将数千个政府岗位转移到多个城市。1999年，马来西亚将许多基层公务员从吉隆坡转移到了一个叫作布城（Putrajaya）的新城市。印尼正考虑将首都从雅加达迁走。

这一趋势反映了世界的变化。在过去的时代，信息传播的速度慢如蜗牛，公务员因而必须聚集在一起。但现在，坐在办公室里的公务员可以在全球范围内发送电子邮件，发起视频对话。出差以进行面对面的会议也许不可避免，但交通网络也已改善。Norec的新基地福德距离奥斯陆400公里，但飞往首都的航班仅一小时航程，每天有五趟。

支持政府机构迁移的人承诺这么做有数不尽的好处。它分散了恐怖袭击或自然灾害导致整个政府陷入瘫痪的风险。政府的专家和策士们搬去“乡下”后，将得到之前无法想象的新想法的启发，这在封闭的首都是难以实现的。远离压力和游说群体后，自治监管机构就能最好地履行职责。有些人甚至盛赞这是应对日渐抬头的犬儒主义和民粹主义的良方。一旦与普通民众打成一片，那些遥远首都里不受待见的官僚将变得和消防员一样受欢迎。

除了这些乐观的愿景外，分散中央政府机构通常有三个具体目标：改善居住在拥堵首都的公务员和老百姓的生活；省钱；纠正区域发展不平衡的问题。麻烦的是这些目标并不总能实现。

改善生活这个目标由来已久。二战后，英国在重建伦敦时将成千上万公务员迁至“宜人的英国乡村城镇”。但从首都搬到小地方并不总是件宜人的事。人才流失率可超过80%。Norec雇用的一般都是不拖家带口的年轻人，但就连他们也会大为不满。其中一位名叫梅根茜尔德·博格塞斯（Magnhild Bogseth）的年轻人回忆说：“我搬到巴拉圭或尼加拉瓜时，我的朋友们从未问过：‘你确定要去吗？’但当我来福德的时候，他们全都在说：‘你在那儿真的会开心吗？你的社交生活要完了！’”很多当地人也很难适应。当一名Norec的工作人员说服了她的哥伦比亚男友和她一起从奥斯陆搬到福德时，镇上的报纸在头版报道了他的到来。

至于那些留在伦敦的公务员，1962年英国的一次审议敦促他们进一步外迁，以改善他们的“健康和福祉”。同样，荷兰在上世纪60年代后期以拥堵和住房短缺为依据转移政府岗位。埃及的将军们以开罗的拥堵和污染为由，着手在沙漠中建造一个至今尚未命名的新首都。

把官僚们从首都打发走的第二个原因是省钱。首都的办公空间成本要高得多。到上世纪70年代末伦敦房地产市场停滞不前时，政府失去了搬迁的热情。转移到其他地方的政府机构通常能以较低的薪水招聘到更好的员工，而在首都，人才都被薪水丰厚的跨国公司吸引走了。

政府部门外迁的第三个原因是解决区域不平等的问题。在墨西哥，AMLO 感叹那些不得不到大城市谋生的人们很“悲惨”。文化部在特拉斯卡拉开始办公的那天，有70名当地人带着简历前去求职。2003年至2010年间英国转移20%的伦敦公务员岗位时，经常会选择失业率较高的地区，例如曾受工业衰退打击的纽波特（Newport）。如今这个威尔士城市是英国国家统计局的所在地。挪威认为联邦政府的岗位就像石油利润一样，是每个地区都应享有的资源。

在政府岗位迁入的城市，私人部门的岗位也会随之增加。1999年德国联邦政府从波恩迁出后，一项对柏林的研究发现，在一个区域每增加100个政府职位，就帮助创造了55个私营部门岗位。对英国在2000年后转移政府职位的回顾研究得出了同样的比率。新增加的岗位往往属于服务业，通常是法律或咨询。

有时，政府搬迁是为了激发二线城市的潜力。与贫穷、偏远的地方不同，较大的城市可以充分利用新搬来的政府机构，将其与当地大学和企业对接，并提供受过良好教育的劳动力。1946年，美国决定将疾病控制中心（Centres for Disease Control）建在亚特兰大而不是华盛顿特区。亚特兰大后来发展成了医疗卫生领域的研究和业务中心。

两难境地显而易见。选择贫困的小城镇，就会为失业率高的地区创造新的就业机会，但很难吸引到最合适的人才。而选择拥有较好基础设施和更高

素质居民的较大城市，又很难让最贫困的地区受益。

无论动机为何，搬迁都是件难事。Norec迁至福德导致42名员工中的34人辞职，而Norec的负责人还自豪地说，这20%的保留比例已是挪威的最高纪录。挪威民航局搬到北极圈时，几乎所有飞行检查官都辞职了。专业人才的流失需要多年才能填补。同样，有465名雇员的丹麦环保署将从哥本哈根迁往该国第三大城市欧登塞（Odense）。该机构的16名毒理学家中有12人打算辞职。

员工的不满并不是唯一的问题。选址常常是出于政治原因。在三个最终入选Norec迁移地的城镇中，福德得分最低。很多人认为当地的一名政客影响了最终决定。2016年，澳大利亚时任副总理的巴纳比·乔伊斯（Barnaby Joyce）促成杀虫剂和兽医监管机构迁到了他自己选区内的一个城镇。更明目张胆的当属奥古斯托·皮诺切特（Augusto Pinochet），他把智利国会从圣地亚哥迁到了自己的家乡瓦尔帕莱索（Valparaíso），如今国会还在那里。

其他人指出，分散政府机构会导致问责不足，引发腐败。2011年，开罗居民举行抗议活动，推翻了一个独裁者。但新首都将远离开罗民众。美国的一项研究发现，位置偏远的州政府腐败的情况更严重，因为记者往往生活在大城市，对当权者的监督会有所松懈。

但政府搬迁受到的阻力可能是巨大的，搬迁计划也经常流产。工人和工会反对搬迁。部长们短期内要承担工作中断和不受欢迎的代价，却很少从更广泛的区域平等中获益。2014年，日本首相安倍晋三提出了一项政府搬迁计划，以释放东京的空间，但遭到了一致反对。

华盛顿特区本是一个小城镇，当初在首都候选名单中只是排在大城市之后一个不起眼的备选，成为首都后发展成了美国第六大经济区。如今这里是政府搬迁与否的又一个战场。内政部长瑞恩·津克（Ryan Zinke，于去年12月辞职）和农业部长索尼·珀杜（Sonny Perdue）这两位内阁部长提议将政府机构迁出首都。津克后来让步了。坚持己见的珀杜则要直面下属的不

满。三项命令机构搬迁的法案都卡在国会委员会那里无法通过。

挪威也曾面对类似的拖沓不前。早在上世纪70年代零散提出的提案从未实施。斯塔万格大学（University of Stavanger）的鲁内·达尔·菲恰尔（Rune Dahl Fitjar）表示，21世纪的头几年出现了转折，政客们希望在自家后院出现新的就业机会，于是齐心协力推动了一项政策。工会领导人约翰·雷瓦娃（John Leirvaag）表示，政府向公共部门的工会隐瞒了搬迁计划，让它们几乎没有时间反对，也没有权利为此罢工。发挥最关键作用的是政治领导人——一位决心实现这一目标的首相。

理论上说，AMLO要在墨西哥推行政府搬迁应该没那么费力。他当选后的一项重要使命就是履行竞选时的承诺，解决墨西哥区域差异问题——在主要由富裕国家组成的经合组织中，墨西哥的区域差异是最严重的。他的梦想是将所有或至少是大多数政府工作人员都迁走。但即便这个梦想真能实现，也还有很长的路要走。与挪威的政府机构不同，墨西哥的政府部门没有义务离开首都。在上任第一天搬迁几个部门的承诺就被放弃了。每个迁出岗位的部门都先是设立卫星办公室，主体仍留在墨西哥城。部长们每周去一次卫星办公室。3月，农业部在墨西哥北部的索诺拉省（Sonora）开设了办事处，农业部长维克多·曼努埃尔·维拉波斯（Victor Manuel Villalobos）说：“我们不能在首都没了大本营。”

特拉斯卡拉提供了一个还算让人欣慰的先例。这里的生活平静如水。2017年，该州安装了第一部自动扶梯，记者们语带嘲讽地做了报道。但这里也没有首都的交通拥堵、污染和暴力问题，而且号称有墨西哥最好的玉米饼。新迁入的少数政府职员里有一位说她在这里工作更快乐。“我们过去住在墨西哥城的一套公寓里。没有鲜花，没有绿地，”她说，“现在我女儿有了一个花园。”





Private education

A class apart

Private education is booming in new markets and new forms, says Emma Duncan

HOUSED in a jumble of ancient buildings in the shadow of Westminster Abbey, Westminster School has been educating boys since it was founded in 1560 by Queen Elizabeth I to provide lessons for 40 poor scholars. It has evolved since then—its 750 pupils now include some girls, and with fees of £39,252 a year for boarders and £27,174 for day pupils, poor scholars are thin on the ground—but for nearly half a millennium, these historical premises defined its geographical limits.

That is about to change. A ground-breaking ceremony on April 9th marked the start of the construction of Westminster Chengdu, the first stage in a venture with a local partner, Hong Kong Melodious Education Technology Group. The school is due to open in September 2020 and will have 2,500 pupils from the ages of 3 to 18. It will be followed by a further five establishments of a similar size in other Chinese cities over the next ten years, by the end of which Westminster will be educating 20 times as many children in China as in the heart of London.

A slice of the Chinese operation's income will flow back to the mother ship, enabling Westminster to increase the share of pupils on bursaries in Britain from around 5% to 20%. "It will give us a revenue stream that will allow us to go back to our roots," says Rodney Harris, deputy headmaster in London, who is moving to Chengdu in September to take the top job there. By extending its model to China, the school thus hopes to mitigate the inequality to which it contributes in Britain.

Education used to be provided by entrepreneurs and religious

organisations, but starting in Prussia in the 18th century, governments began to take over. In more recent years the state has dominated education in the rich world, with the private sector restricted to the elite and the pious. In the developing world, too, new states created from crumbling empires were keen to provide (and control) education, both to respond to their people's ambitions and to shape the minds of the next generation.

But now the private sector is enjoying a resurgence. Enrolment in private schools has risen globally over the past 15 years, from 10-17% at primary level and from 19-27% at secondary level; the increases are happening not so much in the rich world as in low- and middle-income countries. People are pouring money into schooling, tuition and higher education (see chart).

Four factors are driving the increase. First, incomes are rising, especially among the better-off. Since birth rates are falling, the amount of money available for each child is rising even faster than incomes. In China the one-child policy has meant that in many families six people (four grandparents and two parents) are prepared to invest in the education of a single child.

Second, thanks to the relative decline and increasing capital intensity of manufacturing, job opportunities for the less well-educated are shrinking. Even good factory jobs require qualifications. The returns to education have risen despite the rise in the supply of well-educated people. In developing countries, which have fewer of them, the returns are higher than in the rich world, making it even more important for young people there to go to school.

Third, the output of education also provides some of the input: the more children that are educated, the more teachers will be available to bring on the next lot. This is especially true in countries in which job opportunities for women are limited: lots of educated women translate into a ready supply

of cheap teachers.

Fourth, technology is creating a demand for new skills which the private sector seems better at providing. It is also opening up new markets as the internet enables people to get educated in different ways and at different times in their lives.

The dividing line between private and public is often unclear—many countries have government schools that are partly privately financed, for instance, and private schools that are publicly financed—and the size and growth of the private sector varies from country to country. Broadly, the more developed the country, the smaller the private sector's role tends to be. In Haiti about 80% of primary-school pupils are being educated privately; in Germany, just 5%. In mainland Europe, the quality of state education is generally high, so the private sector tends to play a smallish role—though there are wrinkles. For example, a history of religious divisions in the Netherlands has meant that three-quarters of pupils go to private schools, the great majority of them publicly financed; in Sweden, 10% do. In America and Britain the quality of government schools is variable, which explains sizeable elite private sectors and a growing number of privately managed, publicly funded schools—“charters” in America, “academies” in Britain. In the tertiary sector, private institutions have a big role in America, both at the top and the bottom of the market; in Britain, the tertiary sector is now largely privately financed.

In Latin America the Catholic church's big role in schooling, the low quality of state provision and the rapid growth in demand for tertiary education have all contributed to a big role for the private sector. In much of South Asia and Africa, poverty, migration and population growth make it hard for governments to provide schooling in many cities, so the private sector is big, and growing fast. The elites have already left the public systems, and many middle-class and poorer people are following.

Like Europe, East Asia has generous and mostly good state provision, but unlike Europe it also has a fast-growing private sector. Vietnam has both the best state-school system in a low-income country and probably the world's fastest-growing private-school sector. The market capitalisation of Chinese education companies, bigger than those of any other country, suggests that investors see it as a golden opportunity.

The Chinese state is clamping down on the private sector's role between the ages of 6 and 16, but there is still room for growth. If the child goes to a private nursery and a private university, and receives two hours of private tuition on each school day and eight at the weekends, with a summer maths camp thrown in—a fairly standard routine for a child of Chinese professionals—he or she will spend as much time in the private as in the state sector.

All of this makes education attractive to investors, says Ashwin Assomull of L.E.K. Consulting. Demand is growing faster than incomes and holds up well in economic downturns. Technology is creating new markets. Schooling is fragmented, but there are large and growing chains, such as GEMS Education, a Dubai-based company with 47 schools mostly in the Middle East; Cognita, a British company with 73 schools in eight countries; and Beaconhouse School Systems, a Pakistani company with 200 schools in seven countries.

The main downside is the sector's political sensitivity. Private investment in education makes governments uncomfortable because it pits a private good against a social one. Governments, like parents, want children to learn, but they also want to maximise social mobility and minimise inequality, whereas parents simply want to ensure that their children do better than anyone else's.

These objectives inevitably conflict, so governments regulate and restrict the private sector, controlling what is taught, banning profits, outlawing selection, cutting fees and generally making the business unattractive to investors. Yet they need it, too, so they work with it, channelling its skills, inventiveness and capital and pouring taxpayers' money into it.

This special report will consider what the private sector is providing that the state is not, and look at the costs and benefits of its growth. It will examine how well it is performing, and conclude by asking how the private sector and the state can work together to best effect. ■



私立教育

一校一阶层

埃玛·邓肯说，私立教育正在新的市场以新的形式兴起【专题报道《私立教育》系列之一】

西敏公学（Westminster School）坐落于西敏寺旁的一群古建筑中。它由女王伊丽莎白一世于1560年创办，来为40名贫困的学生授课。在很长一段时间里它是一所男校，但也经历了演变。现在它的750名学生中也有一些女孩；鉴于寄宿生的费用为每年39,252英镑，走读生为27,174英镑，贫困生已经寥寥无几。不过，近500年来，它的历史渊源决定了它在地理上的局限性。

而这一点即将改变。4月9日举办的一个奠基仪式标志着成都西敏分校动工。这是与地方合作伙伴香港斯为美教育科技集团（Hong Kong Melodious Education Technology Group）的合资项目的第一阶段。该校将于明年9月开学，招收2500名3至18岁学生。未来十年，中国其他城市将再增开五所类似规模的分校，令西敏在中国的学生数量达到伦敦市中心的20倍。

中国业务的一部分收入将回流本部，使西敏能将领取助学金的英国学生比例从5%左右提高到20%。伦敦的副校长罗德尼·哈里斯（Rodney Harris）说：“它将给我们带来收入流，让我们能回归自己的根基。”他将于9月搬到成都，担任当地的一把手。由此可见，通过将自己的模式扩展至中国，西敏希望能减轻它在英国助长的不平等。

教育曾由企业家和宗教组织提供，但自18世纪的普鲁士开始，政府开始接手。再到后来，富裕国家的教育由政府主导，私立教育仅限于精英阶层和教徒。在发展中国家，从崩溃的帝国废墟中建立的新政府也热衷于提供（以及控制）教育，这既是为响应民众的抱负，也是为控制下一代人的思想。

但现在私立教育正在复兴。过去15年里，私校的入学人数在全球范围内上升，在小学生中的占比从10%升至17%，在中学生中从19%升至27%。中低收入国家的增长超过富裕国家。人们正在向学校教育、学费和高等教育投入大量资金（见图表）。

四个因素在推动这一增长。首先，收入在上升，尤其是富裕阶层。而出生率的下跌使得每个孩子可享用的资金的增速甚至超过收入增速。在中国，独生子女政策意味着在许多家庭中，有六个人（祖父母四人加父母二人）都准备投资于一个孩子的教育。

其次，由于制造业相对衰退且趋向资本密集型，教育程度较低的人就业机会在缩减。好的工厂职位也需要学历。尽管受过良好教育的人力的供应增加，教育的回报仍然上升了。在发展中国家，受过良好教育的人相对更少，教育的回报比在富裕国家更高，这使得求学对于那里的年轻人愈发重要。

第三，教育的产出也为自身提供了一些投入：受教育的孩子越多，能够教育下一批孩子的教师人数就越多。在女性就业机会有限的国家尤其如此——许多受过教育的女性成为了廉价教师的现成来源。

第四，技术正在创造对新技能的需求，而私立教育似乎更擅长培养这些新技能。技术也在开辟新市场，因为互联网使得人们能以不同的方式在人生的不同阶段接受教育。

私立和公立之间的分野往往并不清晰，比如许多国家都有部分由私人融资的公立学校，以及部分受公费资助的私立学校。此外，私立教育的规模和扩张速度因国家而异。大体上，国家越发达，私立教育的势力往往越小。在海地，大约80%的小学生接受私立教育，而在德国只有5%。在欧洲大陆，国家提供的教育质量普遍较高，因此私立教育往往只扮演较小的角色——虽然也不尽如此。比如，荷兰宗教分裂的历史导致该国四分之三的学生进入私立学校，但其中绝大多数学校受公费资助。而在瑞典，这样的学生比例为10%。在美国和英国，公立学校的质量参差不齐，因而出现了相

当规模的精英私校和越来越多由私人管理、但受公费资助的学校——在美国叫“特许学校”（charters），在英国叫“学院”（academies）。在高等教育这一块，私营机构在美国发挥着重大作用，无论是在市场的顶端还是底部；在英国则主要为私人融资。

在拉丁美洲，天主教会在学校教育中扮演重要角色，而政府提供的教育质量低下，对高等教育的需求又快速增长，这一切都促成了私立教育发挥重要作用。在南亚和非洲的大部分地区，贫困、迁移和人口增长使得政府在许多城市难以提供学校教育，因此私立教育规模庞大且扩张迅速。精英阶层已经撤离了公立系统，众多中产阶级和更穷困的人群也在追随他们的脚步。

东亚和欧洲一样，拥有慷慨且大体上优质的公立教育，但与欧洲不同的是，这里的私立教育也在快速增长。越南拥有低收入国家中最好的公校系统，但它的私校系统却也可能是全世界扩张最快的。中国教育类企业的市值比任何其他国家的这类企业都大，表明投资者视之为一个千载难逢的好机会。

中国政府正在压制私立机构在6至16岁教育中的角色，但它仍有增长空间。如果孩子上私立幼儿园和民办大学，接受上学日每天两小时、周末每天八小时的私人补习，再参加个数学夏令营——一套中国专业人士子女的“标配”，那么这个孩子在私立和公立系统中花费的时间将是一样多的。

所有这些都使得教育产业对投资者充满吸引力，艾意凯咨询（L.E.K. Consulting）的阿斯温·阿索米尔（Ashwin Assomull）表示。需求的增长快于收入增长，且在经济低迷期仍保持强劲。技术正在创造新市场。教育市场十分分散，但也出现了不断扩张的大型连锁店，比如总部位于迪拜的环球教育集团（GEMS Education）拥有47所学校，大部分位于中东地区；英国公司Cognita在八个国家拥有73所学校；巴基斯坦的Beaconhouse学校系统在七个设有200所学校。

私立教育的一大劣势是政治敏感性。对教育的民间投资令政府感到不安，

因为它使私营产品与社会公共产品相抗衡。政府和父母一样希望孩子们受教育，但它们同时也希望社会流动性能最大化而不平等能最小化，而父母只想确保自家孩子比其他人的孩子境遇更好。

这样的目标不可避免地相互冲突，致使政府对私立教育实施管制和限制，控制其教授的内容，禁止牟利及筛选生源，削减费用，从总体上消除这个行业对投资者的吸引力。但政府又需要私立教育，因而也与之合作，引导其技能、创造力和资本，并将纳税人的钱注入其中。

本专题报告将探讨私立教育正在提供哪些国家无法提供的事物，并分析其扩张的成本和效益。它将审视私立教育的表现，最后回答这样一个问题：私立和公立系统如何能够联手以取得最佳成效。■



Happiness economics

Dismal science

An old paradox about growth and happiness lives on

PHILOSOPHERS FROM Aristotle to the Beatles have argued that money does not buy happiness. But it seems to help. Since 2005 Gallup, a pollster, has asked a representative sample of adults from countries across the world to rate their life satisfaction on a scale from zero to ten. The headline result is clear: the richer the country, on average, the higher the level of self-reported happiness. The simple correlation suggests that doubling GDP per person lifts life satisfaction by about 0.7 points.

Yet the prediction that as a country gets richer its mood will improve has a dubious record. In 1974 Richard Easterlin, an economist, discovered that average life satisfaction in America had stagnated between 1946 and 1970 even as GDP per person had grown by 65% over the same period. He went on to find a similar disconnect in other places, too. Although income is correlated with happiness when looking across countries—and although economic downturns are reliable sources of temporary misery—long-term GDP growth does not seem to be enough to turn the average frown upside-down.

The “Easterlin paradox” has been hotly disputed since, with some economists claiming to find a link between growth and rising happiness by using better quality data. On March 20th the latest Gallup data were presented in the *World Happiness Report*, an annual UN-backed study. The new data provide some ammunition for both sides of the debate but, on the whole, suggest that the paradox is alive and well.

There are important examples of national income and happiness rising and

falling together. The most significant—in terms of population—is China, where GDP per person has doubled over a decade, while average happiness has risen by 0.43 points. Among rich countries Germany enjoys higher incomes and greater cheer than ten years ago. Venezuela, once the fifth-happiest country in the world, has become miserable as its economy has collapsed. Looking across countries, growth is correlated with rising happiness.

Yet that correlation is very weak. Of the 125 countries for which good data exist, 43 have seen GDP per person and happiness move in opposite directions. Like China, India is a populous developing economy that is growing quickly. But happiness is down by about 1.2 points in the past decade. America, the subject of Easterlin's initial study, has again seen happiness fall as the economy has grown. In total the world's population looks roughly equally divided between places where happiness and incomes have moved in the same direction over the past ten years, and places where they have diverged. ■



幸福经济学

沉闷的科学

经济增长与幸福感的陈年悖论依然无解

从亚里士多德到披头士乐队，众多思想者都认为金钱不能带来幸福。但金钱似乎确实有助提升幸福感。自2005年以来，民调机构盖洛普（Gallup）开始在世界各国调查具代表性的成年人样本，请他们按0至10的等级评价生活满意度。主要结果很明确：平均而言，国家越富裕，人们自评的幸福感越高。这种直接关联表明，人均GDP翻倍可令生活满意度提高约0.7个百分点。

不过，国家越富裕，其民众情绪越会正面提升的预言一直都存疑。1974年，经济学家理查德·伊斯特林（Richard Easterlin）发现，1946年至1970年间，美国人均GDP上升了65%，但美国人对生活的平均满意度却停滞不前。他之后在其他地区也找到了类似的脱钩。虽然就全球来看幸福感与收入水平相关，而且经济衰退必然会导致短期的痛苦感受，但长期的GDP增长似乎并不足以扭转普遍的负面情绪。

此后“伊斯特林悖论”一直备受争议。一些经济学家声称通过更高质量的数据找到了经济增长与幸福感提升之间的关联。3月20日，联合国发布的年度研究《全球幸福报告》（World Happiness Report）公布了最新的盖洛普数据。新数据为辩论正反双方都提供了一些弹药，但总体而言，这一悖论看来仍然难以解决。

数据中有显著的例子表明国民收入和幸福感同步升降。最显著的（以人口规模论）是中国，它的人均GDP在十年内翻了一番，平均幸福感上升了0.43个百分点。在富裕国家中，德国的收入水平和幸福感都比十年前高。委内瑞拉的幸福感曾位居全球第五，但随着经济崩溃，已被一片愁云笼罩。纵观各国，幸福感提升确与经济增长相关。

然而，这种相关性非常弱。在获得充分数据的125个国家中，43个国家的人均GDP和幸福感呈反相关性。与中国一样，印度也是人口庞大、增长迅速的发展中经济体。但印度人的幸福感在过去十年下降了约1.2个百分点。作为伊斯特林最初的研究对象，美国再次出现经济增长但幸福感下降的情况。总的来说，过去十年里，幸福感和收入变动呈正相关和呈反相关的地区大概各覆盖了一半的全球人口。 ■



Variety

Just for you

Even in China, one-size education does not fit all

FOUNDED BY A 76th-generation descendant of the sage, the Confucius International School at Anren, on the outskirts of Chengdu, mixes Chinese with Western tradition. “We offer a relatively liberal education here,” says Jill Cowie, the Scottish principal. In the art block, one class discusses a Dürer etching while another designs jewellery for superheroes. Boys dressed in tailcoats and girls in kilts share the grounds with peacocks, pheasants and white rabbits. The Harry Potteresque atmosphere sits oddly with the fact that the school is now owned by a firm backed by a state-owned-enterprise.

Around the world, government schools tend to be standardised, for a range of reasons. Uniformity is cheaper than variety; governments want to inculcate a shared understanding of history and citizenship; and equality of opportunity mandates equal treatment for all. But many parents want something different for their children. In some countries that means a more religious education. In China, though, three different varieties of private education are flourishing for other reasons.

Most of the private schools that now educate 10% of Chinese 6- to 18-year-olds are *gaokao* mills, which drill their students for the all-important end-of-school exam. But 10% of those private establishments are bilingual schools which prepare students for a university education abroad. According to data from EY-Parthenon, a consultancy, this is the fastest-growing part of the market.

A foreign university education is increasingly standard for the Chinese elite. More than 600,000 Chinese youngsters are currently studying abroad. It

is a large investment—parents would not get much change from \$250,000 for a degree from a decent American university—but it offers both good economic prospects and social prestige. “It’s all about anxious new money,” says Jiang Xueqin, an educational consultant. “Everybody here knows that you can only get rich by stealing money. You’re legitimising your wealth by proving how clever your family is. The degrees from Oxford or Yale—they’re reputation-laundering.”

But bilingual schools also offer an escape route from the rigour and boredom of the Chinese public system. Emily Yu, a parent at YK Pao, Shanghai’s most prestigious bilingual school, describes both herself and her husband as “survivors of the Chinese system. It was quite a painful process.” Li Tong, principal of a government school in Chengdu, moved her son from the public to the private sector. “It was difficult for him in the Chinese system because he has a strong personality, with strong likes and dislikes.”

A Western style of education may offer broader benefits, too. Shelley Chen, the principal of Vanke Bilingual School in Shanghai, where pictures of Abraham Lincoln, Amelia Earhart and Martin Luther King decorate the walls, explains that many of her parents—often executives in multinational firms—think “they weren’t well prepared by their schools. They feel there’s a glass ceiling. When they compare themselves with colleagues from other parts of the world, even India, they think they’re not so good at critical thinking.” Vanke, she says, focuses on the 5cs: “Caring, communicative, confident, cordial...let me check [which she does on her computer]...creative.”

Like many of China’s private-school providers, Vanke is mainly in the property business. Elite schools help attract the rich to upmarket developments, which explains why some of the local partners of the British brands that are piling into China are property companies. There may now be too many of them. Wang Shu, founder and president of Cogdel, a

consultancy in Chengdu, reckons that investors must look to third-tier cities because first- and second-tier cities are oversupplied: Chengdu alone has 37 bilingual schools. And Westminster is about to arrive.

On a table at Baiyun Technician College in Guangdong sit 3D-printed models of Mao Zedong, Sun Yat-sen and Vladimir Putin, rubbing shoulders with cartoon characters. Elsewhere on the campus, students train to build and operate drones, to become baristas, to make clothes, and much more. The work being done here illustrates a second variety of education that is flourishing in China's private sector.

Chinese state-provided higher education is, in the Confucian tradition, academic rather than practical. It does not do much for young people with more vocational interests. That is where China Education, Baiyun Technician College's owner, has found a niche.

China Education focuses its investments on markets where demand is strong. Guangdong province, home of Baiyun Technician College and its sister institution, Baiyun University (with 27,000 students), fits the bill. Although Guangdong is rich, only 42% of school-leavers there go on to higher education, compared with 48% nationwide. China's fast-developing high-speed and metro rail networks are another focus for the company: it owns Xian Railway College and Zhengzhou City Rail Transit School.

Liu Jianfeng, the party general secretary at Baiyun University, who has an ideological as well as a management role, takes a robustly un-ideological view of the institution's job. "Public universities are more focused on following the government plan and ideology," he says. "We are training up human resources to meet the demand from the marketplace." To make the point, Baiyun Technician College's exterior walls are painted with the logos of many of the 3,000 corporate partnerships the college has cultivated for the benefit of its 13,000 students, including with Bosch, Nestlé, Nissan,

Grand Hyatt and Hilton. In order to get a job at Nissan, students train for three years; for the last four or five months of the course they are taught by Nissan employees.

Students at Baiyun University, who take degrees in vocationally oriented subjects such as engineering and accountancy, pay 19,000-28,000 yuan a year, compared with 4,500-8,000 yuan at a public university. But an impressive 91% of students leave Baiyun University with a job to go to, compared with 85% for all places of higher learning.

A third variety of private education is audible in the corridors of the 300-year-old Qinhan Hutong, an educational centre in the old town of Shanghai built around a courtyard with a stream tumbling over rocks. In one room a group of preschoolers chants a traditional poem about a civil servant going on a long journey; in another a student plays a 21-string guitar. A mynah bird squawks next to an art teacher, who is putting the finishing touches to a painting of peonies done in the classical style.

“People think that the Chinese lack manners and civility. That’s because we lost our culture for 60 years. But for the previous 1,000 years, this culture dominated East Asia,” says Wang Shuangqiang, Qinhan Hutong’s chairman and founder, who is dressed, somewhat incongruously, in a camouflage jacket. “We don’t believe in God. We believe in our words, our calligraphy, our poetry, our ancient relics.” Three years ago Mr Wang had 35 such centres; now he has 70, with 70,000 students, who pay an average of 17,000 yuan a year. The rebirth of interest, he says, “comes from people’s hearts, and it comes from Chairman Xi. He’s always quoting ancient Chinese sayings.”

The government’s different attitudes to those three varieties of education reveal its concerns and priorities. It allowed the establishment of bilingual education in China in order to discourage parents from sending children to boarding schools in America and Britain, which they have increasingly

been doing in recent years. But it is jealously guarding its hold on basic education, so it keeps those schools on a tight leash. They must use the textbooks mandated for all schools, which inculcate “core socialist values”, and follow strict rules on the amount of time to be devoted to each subject. They must host party cells and branches of the Young Pioneers, the junior wing of the Communist Party.

It is also nervous about the growing educational divide between the rich, who buy tuition, bilingual schooling and foreign degrees for their children, and everybody else, so it has clamped down on investment in the sector. Making profits from “basic” schooling for 6- to 16-year-olds has been banned.

Firms are understandably nervous about the close watch the state keeps on the sector. “Vanke wants to make children happy, parents happy and the government happy,” says Cynthia Xu, the party secretary and deputy general manager of Vanke Shanghai. “It’s very difficult to navigate the shifting sands of the Chinese regulatory environment: it’s going to be interesting to see what happens to British schools that are happily handing over their name and reputation to entities in this country if they don’t have educational expertise and a management team on the ground to navigate the regulatory environment,” says Fraser White, chief executive of Dulwich College International.

Vocational education, by contrast, faces few restrictions. The government recognises that there is unmet demand, so it helps such colleges by giving good ones a stamp of approval, which enables them to charge higher fees. “Because vocational training helps solve social problems, it has always received support from government, and we think it will go on receiving support,” says Xie Shaohua, executive director of China Education.

Mr Wang is furthering Mr Xi’s push for a cultural revival, so he encounters

no interference. Indeed, he receives a subsidy of 1m yuan a year from the Shanghai municipal government. In a very small way, this example shows that the Chinese state is prepared to use the private sector to meet its educational aims. Many other governments go much further. ■



多样化

因材施教

即使在中国，一种模式的教育并不适合所有人【专题报道《私立教育》系列之三】

由孔子的第76代传人设立、位于成都郊区的成都安仁孔裔外国语学校将中国与西方的传统融为一体。“我们在这里提供相对自由的教育。”来自苏格兰的校长吉尔·考伊（Jill Cowie）说。在艺术模块中，一个班讨论了丢勒的蚀刻画，另一个班为超级英雄设计珠宝。男孩们身着燕尾服，女孩们穿着苏格兰短裙。庭院中还有孔雀、野鸡和白兔。令人惊讶的是，这所充满了哈利·波特式气氛的学校现在由一家国有企业支持的公司所有。

在世界各地，出于各种原因，政府设立的学校往往是标准化的。一刀切比多样化要便宜；政府希望灌输对历史和公民身份的共同理解；机会均等则要求所有人享有平等待遇。但许多父母希望自己的孩子能得到不一样的教育。在一些国家，这意味着更多的宗教教育。而在中国，三类不同的私立教育蓬勃发展却另有原因。

现在招收了中国10%的6到18岁儿童的私立学校大多是高考工厂，为学生们备考这头等重要的毕业考试。但是，这些私立机构中有10%是双语学校，让学生们为出国读大学做准备。根据咨询公司安永-帕特侬的数据，这是市场中增长最快的部分。

外国大学教育越来越成为中国精英的标配。目前有60多万中国青少年在国外学习。这是一项巨大的投资——从一所体面的美国大学拿到学位要花掉父母将近25万美元——但它提供了良好的经济前景和社会声望。“这都是因为焦虑的新贵阶层，”教育顾问姜学勤说，“这里的每个人都知道只能通过不义之财来致富。通过证明你的家族有多聪明，就可以使你的财富合法化。牛津或耶鲁的学位就是在洗白声誉。”

但双语学校也为中国公立体系的严苛和无聊提供了一条逃生路线。上海最负盛名的双语学校包玉刚实验学校的家长埃米利·俞（音译）将自己和丈

夫描述为“中国体制的幸存者”，说“这是个非常痛苦的过程”。成都一所公立学校的校长李彤（音译）将儿子从公立学校转到了私校。“他在中国体制里很难适应，因为他个性强烈，爱憎分明。”

西式教育还可能带来更广泛的益处。上海万科双语学校的校长陈舒的办公室里挂着亚伯拉罕·林肯、阿梅莉亚·埃尔哈特（Amelia Earhart）和马丁·路德·金的照片。她解释说，她学校里的许多家长——通常是跨国公司的高管——认为“当年的学校教育没能很好地培养自己。他们觉得有一个玻璃天花板。当他们与来自世界其他地区的同事甚至是印度的同事相比时，觉得自己并不擅长批判性思维。”她说万科专注于五个“C”：“关爱、交流、自信、真诚……让我查一下（她在电脑上查了一下）……创造。”

与许多中国的私立学校供应商一样，万科主要从事房地产业务。精英学校有助于吸引富人进入高端住宅区，这就解释了为什么一些涌入中国的英国品牌的地方合作伙伴是房地产公司。现在这种学校可能已经太多了。成都咨询公司康德教育的创始人兼总裁王舒认为，由于一线和二线城市已经供过于求，投资者必须关注三线城市：仅成都就有37所双语学校。而且西敏公学就要来了。

在位于广东的白云技师学院的一张桌子上，放着毛泽东、孙中山和普京的3D打印模型，与卡通人物并肩而立。在校园的其他地方，学生们在接受训练以制作和操作无人机、成为咖啡师、剪裁服装等等。这里进行着的工作展现了在中国私营部门中蓬勃发展的第二类教育。

在儒家传统中，中国的公立高等教育提供的是学术而非实践。这对于那些对职业工作更感兴趣的年轻来说并没有太多用处。白云技师学院所属的中国教育集团就此找到了一席之地。

中国教育集团重点投资于需求旺盛的市场。白云技师学院及其姊妹机构广东白云学院（拥有27,000名学生）的所在地广东省就十分符合条件。虽然广东很富裕，但只有42%的中学毕业生继续接受高等教育，而全国的比例是48%。中国快速发展的高铁和地铁网络是该公司的另一个重点：它拥有

西安铁路学院和郑州市轨道交通学校。

广东白云学院的党委书记刘剑锋同时负责抓意识形态和管理，却对学院的工作持有坚定的非意识形态观点。“公立大学更注重遵循政府的计划和意识形态，”他说，“我们是要培训能满足市场需求的人力资源。”为了传达这一点，白云技师学院的外墙上画有该学院为其13,000名学生建立的3000个企业合作伙伴中许多公司的标志，包括博世、雀巢、日产、君悦和希尔顿等。为了能在日产得到职位，学生们要经过三年培训，课程的最后四五个月由日产的员工授课。

在白云学院攻读工程和会计等职业导向的学位每年要支付19,000到28,000元，而公立大学的学费为4500到8000元。但令人印象深刻的是，91%的学生在离开白云学院时已经找到工作，而所有高等院校的这一比例为85%。

在拥有300年历史的秦汉胡同的走廊里，第三种私立教育清晰可闻。这是一个位于上海老城区、围绕一个庭院而建的教育中心，庭院中有一条在乱石上流淌的小溪。在一个房间里，一群学龄前儿童吟诵着一首有关一名朝廷官吏出远门的古诗。在另一个教室里，一名学生在弹古筝。一只八哥在一位美术老师身旁叽里呱啦，而他正在为一幅牡丹国画做收尾之笔。

“人们觉得中国人缺乏教养和文明。那是因为我们把文化丢了60年。但是在之前的1000年里，这种文化都统治着东亚。”秦汉胡同的董事长兼创始人王双强说道。他身穿一件迷彩夹克，多少有点与这情境不搭。“我们不信上帝。我们相信我们的文字、书法、诗歌、文物。”三年前王双强有35个这样的中心，现在有70个，招有7万名学生，每人每年平均支付17,000元。他说兴趣的重生“来自人们的心，来自自习主席。他总是引用中国古代的名言。”

政府对这三种教育的不同态度揭示了它的担忧和轻重缓急。它允许在中国开办双语学校，以阻止父母将孩子送到美国和英国的寄宿学校——这种做法近年越来越常见。但是它小心翼翼地守护对基础教育的控制，因此把这些学校束缚得很紧。它们也必须采用所有学校都要使用的教科书，其中灌

输了“社会主义核心价值观”，并严格遵守在每门学科上投入多少时间的规定。它们还必须建立党组织，以及少先队的分支机构。

政府还对花钱让孩子上私立补习班、念双语学校和攻读外国学位的富人与其他人之间日益增长的教育鸿沟感到紧张，因此已经限制了对该行业的投资。从6至16岁的“基础”学校教育中获利已被禁止。

国家对该行业的密切监视自然令企业感到不安。“万科希望让孩子们开心，让父母高兴，让政府高兴。”上海万科党委书记兼副总经理许青川说。德威国际学院的首席执行官弗雷泽·怀特（Fraser White）表示，“中国监管环境的变化很难驾驭。一些英国学校没有本地的教育专业知识和管理团队来应对监管环境，因而乐于把自己的名字和声誉交给中国的实体。看看结果如何会很有意思。”

相比之下，职业教育几乎没有什么限制。政府认识到存在未被满足的需求，所以就帮助这类学校——给好学校盖章批准，让它们能够收取更高的费用。“由于职业培训有助于解决社会问题，它一直得到政府的支持，我们认为它将继续获得支持。”中国教育集团的执行董事谢少华说。

王双强正在推动习近平的文化复兴运动，因此他没有受到任何干涉。实际上，他每年能从上海市政府获得100万元的补贴。从这个例子中可以窥见，中国政府准备利用私营部门来实现其教育目标。许多其他国家政府的动作要大得多。 ■



Filling the gaps

You demand, we supply

The private sector steps in where the state leaves off

DOGS AND emaciated cows pick their way through the rubbish dump that marks the visitor's arrival in Sangam Vihar, an "unauthorised colony" amidst the sprawl of south Delhi. It sprang up without planning permission and now houses 1.5m people. The government offers very little in the way of services. Water arrives in trucks run by gangs whose members have a habit of murdering each other. Education is provided by four government schools and around 100 private ones, according to Sushil Dhankar, who runs Hari Vidya Bhawan School.

At Mr Dhankar's smart, modern establishment in an alley off the grubby main street, pupils in spotless cream uniforms welcome the visitor with floral garlands. The school was set up by Mr Dhankar's father, who begged his son to return from a job in accountancy in Australia to help run it. Mr Dhankar's sister runs the primary school and his wife the secondary one. It is a flourishing enterprise with 2,000 students from 4 to 18 and an average result in the Central Board of Secondary Education exam of 86%, slightly above the national average. Fees range from 850 rupees (\$12) a month for the little ones to 1,800 rupees for the oldest. By Indian standards, this is not cheap. But local parents, mostly labourers or drivers earning around 500 rupees a day, are prepared to make sacrifices, says Mr Dhankar: "They don't want their children to do what they are doing."

In most of the world the state provides most of the population with primary and secondary education. But in some countries it struggles to keep up with population growth and movement, and the countries whose populations are growing and moving fastest tend to be poorer ones with less capable

governments.

Most low-cost private schools are mom-and-pop outfits. A few chains are emerging, some of which are for profit, such as Bridge International Academies, whose investors include Bill Gates of Microsoft and Mark Zuckerberg of Facebook. It has produced good results but has become controversial, partly because the idea of foreigners making profits out of providing education for poor people is politically sensitive. The non-profit model is an easier sell. Bangladesh and Pakistan, both weak states with a huge need for education, have produced two impressive non-profit operators, Brac (which educates 1m children) and The Citizen's Foundation (TCF, with 220,000) respectively. A few Western-run non-profit chains, such as Peas, have produced excellent results in Africa.

The private sector is also filling gaps in provision for children's early years. Enrolment in pre-school education varies widely, even in rich countries. Most countries mandate formal education only from age five or six onwards, but attitudes are changing as the early years are increasingly seen as the most crucial period in the development of the human brain. Across the OECD, preschool attendance among under-threes rose from 18% to 33% between 2005 and 2016, and among three- to five-year-olds from 76% to 86%. Last year France announced it would make enrolment from age three compulsory. But governments are not keen to take on extra financial burdens, so in most places the extra demand is being met largely by the private sector.

Wealthy people will spend heavily to buy their children an early advantage, as demonstrated by Cognita's new "early-learning village" in Singapore, which will eventually cater for 2,100 children aged 18 months to six years. Facilities include 114 outside spaces, one for each classroom, and nine playdecks equipped with pirate ships, tricycle tracks and suchlike. The classrooms are arranged in groups of four, each with a central space to create

a sense of community. “The building develops with the children,” says Adam Paterson, one of the centre’s two headteachers. “They move through it as they grow.” Fees range from S\$14,832 (\$8,393) to S\$35,610 a year.

But despite strong demand, the early-years business is not all plain sailing for companies. Some, such as Australia’s G8, have struggled in an oversupplied market. Barriers to entry are low, and firms need to be careful when looking after people’s most valued assets; the stock price of RYB, a big Chinese operator, crashed after staff at its nurseries were found to be punishing children by pricking them with needles and feeding them pills to make them sleep.

Demand for education outstrips public-sector supply not just in the early years but at core school age as well. The state may provide it five days a week, but many parents cannot get enough of it, so the private sector supplements it in the evenings, at the weekends and in the holidays. A survey by Ipsos MORI for the Sutton Trust showed that the share of British children who had had private tuition rose from 18% in 2005 to 30% in 2017. And British children get off relatively lightly, with an average of ten hours’ extra tuition a week, compared with 12 in China, 15 in South Korea and 16 in Bulgaria.

It is not just the elite that buys tuition. The Ipsos MORI survey showed that although richer parents were somewhat more likely to resort to it than poorer ones, parents from ethnic minorities, both black and Asian, were much more likely to use it than white ones. Shehda Asif, a maid with three children at the Royal Public School, a small establishment on the outskirts of Lahore, spends 1,700 rupees (\$12) a month on the fees and a further 1,000 rupees on after-school tuition. Almost all of her income goes on education; for the rest of its outgoings the family relies on her husband, a labourer.

In much of the world, private tuition is a small-scale business, often using casual labour which itself has become available because many more people

are being educated. At Heaven Kids School in Township, a lower-middle-class area of Lahore, most of the young men in a group of tutors are themselves students. Tutoring one child in one subject for Pakistan's matriculation exam for one hour six days a week can cost up to 10,000 rupees a month; for the International Baccalaureate, twice as much. Tutors tend to check out the parents' house before setting a price. The system suits the tutors, but some disapprove. "There's too much competition among parents," says Mohammed Ashfaq, who is studying for a master's degree.

But some large companies are involved, too. Two of the world's biggest listed education companies, New Oriental and TAL Education, are Chinese providers of tuition and test-preparation. Technology is driving the expansion of the business, for instance by allowing the children of the well-off in emerging markets to be tutored by hard-up young people in the rich world. India's biggest ed-tech company, Byju's, sells test-prep apps, charging a subscription of up to 37,000 rupees a month; it has 2.2m paid subscribers, who spend an average of 64 minutes each day on the app. It is cheaper than hiring an American over the internet, but still only for the well-off.

The private sector has long played an important part in the tertiary-education market, perhaps because the benefits of a degree go more clearly to the individual than to society as a whole. In rich countries, policy has also pushed in that direction. The top ranks of America's higher-education system—financed by user fees and student loans—are dominated by non-profit private institutions, the middle by public institutions and the bottom by the for-profit private sector. (The last part is currently the only large chunk of the world's private-education market that is shrinking; poor results at for-profit colleges prompted the Obama administration to restrict access to government loans for students.) Britain and Australia, too, have moved towards a system of user fees. In developing countries the trend towards privatisation in higher education is even more pronounced. In Latin America, especially, governments have left the tertiary sector largely

to private companies: three-quarters of Brazilian students, for instance, attend private universities.

Technological change is driving the adult-education business because it is generating demand for new skills. It has created the bootcamp business, in which recent graduates or adults already in the workplace take short and brutally intense courses that boost their market value by training them in various aspects of tech. “I’ve never seen people work so hard,” says Natasha Jahchan, a former structural engineer who took a ten-week course at General Assembly, the star of the sector, in UX (user experience), costing \$15,000. She left a job that bored her and got a better-paid one she enjoyed: “I spent my savings but I made it back in three months.” Since GA was founded in 2011 it has trained more than 50,000 people, and revenues are growing at 30% a year. Last year it was bought by Adecco, a recruitment company, for \$412m.

Tech has also increased the supply of adult education, since students no longer have to sit in a classroom. Online education started in the for-profit private sector, but has moved into the non-profit and public sectors. Ann Cleland, who had been working as an accountant on the post-hurricane disaster-recovery programme in Puerto Rico, signed up for the Harvard Business School’s business analytics programme, an online nine-month course which teaches strategy in the age of big data, blockchain, machine learning and AI. At \$50,000 it’s not cheap, but to Ms Cleland it was worth every cent. “I cried at graduation and hugged my professors and told them it had changed my life.”

About a third of graduate education is now online, according to Richard Garrett of Eduventures, a consultancy. In this bit of the market, private and public sectors are melding: public universities such as Arizona State University and private non-profits such as the University of Southern New

Hampshire offer online courses designed, supplied and marketed by firms such as Pearson and 2U which commonly take around two-thirds of the revenue.

But the private sector does not just supply education at times and in places where the public sector is not active. It also offers different kinds of education altogether. ■



补漏

有求必应

政府不作为的环节，私立机构行动起来【专题报道《私立教育》系列之二】

一进沙加姆维哈地区就能看见一个标志性的垃圾场，狗和瘦削的奶牛在里头艰难地穿行。该区是四处扩张的南德里之中一个“未经授权的殖民地”。它在未经规划许可的情况下兴起，现有150万居民。政府提供的服务极少。惯于互相残杀的黑帮开着卡车送水。据管理Hari Vidya Bhawan高中的苏希尔·丹卡尔（Sushil Dhankar）说，当地教育由四所公立学校和约一百所私立学校提供。

丹卡尔经营的整洁光鲜的现代化校舍位于一条肮脏的主街旁边的巷子里。穿着一尘不染的奶白色制服的学生用花环欢迎记者。这所学校是丹卡尔的父亲创办的，他恳求儿子放弃在澳大利亚的会计工作，回来帮忙办学。丹卡尔的姐姐管理小学，他的妻子管理初中。这个家族学校蓬勃发展，共招收了2000名4至18岁学生，在印度中央中学教育委员会（CBSE）举办的考试中平均成绩为86%，略高于全国平均。学费从幼儿的每月850卢比（12美元）到最高年级的1800卢比不等。按印度的标准来看这并不便宜。但丹卡尔说，当地的父母——大多是每天赚约500卢比的劳力工人或司机——都准备做出牺牲，“他们不想让孩子也干他们干的活。”

在世界大部分地区，国家为大多数人提供小学和中学教育。但在一些国家，政府难以跟上人口增长和迁移的步伐，而人口增长和迁移最快的国家往往又是政府能力较差的较贫穷国家。

大多数收费低廉的私立学校都是夫妻老婆店。少数连锁机构正在崛起，其中一些是营利性的，比如桥梁国际学院（Bridge International Academies），其投资者包括微软的比尔·盖茨和Facebook的马克·扎克伯格。它们取得了良好的成效，但引发了争议，部分是因为外国人通过给穷人提供教育来赚钱这件事在政治上有些敏感。非营利模式更易于推广。在

孟加拉国和巴基斯坦这两个教育需求巨大的弱国，出现了两家令人印象深刻的非营利性运营商：Brac（为100万名儿童授课）和公民基金会（TCF，22万名）。一些西方非营利性连锁机构，如Peas组织，在非洲取得了优异的成果。

私立教育也在填补儿童早期教育的供给不足。学前教育的入学率差异很大，即使在富裕国家也是如此。大多数国家仅要求孩子从五、六岁开始接受正规教育。但随着人生头几年越来越被视为人脑发展的最关键时期，政府的态度也在变化。在经合组织中，2005至2016年间，三岁以下儿童的学前班入学率从18%上升至33%，三至五岁儿童从76%上升至86%。去年，法国宣布该国儿童将从三岁起接受义务教育。不过各国政府并不希望承担额外的财务负担，因此在大多数地方，这一额外需求主要由私立机构来满足。

富人们将大把砸钱来让自己的孩子“赢在起跑线上”，从Cognita在新加坡新落成的“早教村”就可见一斑。它最终将容纳2100名18个月至6岁儿童。其设施包括114个室外空间，每个教室一个；还有九个配有海盗船、三轮玩具车轨道等设施的游戏平台。教室里四人一组，每组都有一个中央空间，营造出一种社区感。“这栋楼和孩子一起成长，”该中心的两位校长之一亚当·帕特森（Adam Paterson）说，“他们在成长过程中会遍历整个大楼。”学费从每年14,832新加坡元（8393美元）到35,610新加坡元不等。

但是，尽管需求强劲，公司要做早期教育的生意可不是一帆风顺。一些公司在供过于求的市场中苦苦挣扎，例如澳大利亚的八校联盟（G8）。进入门槛很低，而企业在照看孩子这一人们最珍视的资产时需要加倍小心。中国一家大型运营商红黄蓝教育旗下的幼儿园被爆出员工用针扎孩子来实施惩罚，喂药片让孩子午睡，之后股价崩盘。

对教育的需求不仅在早期阶段超出了公立系统的供给，在核心学龄也一样。国家可能每周开课五天，但对许多家长来说这并不够，于是私立机构在晚上、周末和节假日提供补充。益普索莫里市场研究公司（Ipsos MORI）为萨顿信托（Sutton Trust）所做的一项调查显示，接受私立补习

的英国儿童比例从2005年的18%上升到2017年的30%。英国孩子相对还算轻松的，他们平均每周额外学习10小时。而在中国这一数字为12小时，韩国为15小时，保加利亚为16小时。

不是只有精英家庭才花钱补习。益普索莫里的调查显示，虽然富裕的父母相比贫穷的父母更可能诉诸于这种方式，但包括黑人和亚裔在内的少数族裔父母使用它的可能性要比白人高得多。女佣谢哈达·阿西夫（Shehda Asif）的三个孩子在拉合尔郊区的一家小型机构皇家公立学校（Royal Public School）上学，每月学费1700卢比（12美元），另外还要花1000卢比用于课后补习。她的收入几乎全都花在了孩子们的教育上。家里其他开销都要靠她干体力活的丈夫。

在世界大部分地区，私立补习是一种小规模生意，通常都使用临时工，而有这类人员可用本身就是因为更多人接受了教育。在位于拉合尔中下阶层区域“镇区”（Township）的天堂儿童学校（Heaven Kids School），辅导教师中的大多数年轻人本身就是学生。给一个孩子提供每周六天、每天一小时针对巴基斯坦大学预科考试单门课程的辅导的每月收费可高达10,000卢比；如果是辅导IB课程，费用再翻一倍。教师们在定下价格前常常会家访。这个体制适合这些教师，但他们中有些人并不认同它。“父母之间的竞争太激烈了。”正在攻读硕士学位的穆罕默德·阿什法克（Mohammed Ashfaq）说。

但也有一些大公司参与其中。全球最大的两家上市教育公司——新东方和好未来——是中国的补习和备考供应商。技术正在推动业务的扩张，比如富裕国家里缺钱的年轻人现在可以为新兴市场的富家子弟提供辅导了。印度最大的教育科技公司Byju's销售备考应用，订阅月费高达37,000卢比。它有220万付费用户，每天平均花64分钟在该应用上。它比通过互联网雇用美国人便宜，但仍然只适合富人。

私立机构在高等教育市场中发挥重要作用由来已久，这也许是因为学位带来的益处会更明显地归于个人而非整个社会。在富裕国家，政策也在朝这个方向发展。美国高等教育体系的最顶端由学生付费和学生贷款提供资

金，由私立非营利机构主导，中间部分由公立机构主导，底端则由私立营利机构主导。（最后一部分是目前全球私立教育市场中唯一正在萎缩的一块：由于营利性大学的成绩糟糕，奥巴马政府限制其学生获得政府贷款。）英国和澳大利亚也已向学生付费系统倾斜。在发展中国家，高等教育私有化的趋势就更明显了。特别是在拉丁美洲，政府将高等教育大半留给了私立机构。例如，巴西四分之三的学生都在私立大学就读。

技术变革正在推动成人教育业务，因为它正在生成对新技能的需求。它催生了“训练营”业务。在这类营地，刚毕业的学生或已经身在职场的成年人参加短期超高强度课程来获得各类技术培训以提高身价。“我从没见过人们如此努力地学习。”之前担任结构工程师的娜塔莎·雅辛（Natasha Jahchan）说。她参加了该领域的明星企业General Assembly提供的一个为期10周的用户体验（UX）课程，花了15,000美元。她离开了一份让她感到无聊的工作，得到了一份她喜欢的、收入也更高的工作。“我花光了积蓄，但用了三个月就赚了回来。”General Assembly于2011年创办以来已培训超过五万人，营收年增长30%。去年它被人力资源公司阿第克（Adecco）以4.12亿美元收购。

科技也增加了成人教育的供给，因为学生们不再需要坐在教室里。在线教育始于私立营利机构，但已进入非营利和公立部门。曾在波多黎各飓风灾后重建项目中担任会计师的安·克莱兰（Ann Cleland）报名参加了哈佛商学院一个为期九个月的商业分析在线课程，学习大数据、区块链、机器学习和人工智能时代的商业战略。学费五万美元，并不便宜，但对克莱兰来说每一分钱都花得值得。“毕业时我哭了。我拥抱教授们，告诉他们这些课改变了我的人生。”

据咨询公司Eduventures的理查德·加勒特（Richard Garrett）说，现在约三分之一的研究生教育是在线上完成的。在这块市场中，私立和公立部门正在融合：亚利桑那州立大学等公立大学和南新罕布什尔大学等私立非营利性大学提供由培生出版集团（Pearson）和2U等公司设计、供应及营销的在线课程。这些公司通常拿走收入的约三分之二。

但私立机构不仅仅是在公立部门不活跃的时间地点提供教育。它还提供完全不同类型的教育。 ■



Digital literature

Yearning to be touched

An online reading room wants to get into the printing business

WHEN WATTPAD opened its online reading room in 2006, its catalogue contained chiefly public-domain tear-jerkers like “Sense and Sensibility”. It also invited budding Jane Austens to post their own oeuvres. Readers, particularly young women, flocked to the site. It now draws 70m monthly active users. Include poems, novellas and serial chapters, and its virtual shelves buckle under 565m texts in over 50 languages. Now it wants to turn some of them into print.

Online book-reading spaces are proliferating. They include Tor (for science fiction and fantasy), Tapas (comics) and Radish (serialised novels). Wattpad has cornered romance—with an estimated \$1bn in annual book sales in America alone not counting self-published ones, as much as sci-fi and crime combined, a popular genre. Along the way, says Porter Anderson, editor of *Publishing Perspectives*, an online trade journal, it has also tried to solve an age-old problem in the publishing business: how to foretell hits.

Books are costly to promote and, in print, to distribute. Publishers try to predict which manuscripts will succeed. For every bestseller, they still plug plenty of duds. This is especially true for debut novels by unknown authors. Wattpad’s algorithm skims its uploads, as well as user comments and other data, to work out what appeals to readers. The site lets authors and fans interact—and writers fine-tune their work to please the audience. High-scoring page-turners get promoted to advertisers (who pay some authors to weave brands into their narrative) and publishers. “After”, a book which was viewed 1.5bn times on the site, was snapped up by Simon & Schuster and made the *New York Times* bestseller list. In 2018 Netflix released “The

Kissing Booth", based on a Wattpad book by an American author who wrote it when she was 15. It is planning a sequel.

Wattpad, which makes most texts available free of charge, takes a cut of any book or film deal struck, as a literary agent does. It wants to emulate traditional publishers, too. It is toying with paywalls, and in January said it will churn out print runs of its algorithm's top picks. Nearly three in four Americans aged 18 to 29 say they read a print book in the previous year; only two-thirds of their grandparents did. And a physical book is a "trophy" for readers who helped craft the narrative, says Ashleigh Gardner, Wattpad's head of publishing.

Last year Wattpad raised \$51m from venture capitalists, reportedly valuing it at \$400m. Its boss recently insisted revenues were "growing nicely". The firm will not say if it is spilling red ink. Rapt investors are hoping for a happy ending. ■



数字文学

渴望被触摸

一个在线阅读平台想要进军纸质出版

当Wattpad于2006年推出其在线阅读平台时，书目里主要是《理智与情感》这样的煽情公版著作。平台还邀请那些初出茅庐的简·奥斯汀们发布自己的作品。读者蜂拥而至，尤其是年轻女性。现在它每月有7000万活跃用户。包括诗歌、中篇小说和连载作品在内，它的虚拟书架上堆放着以50多种语言写成的5.65亿部作品。现在，它想把其中一些变成纸质书。

在线阅读平台正大量涌现，比如Tor（发布科幻和奇幻作品）、Tapas（漫画）和Radish（连载小说）。Wattpad已垄断了广受欢迎的言情小说版块——单在美国，这类书籍的年销售额估计就达十亿美元（不包括自费出版的部分），相当于科幻和犯罪这两类题材的总和。出版业网络期刊《出版视角》（Publishing Perspectives）的主编波特·安德森（Porter Anderson）说，Wattpad在发展的过程中还试图解决出版业的一个古老问题：如何预测畅销作品。

书的推广成本以及纸质书的发行成本都很高。出版商想方设法预测哪些书稿会成功。在每本畅销书的背后，他们其实还推出了大量失败之作。不出名作者的处女作小说尤其如此。Wattpad的算法浏览上传的作品、用户评论和其他数据，分析吸引读者的元素。平台让作者和粉丝互动，作者可以调整作品来取悦读者。吸引人的高分作品会被推荐给广告主（他们会向一些作者付费，让其在作品内植入品牌广告）和出版商。浏览量达15亿次的作品《之后》（After）被西蒙与舒斯特出版公司（Simon & Schuster）抢下版权，最终打入《纽约时报》畅销书排行榜。2018年，Netflix推出了爱情喜剧《亲吻亭》（The Kissing Booth），改编自一位美国作者在15岁时写就并发布在Wattpad上的一部作品。Netflix正在策划制作续集。

Wattpad平台上的大部分作品都是免费取阅的，而平台就像文学经纪人那

样，从谈成的书或电影版权交易中抽成。Wattpad还想仿效传统出版商。它正在考虑设置付费墙，并在1月份表示将大量付印由算法优选用的作品。18至29岁的美国人中近四分之三表示在过去一年里读过一本纸质书，而在他们的祖父母中这一比例仅为三分之二。Wattpad的出版业务负责人阿什利·加德纳（Ashleigh Gardner）表示，对于参与打造故事的读者来说，一本实体书就是一座“奖杯”。

去年，Wattpad获得了5100万美元的风险投资，据说估值达四亿美元。它的老板最近坚称公司收入“增长不俗”。Wattpad不愿透露自己是否在书写赤字，而看得如痴如醉的投资者在期盼一个圆满的结局。 ■



Insects

Plague without locusts

Insectageddon is not imminent. But the decline of insect species is still a concern

“BE AFRAID. BE very afraid,” says a character in “The Fly”, a horror film about a man who turns into an enormous insect. It captures the unease and disgust people often feel for the kingdom of cockroaches, Zika-carrying mosquitoes and creepy-crawlies of all kinds. However, ecologists increasingly see the insect world as something to be frightened for, not frightened of. In the past two years scores of scientific studies have suggested that trillions of murmuring, droning, susurrating honeybees, butterflies, caddisflies, damselflies and beetles are dying off. “If all mankind were to disappear”, wrote E.O. Wilson, the doyen of entomologists, “the world would regenerate...If insects were to vanish the environment would collapse into chaos.”

Most of these studies describe declines of 50% and more over decades in different measures of insect health. The immediate reaction is consternation. Because insects enable plants to reproduce, through pollination, and are food for other animals, a collapse in their numbers would be catastrophic. “The insect apocalypse is here,” trumpeted the *New York Times* last year.

But a second look leads to a different assessment. Rather than causing a panic, the studies should act as a timely warning and a reason to take precautions.

That is because the worst fears are unproven. Only a handful of databases record the abundance of insects over a long time—and not enough to judge long-term population trends accurately. There are no studies at all of wild

insect numbers in most of the world, including China, India, the Middle East, Australia and most of South America, South-East Asia and Africa. Reliable data are too scarce to declare a global emergency.

Moreover, where the evidence does show a collapse—in Europe and America—agricultural and rural ecosystems are holding up. Although insect-eating birds are disappearing from European farmlands, plants still grow, attract pollinators and reproduce. Farm yields remain high. As some insect species die out, others seem to be moving into the niches they have left, keeping ecosystems going, albeit with less biodiversity than before. It is hard to argue that insect decline is yet wreaking significant economic damage.

But there are complications. Agricultural productivity is not the only measure of environmental health. Animals have value, independent of any direct economic contribution they may make. People rely on healthy ecosystems for everything from nutrient cycling to the local weather, and the more species make up an ecosystem the more stable it is likely to be. The extinction of a few insect species among so many might not make a big difference. The loss of hundreds of thousands would.

And the scale of the observed decline raises doubts about how long ecosystems can remain resilient. An experiment in which researchers gradually plucked out insect pollinators from fields found that plant diversity held up well until about 90% of insects had been removed. Then it collapsed. In Krefeld, in western Germany, the mass of aerial insects declined by more than 75% between 1989 and 2016. As one character in a novel by Ernest Hemingway says, bankruptcy came in two ways: “gradually, then suddenly”. Given the paucity of data, it is impossible to know how close Europe and America are to an ecosystem collapse. But it would be reckless to find out by actually triggering one.

Insects can be protected in two broad ways, dubbed sharing and sparing. Sharing means nudging farmers and consumers to adopt more organic habits, which do less damage to wildlife. That might have local benefits, but organic yields are often lower than intensive ones. With the world's population rising, more land would go under the plough, reducing insect diversity further. So sparing is needed, too. This means going hell for leather with every high-yield technique you can think of, including insecticide-reducing genetically modified organisms, and then setting some land aside for wildlife.

Insects are indicators of ecosystem health. Their decline is a warning to pay attention to it—before it really is too late. ■



昆虫

无蝗之灾

昆虫大灭绝并非迫在眉睫。但昆虫种类的减少仍值得担忧

“要害怕。要非常害怕。”《变蝇人》（The Fly）中的一个角色说道。这部恐怖片讲述了一名男子变成一只巨大的昆虫的故事，刻画出了人们对昆虫王国常常怀有的不安和厌恶——不管是蟑螂、携带寨卡病毒的蚊子，还是各种令人毛骨悚然的爬虫，都时常令人不快。然而，生态学家日益认为人类不应害怕昆虫世界，倒是该为它的现状和未来担忧。过去两年里，大量科学研究表明数万亿嘤嘤嗡嗡作响的蜜蜂、蝴蝶、石蛾、豆娘和甲虫正在消亡。“如果人类全部消失，”昆虫学界的泰斗爱德华·威尔逊（E.O. Wilson）曾写道，“世界会再生……但如果是昆虫灭绝了，自然环境就会陷入混乱。”

这些研究中的大部分都显示，以不同的昆虫健康指标来衡量，几十年来昆虫的数量减少了50%甚至更多。对此，人们最直接的反应是惊恐。昆虫通过授粉使植物得以繁殖，而且还是其他动物的食物，因此，昆虫数量一旦减少，后果将是灾难性的。《纽约时报》去年曾大声疾呼：“昆虫大灾难就在眼前。”

但是再审视一番，就会得出不同的评估结果。研究该做的是适时发出警告，督促人们采取预防措施，而不是引起恐慌。

这是因为人们最深切的担忧尚未被证实。只有少量数据库记录下了大量昆虫在较长时间内的信息，因而不足以准确地判断长期的种群趋势。世界上大多数地区都没开展过任何有关野生昆虫数量的研究，包括中国、印度、中东、澳大利亚以及南美洲、东南亚和非洲的大部分地区。由于可靠的数据太少，无法断言已经出现一场全球性危机。

此外，在那些确有证据显示昆虫数量大减的地方——欧洲和美洲，农业和农村生态系统状况良好。尽管吃昆虫的鸟类正从欧洲的农田消失，但植物

仍在生长、吸引传粉媒介和繁殖。农业产量依然很高。随着一些昆虫物种消亡，其他种类的昆虫似乎正在填补它们留下的空位，令生态系统保持运转，只不过生物多样性较从前降低了。很难说昆虫数量的下降正在造成重大的经济损失。

但也还是存在一些麻烦。农业生产力不是衡量环境健康的唯一标准。动物是有价值的，而且其价值不取决于它们做出的任何直接经济贡献。从养分循环到本地天气，人们在方方面面都要依赖健康的生态系统，而物种越多，生态系统就越有可能保持稳定。昆虫物种毕竟有那么多，少数种类的灭绝可能并不会产生很大影响。但如果数十万种昆虫都走向消亡，影响可能就非同小可。

另外，研究所观察到的昆虫数量下降的程度之大，让人不禁怀疑生态系统的适应力还能保持多久。在一项实验中，研究人员从田间循序渐进地捕集传粉昆虫。他们发现植物多样性保持良好，直到大约90%的昆虫被移除后，植物多样性崩溃了。在德国西部的克雷菲尔德（Krefeld），飞行昆虫的数量在1989年至2016年间下降了75%以上。正如海明威小说中的一个角色所言，破产以两种方式发生：“先是逐渐发生，然后再突然发生。”鉴于数据匮乏，人们不可能知道欧洲和美洲距离生态系统崩溃还有多远。但为了得出答案就真的触发一次崩溃也太不顾后果了。

总的来说，可以通过两种方式保护昆虫：共享和分离。共享是指推动农民和消费者养成更有机的习惯，从而减少对野生生物的伤害。这可能会惠及地方，但有机农业的产出往往低于集约农业。随着世界人口的增加，将会有更多土地被耕种，而这将进一步降低昆虫的多样性。因此还需要分离这一方式。它指的是争分夺秒地积极运用你能想到的每一项高产技术——包括能降低杀虫剂用量的转基因生物，然后留出部分土地供野生生物繁衍生息。

昆虫是生态系统健康的指标。昆虫数量减少是一个警告，提醒我们注意生态健康，不然就真的来不及了。 ■



Bartleby

It's a man's world

The subtle ways in which discrimination works

PREGNANT WOMEN have limited mobility. That is obvious to anyone who has had a baby, but didn't occur to the founders of Google when they designed their car park. When Sheryl Sandberg, then head of online sales, became pregnant in 2004, she made a simple request: parking spaces for expectant women as close to the building entrance as possible.

That is just one example of how many aspects of the workplace lack the female perspective. In her brilliant book "Invisible Women: Exposing Data Bias In A World Designed For Men", Caroline Criado Perez shows how widespread these subtle biases can be.

It starts at the recruitment stage. Women are put off from applying for jobs that use words in their adverts such as "aggressive" or "ambitious". When one company changed its ad to focus on qualities such as enthusiasm and innovation, and used a photo of a woman rather than a man, the proportion of female applicants rose from 5% to 40%.

Once you have a job, you must get to the office. Because they often care for children or elderly relatives, women are likelier to make multiple journeys. Those who use public transport often need radial routes whereas most systems favour commuters heading from the suburb to the centre of town. This means female journeys can be much longer than male ones, making it difficult for them to get to work on time.

Women experience more work-related stress than men, according to research by Britain's Health and Safety Executive, and face a particular problem with long working hours. But a study found that unencumbered

people of both sexes (those with few or no caring responsibilities) could cope equally well with a 48-hour week. The stress occurred because women struggled to combine their caring responsibilities with work, a problem faced by a smaller number of men.

Those responsibilities may also mean that women find it more difficult to take part in after-work bonding activities like dinners, Ms Criado Perez argues. Many companies allow workers to put the cost of food and drink at such events on expenses, but not the cost of a babysitter. That is a problem for single parents, and women comprise 80% of that category in America and 90% in Britain.

When their performance is reviewed, Ms Criado Perez argues that women are criticised for being bossy, abrasive or strident, whereas men are encouraged to be more aggressive. But if women are warm and friendly, they get criticised for being insufficiently professional.

Women's physical health, too, may be affected by male-dominated design. Their bodies absorb chemicals more quickly than men's do. The long-term effects of inhaled particles on (mostly male) miners have been studied extensively; those of cleaning products on (mostly female) cleaners have not. In construction and engineering, tools and safety jackets are designed for male hands and bodies, not female ones. Bulletproof and stabproof jackets are also designed for men and thus do not fit women comfortably; a British police officer removed her jacket so she could use a hydraulic ram to enter a flat, only to be stabbed and killed.

Many men do not realise there is a problem. Those who believe they are objective when recruiting are nevertheless more likely to hire another man than a woman with identical qualifications, as a paper from 2007 showed.

A similar issue is apparent with race, as Jennifer Eberhardt, a professor at

Stanford University, describes in her book “Biased: The New Science of Race and Inequality”. An American study showed that candidates with black-sounding names get fewer callbacks than those with traditional European names. Even highly qualified African-Americans received fewer calls for interview than whites with lesser qualifications. White people with a criminal record received as many callbacks from employers as black people who had never committed an offence. And this was true whether or not the company described itself as an “equal opportunity employer”.

It is natural if you have succeeded in work to assume this was down to your own merits. But the existence of hidden biases shows that the playing field is not level. As both authors argue, preventing discrimination depends not on white men discovering their inner liberal but on decisions being taken by those with broader perspectives. If every executive carries a hammer, it might not occur to them that some jobs need a screwdriver. ■



巴托比

男性主宰的世界

不易察觉的歧视

孕妇行动不便。这在每个有过孩子的人看来都是明摆着的事，但谷歌创始人在设计公司停车场时并没有想到这一点。2004年，时任网络销售主管的谢丽尔·桑德伯格（Sheryl Sandberg）在怀孕期间曾提出一个简单的要求：孕妇的停车位要尽可能靠近办公楼入口。

这个例子折射出职场在很多方面都不能从女性的角度来考虑问题。在《被忽视的女性：男权世界中的数据偏见》（Invisible Women: Exposing Data Bias In A World Designed For Men）这本优秀著作中，卡洛琳·克里亚多·佩雷斯（Caroline Criado Perez）指出了这些不易察觉的偏见有多普遍。

它们在招聘阶段就开始了。如果招聘广告的职位描述中包含“强势进取”或“有雄心抱负”等字眼，女性就容易打消申请的念头。曾有一家公司更改了招聘广告的内容，转为强调热情和创新等品质，并且改用女性而不是男性的照片，之后女性求职者的比例从5%上升到了40%。

一旦有了工作，就必须去办公室。女性经常要照顾孩子或家中长者，所以出行次数往往更多。搭乘公共交通的人往往需要从市中心去往各处，而大多数公交系统却有利于从郊区去往市中心的通勤者。这样一来女性的行程会比男性长得多，也就很难准时到岗。

英国健康与安全执行局（Health and Safety Executive）的调查表明，女性比男性承受了更多工作压力，而且还面临工作时间长这个特定问题。但一项研究发现，那些很少或不用照顾他人的无负担者，无论男女，都能同样自如地应对每周48小时的工作。造成压力的原因是女性很难兼顾家人和工作，而男性面临这一问题的人数较少。

克里亚多·佩雷斯认为，照顾家人可能还意味着女性更难参加下班后的聚

餐等联谊活动。许多公司允许员工报销此类活动的餐饮费用，但不能报销请人看管小孩的费用。这对单亲父母来说是个问题。在美国有80%的单亲父母为女性，英国为90%。

克里亚多·佩雷斯指出，在评估人们的工作表现时，女性会因专横、粗鲁或强硬而受到批评，而男性却被鼓励要更咄咄逼人。但如果女性表现得热情、友好，又会被指责不够专业。

以男性为主宰的设计可能还会影响女性的身体健康。女性比男性更容易吸收化学物质。长期吸入颗粒物对矿工（大多为男性）的影响已经得到广泛研究，而长期吸入清洁产品对清洁工（大多为女性）的影响却没有得到同样多的研究。在建筑和工程行业，工具和防护服都是按照男性而非女性的手和身体来设计的。防弹衣和防刺衣也是为男性设计的，因此女性穿起来就不舒服。曾有一名英国女警为了能用液压破门器进入一间公寓而脱掉了防护服，结果被刺死。

很多男性并没有意识到问题的存在。然而，正如2007年的一篇论文所示，那些在招聘时自认为客观的男性却更有可能录用男性求职者，而不是资历完全相同的女性。

正如斯坦福大学教授詹妮弗·埃伯哈特（Jennifer Eberhardt）在她的著作《偏见：种族与不平等之新学科》（Biased: The New Science of Race and Inequality）中所描述的那样，一个类似的情况在种族问题上也很明显。美国一项研究表明，那些名字听起来像黑人的求职者比听起来像是传统欧洲人名的求职者接到的面试通知电话更少。即使是非常符合条件的非裔美国人，接到的面试电话也少于那些资质更逊色的白人。有过一次犯罪记录的白人与从未犯过罪的黑人接到雇主的面试通知电话一样多。无论公司是否自称为“提供平等就业机会的雇主”，情况都是如此。

人们很自然地会将事业上的成功归因于自身才能。但各种隐性偏见的存在表明竞争环境并不平等。正如两位作者所言，防止歧视靠的不是白人男性开明意识的觉醒，而是那些具备更宽广视野的人所做的决策。如果每个高

管都拿着一把锤子，他们可能不会想到有些工作需要的是螺丝刀。■



China and the Arab world

Middle Kingdom meets Middle East

Chinese money is behind some of the Arab world's biggest projects

THERE IS NOT much to see for the first 500km south of Oman's capital, Muscat, as the highway slices through the Hajar mountains and down a barren coast. Then it hits Duqm, a sleepy fishing village that is being transformed into a mega-port. The government's hope is to capture a share of the shipping trade between Asia, Africa and Europe. And there, in the middle of nowhere, a consortium of Chinese firms wants to invest \$10bn to build a 1,000-hectare industrial zone. "Petrochemicals, glass, solar panels, car batteries—they want to attack all these markets," says Reggy Vermeulen, the port's CEO.

For decades the Middle Kingdom saw the Middle East as a petrol station. About half of China's oil came from Arab states and Iran. Little went in the other direction. In 2008 the region got less than 1% of China's net outbound foreign direct investment (FDI). Skip ahead a decade and Chinese money is everywhere: ports in Oman, factories in Algeria, skyscrapers in Egypt's new capital. Last year it pledged \$23bn in loans and aid to Arab states and signed another \$28bn in investment and construction deals (see chart).

The Arab world is hungry for such investment. Annual FDI inflows have fallen by two-thirds since 2008 and lag far behind other emerging markets. Take Egypt, which is famous for its cotton. Its state-run textile firms are a mess, with machinery that has not been updated in decades. Enter China: in January it promised 2.1bn Egyptian pounds (\$121m) to build modern textile factories outside of Cairo. Officials hope the project will create more than 100,000 jobs.

Such job creation is not common, though. Since 2005 China has signed \$148bn worth of construction deals with Arab states, estimates the American Enterprise Institute, a think-tank. More than one-third of that sum went to energy projects which, while necessary, will not employ many locals. Even the construction itself does not create many local jobs. The China State Construction Engineering Corporation has built both a five-star Sheraton resort in Algiers and a less luxurious prison south-east of Algeria's capital. On these projects, and dozens of others in Algeria worth a combined \$16bn, some 40,000 Chinese labourers did most of the work.

Trade between China and the Arab world is lopsided. In 2017 Tunisia imported \$1.9bn worth of goods from China, 9% of its total imports. It exported just \$30m to China. "Twenty-five percent of our trade deficit comes from China alone," says Lotfi Bensassi, an adviser to the prime minister. The trinkets hawked to tourists in souqs are usually made in Chinese factories, not Arab workshops. In the occupied West Bank even the makers of keffiyehs, a symbol of Palestinian identity, cannot keep up with their Chinese competitors. A few Arab states hope that China's growing taste for olive oil will lower their trade deficits a bit. But China will not put millions of unemployed Arabs to work.

Instead it is following the model that has burdened some Asian and African states with crippling debt. Arab governments have been more cautious. There are no local equivalents of Sri Lanka's "ghost airport", built with Chinese capital and devoid of flights. Algeria, struggling with low oil prices and a high budget deficit, stopped signing big deals with Chinese firms two years ago. Infrastructure loans from China to the Middle East grew almost tenfold from 2015 to 2016, to \$3.5bn. But more than half went to the United Arab Emirates (UAE) to finance projects like the expansion of Dubai's airports, the world's busiest. Wealthy Gulf states like the UAE have no trouble repaying big loans.

Although the UAE is keen to attract China's cash, it is also nervous about its ambitions. Officials at DP World, a port operator mostly owned by Dubai, say its network of ports and railway hubs will complement the Belt and Road Initiative (BRI), a programme of global infrastructure projects by China. Maybe so, but the BRI is also a threat. Almost two-thirds of Chinese exports to Europe, the Middle East and Africa move through Emirati ports. If the Chinese-funded port at Gwadar, in Pakistan, becomes a trans-shipment hub, it could take business from Dubai's flagship Jebel Ali port. Duqm poses a similar threat.

Other countries that are active in the region worry about security. A Chinese firm won the tender to operate a new port in Haifa, Israel's third-biggest city, where American warships often call. America wants Israel to reverse the decision. Oman got a similar warning over Duqm. "They can have a piece of the industrial zone, but we're keen to keep them out of the military side," says an American diplomat in Muscat. In recent months Oman has signed deals that allow the American and British navies to operate in Duqm. China received no such privileges.

Part of what makes China an attractive partner is that its money comes with few strings attached. Its policy of political "non-interference" lets it build ties with mortal enemies—Saudi Arabia and Iran, Israel and Syria—and makes it a useful hedge against America, which Arab autocrats fear will abandon them. But the lack of strategic engagement has a downside. Without ships in the Mediterranean, China needed Greece's help to extract its citizens from war-torn Libya. The opening of China's first overseas military base, in Djibouti, in 2017 may be a sign of broader ambitions.

Arab officials who once ignored China talk of it as a rising regional power—a softer sort than America or Russia. An influx of Chinese tourists has led to hotels in Cairo teaching staff to speak Mandarin and cook Chinese dishes. Diplomats from Beijing often have a command of Arabic that puts their

Western counterparts to shame. When Lebanon's prime minister formed a government in February, after nine months of deadlock, his first visit came from the Chinese ambassador. But China seems to have little interest in sorting out the civil war just over the border in Syria. Mercantilism is its priority, not fixing the region's many problems. ■



中国与阿拉伯世界

当中国遇上中东

中国资本支持了阿拉伯世界一些最大型的项目

从阿曼首都马斯喀特（Muscat）向南走，头500公里的路上乏善可陈。高速公路先穿过哈迦山脉，然后沿荒芜的海岸线下行。接着就到了杜库姆（Duqm），这个原本沉寂的渔村正被改造为一个巨型港口。当地政府希望借此争取亚洲、非洲和欧洲之间的部分航运贸易。在这个荒僻的地方，一个中国企业财团打算投资100亿美元建造一个占地1000公顷的工业区。“石油化工、玻璃、太阳能电池板、汽车电池，他们想打入所有这些市场。”杜库姆港的CEO雷吉·韦尔默朗（Reggy Vermeulen）说。

几十年来，中国一直将中东视为一个加油站。中国约有一半的石油来自阿拉伯国家和伊朗。而它对这些国家的输出很少。2008年，在中国的对外直接净投资中，流向这一地区的不到1%。十年过去了，现在中国资金无处不在：阿曼的港口、阿尔及利亚的工厂、埃及新首都的摩天大楼都有中资的身影。去年，中国承诺向阿拉伯国家提供230亿美元的贷款和援助，并另外签署了价值280亿美元的投资和建设协议（见图表）。

阿拉伯世界急需这些投资。自2008年以来，该地区的外国直接投资年流入额下降了三分之二，远远落后于其他新兴市场。以盛产棉花的埃及为例，其国营纺织公司境况糟糕，机械设备已几十年没有升级更新。现在中国登场了：今年1月，中国承诺投资21亿埃及镑（1.21亿美元）在开罗郊外建造现代化纺织工厂。官员们希望该项目能创造超过十万个就业岗位。

但是，像这样大量创造职位并不常见。智库美国企业研究所（American Enterprise Institute）估计，自2005年以来，中国与阿拉伯国家签署了价值1480亿美元的建筑工程协议。其中超过三分之一的资金用于能源项目。这些项目有其必要性，但不会雇用很多当地人。就连施工过程本身也不会为本地创造多少工作机会。中国建筑工程总公司在阿尔及尔建造了一座五

星级喜来登度假酒店，在阿尔及利亚首都东南部建造了一座监狱。这些项目的施工，以及阿尔及利亚数十个总值160亿美元的项目的施工，大部分都是由约四万名中国工人完成的。

中国与阿拉伯世界之间的贸易是不平衡的。2017年，突尼斯从中国进口了19亿美元的商品，占其进口总额的9%。而突尼斯对中国出口的货物总值仅为3000万美元。“我们的贸易逆差有25%来自中国。”突尼斯总理的顾问拉蒂夫·本沙斯（Lotfi Bensassi）说。当地集市摊贩向游客兜售的小饰品往往不是产自阿拉伯的作坊，而是中国的工厂。在约旦河西岸被占领地区，连“库菲亚”头巾（象征巴勒斯坦人身份的阿拉伯头巾）的制造商也竞争不过中国对手。中国人对橄榄油的兴趣日渐增长，一些阿拉伯国家希望这能帮助自己减少一些贸易逆差。但中国无法为数百万失业的阿拉伯人带来工作。

相反，中国正在采取的模式已经导致亚洲和非洲一些国家负债累累。相比之下，阿拉伯各国政府更谨慎些。当地没有像斯里兰卡的“幽灵机场”（中资兴建，却没有航班使用该机场）那样的工程项目。因低油价和高预算赤字而身处困境的阿尔及利亚两年前停止与中国公司签署大宗交易协议。从2015年到2016年，中国提供给中东的基础设施贷款增长了近十倍，达到35亿美元。但其中超过一半流向了阿联酋，用于资助全球最繁忙机场之一迪拜机场的扩建等项目。像阿联酋这样的富裕海湾国家在偿还大笔贷款上没什么困难。

尽管阿联酋很想吸引中国资金，但也对中国的野心感到不安。迪拜控股的港口运营商迪拜环球港务集团（DP World）的官员表示，迪拜的港口和铁路枢纽网络将对中国的全球性基础设施项目“一带一路”倡议起到补充作用。或许确实如此，但“一带一路”也是一种威胁。中国对欧洲、中东和非洲的出口有近三分之二是通过阿联酋的港口转运的。如果位于巴基斯坦瓜达尔的中资港口成为转运枢纽，将会抢走迪拜头号港口杰贝阿里（Jebel Ali）的生意。杜库姆也会造成类似的威胁。

活跃于该地区的其他国家对安全问题感到担忧。一家中国公司赢得了在以

色列第三大城市海法运营一个新港口的招标，而美国军舰常在此短暂停留。美国希望以色列改变这一决定。在杜库姆项目上，阿曼也收到了类似的警告。“工业区可以让中国拿一部分，但我们会极力阻止他们染指军事领域。”马斯喀特的一位美国外交官说道。近几个月，阿曼签署了协议，允许美国和英国海军在杜库姆港活动。中国则没有这样的特权。

中国成为吸引人的合作伙伴，部分原因是其投资的附带条件不多。靠着不干涉他国内政的原则，中国在一些互为死敌的国家之间左右逢源，例如沙特阿拉伯和伊朗、以色列和叙利亚；还成为中东国家用以制衡美国的有用工具——阿拉伯独裁者担心美国会抛弃自己。但缺席军事战略部署有个坏处。之前，中国需要希腊相助才得以将其公民从战火纷飞的利比亚撤出，因为它在地中海没有自己的舰船。2017年，中国首个海外军事基地在吉布提投入使用，也许是中国野心增大的信号。

曾经不把中国放在眼里的阿拉伯官员如今称中国为崛起的地区强国——比美国或俄罗斯更温和的那种。由于中国游客大量涌入，开罗的酒店已培训自己的员工讲普通话、做中国菜。来自北京的外交官往往懂阿拉伯语，让他们的西方国家同行自愧不如。经过九个月的僵局之后，黎巴嫩总理在今年2月组建了政府，最先拜会他的是中国驻黎巴嫩大使。但中国似乎无意调解边境那一边的叙利亚内战。它的首要考虑是在商言商，而不是解决该地区的诸多问题。 ■



The new black arts of manufacturing

How to knit a sports car

Faster ways to knit together carbon fibre will transform many products

BERTHA RESIDES on a quiet industrial estate in Bristol, in the west of Britain. The affectionate name has been given to what at first appears to be a giant loom from the Industrial Revolution. And in some ways it is. Bertha (pictured) is an automated braiding machine. Like a horizontal maypole, ribbons of carbon fibre are drawn from 288 bobbins contained on a pair of huge rings, and passed over and under one another as they are wound tightly around a revolving mould. The final product could be a propeller for an aeroplane, a ship's hydrofoil or a set of wheels for a sports car. In fact, Bertha can knit just about any hollow component up to 800mm by ten metres, and do so quickly and accurately by depositing some 300kg of carbon fibre an hour.

Just as textile production began to be mechanised at the end of the 18th century, creating the modern factory, manufacturing is going through another revolution. This time it is driven by digital processes and new materials, such as carbon-fibre composites. Automated braiders are one of several new systems turning carbon-fibre production from a slow, labour-intensive craft into a mass-manufacturing process that will change many industries.

Carbon fibre is attractive because it is lightweight and exceptionally strong. The toughest fibres are up to ten times stronger than steel and eight times more so than aluminium, reckons Zoltek, an American carbon-fibre producer. Carbon fibre is also five times lighter than steel and half the weight, or less, of aluminium. Nor does it corrode. In transport industries, where "lightweighting" is most valuable, carbon fibre allows aircraft and

cars to be made lighter and so travel farther on the same amount of fuel or a single charge of their batteries. This will help them meet tougher emissions targets.

And there are other advantages, too. One is that carbon fibre allows manufacturers to make much larger, more complex parts in one go, says Richard Oldfield, chief executive of the National Composites Centre (NCC), a research laboratory set up by the University of Bristol, and home to Bertha. Instead of making an aircraft's wing or car body by welding, riveting and bolting together hundreds of individual components, these bits can be consolidated into a single carbon-fibre structure. This saves time and materials and allows designers to come up with novel products.

Engineers got interested in carbon fibre in the 1960s. The fibres consist of carbonised polymers, made up of long strings of molecules bound together by the powerful bonds between carbon atoms. The fibres are made by heating a precursor material to around 3,000°C in a protective atmosphere of inert gases. The most commonly used precursor is polyacrylonitrile (PAN), which is produced by the petrochemicals industry. Pitch, obtained from coal tar, is sometimes used instead. Once carbonised, the fibres are wound onto bobbins, spun into yarns or formed into tapes. Depending on the final application, they can also be woven into fabric sheets.

On their own, carbon fibres are brittle and can break easily. But their strength comes in tension (they resist being pulled apart). So, the fibres need to be aligned in such a way to impart their strength by distributing loads throughout a structure. This is done by placing the fibres, tapes or mats onto a mould in the required orientation, creating what is known as a preform. It is a slow process often done by hand. This is now being automated, aided by the fact that the optimal alignment of the fibres is often calculated using sophisticated computer-aided design systems, and the same data can program robots to lay-up the fibres or wind them on

braiding machines such as Bertha.

The preforms then need to be made solid. This is done by impregnating the fibres with a chemically activated resin, which hardens when it is cured. The curing process is usually carried out inside a large oven called an autoclave, which applies heat and pressure to consolidate the structure and force out any air bubbles. It can take hours, sometimes with autoclaves left to run overnight. For a relatively low throughput this might not be a problem. But for higher volumes, especially in carmaking, faster cycle times are needed.

Various out-of-autoclave curing techniques are starting to be used. One is resin transfer moulding (RTM). This involves placing preforms inside a mould which is then closed. Resin is injected into the mould and heat and pressure applied. Depending on what is being produced, RTM can cut processing times by half or more.

McLaren has been making sports cars out of carbon fibre since the British company used the material for the world's first Formula 1 racing car in 1981. All F1 cars are now made from carbon fibre, and the protection it affords drivers has allowed many to walk away from spectacular crashes. To build its sports cars the company starts with a carbon-fibre "MonoCell", a giant tub which forms the main structure of the vehicle.

The company uses a specialist contractor to make MonoCells, although those for future car models will be produced at a new £50m (\$65m) McLaren Composites Technology Centre in Sheffield, Britain. The first of the new cells has just been delivered. Impressively, the large and complicated structures are produced with RTM in one go—although McLaren is keeping the details secret. "I often look at the MonoCell and wonder myself how it is possible to make it," says Claudio Santoni, the centre's technical director.

McLaren says carbon fibre will be essential in keeping weight down in

future hybrid and electric models. By 2025 it expects the centre to be making MonoCells for some 6,000 cars a year. As a high-end brand, it is not seeking large volumes. But other carmakers are. One is BMW, which uses a variant of RTM in Leipzig, Germany, to make bodies for more than 130 of its i3 electric cars every day. BMW plans to increase that number substantially.

Another speedy production process is “overmoulding”. This combines sheets of carbon fibre with injection-moulded plastic. Injection moulding has long been used to produce plastic parts by extruding a molten polymer into a mould. It is quick and accurate. By combining the two processes, overmoulding allows plastic parts to be selectively reinforced with carbon fibre. Thus strengthened, such parts could be used as car doors, aircraft interiors and in many other products. The NCC reckons an overmoulding system it is working with in Bristol can churn out finished components in just 60 seconds.

Progress is also being made in reducing the cost of carbon fibre itself. Prices vary according to quality, but industrial-grade carbon fibre is roughly \$20 a kilogram, although aerospace versions are more expensive. By comparison, steel used in carmaking is about \$1 a kilogram. As carbon fibre is so much lighter and stronger than steel, less material is needed. And the additional cost is also compensated for by product-lifetime savings on fuel and emissions. Nevertheless, cheaper carbon fibre would find greater use in manufacturing.

Oak Ridge National Laboratory in Tennessee thinks it could cut the cost of industrial-grade carbon fibre by about half with more efficient production processes. According to some estimates, roughly 90% of the energy needed to make things with carbon composites is consumed in producing the fibre itself. Oak Ridge is looking at the use of cheaper alternatives to PAN and low-temperature carbonisation processes.

The lab also uses chopped-up carbon fibre in large-scale 3D printers to produce structures. It recently employed the system to print moulds for the precast concrete façade of the Domino tower, a new 42-storey building in Brooklyn, New York.

Chopped carbon fibres can be made from manufacturing offcuts or recycled material. Recycling will become even more important once a greater number of carbon-fibre cars, aircraft, ships, wind turbines and other products reach the end of their working lives. There will be mountains of the black stuff to deal with. Companies are coming up with ways to recover the fibres, usually with heat or chemicals. Sometimes the fibres can be re-spun, but if they are too short they can still be suitable for parts subject to less stress. A combination of lower-cost mass-production techniques and effective carbon-fibre recycling, will lead to a lot more Berthas knitting away furiously. ■



制造业黑科技

如何编织一辆跑车

有了更快速的碳纤维编织技术，很多产品都将彻底改变

位于英国西部城市布里斯托尔（Bristol）的一个安静的工业园区是“贝莎”的安身之所。这个被亲切唤作“贝莎”的家伙乍看上去像一台工业革命时期的巨型织布机。从某种意义上说确实如此。贝莎（见图）是一台自动编织机。就像一根水平放置的五朔节花柱，碳纤维带从一对巨环上的288个线轴中抽出，彼此交叠，紧紧缠绕在一个旋转的模具上。最终的产品可能是飞机的螺旋桨、轮船的水翼或者跑车的一组轮子。事实上，贝莎几乎可以编织任何直径800毫米以内、长度10米以内的空心部件。它的动作快速而精确，每小时能编织约300公斤碳纤维。

十八世纪末，纺织生产开始机械化，现代工厂应运而生；如今制造业正在经历另一场革命。这一次的驱动力是数字工艺流程和碳纤维复合材料等新材料。碳纤维生产本是缓慢的劳动密集型工艺，而自动编织机是将之转变为大规模生产工序的几个新方法之一。这种变化将改变很多行业。

碳纤维之所以受到青睐是因为它不仅轻量，还异常结实。美国碳纤维制造商卓尔泰克（Zoltek）估算，最结实的碳纤维的强度最高可达钢的十倍、铝的八倍。而碳纤维的重量是钢的五分之一、铝的一半甚至更少。它还抗腐蚀。在“轻量化”至上的运输行业，采用碳纤维的飞机和汽车质量更轻，因此在消耗等量燃料或电池单次充电的情况下可以行进得更远。这将有助于它们达到更严格的排放目标。

碳纤维还有其他优点。由布里斯托尔大学设立的研究实验室——英国国家复合材料中心（NCC）——是贝莎的出生地。该中心的首席执行官理查德·奥德菲尔德（Richard Oldfield）表示，碳纤维的优势之一是让厂家可以一次性生产出大得多的、更复杂的零部件。在制造飞机机翼或汽车车身时，不需要通过焊接、铆接和栓接将数百个单独部件连接在一起，而是可以将

这些部件集成到一整个碳纤维结构体之中。这节约了时间和材料成本，还能让设计师构想出新颖的产品。

上世纪60年代，工程师们对碳纤维产生了兴趣。碳纤维由碳化聚合物构成。而碳化聚合物则由通过碳原子之间强有力的成键而结合在一起的长串分子组成。碳纤维是在由惰性气体环绕的保护性环境中，将前驱体材料加热到 3000°C 制成的。最常用的前驱体材料是在石化工业中生成的聚丙烯腈（PAN）。从煤焦油中提取的沥青有时也用来替代PAN作为前驱体材料。纤维碳化后被缠绕在线轴上，纺成线或织成带，有时也根据最终用途而被织成碳纤维布。

碳纤维本身很脆，容易破裂。但它们结合在一起后的抗拉强度好，不容易被拉断。为此需要将纤维排列成可以将压力分散到整体中的结构。这是通过将碳纤维线、带或布按指定方向铺放在模具上，生成所谓的预制体而完成的。这一工艺流程通常由手工操作，缓慢费时，而如今正在实现自动化。这得益于先进的计算机辅助设计系统，它们一般可以计算出纤维的最佳排列方式；而且这些排列数据也能用来给机器人编程，在像贝莎这样的编织机上将纤维铺叠或缠绕起来。

然后需要将预制体固化。方法是使用经化学活化的树脂来浸渍纤维，这种树脂固化后就会变硬。固化工艺通常是在一个叫作高压釜的大容器里进行。高压釜通过加压、加热将结构体合成一体，并强制排出所有气泡。整个过程可能耗时数小时，有时高压釜要通宵达旦地工作。如果产量不高，可能问题还不大。但如果需要更高的产量，特别是在汽车制造业，就需要更短的固化周期。

各种不使用高压釜的固化工艺开始得到应用。一种是树脂传递模塑（RTM）。这需要将预制体放入模具内，而后关闭模具。将树脂注入模具并加热加压。根据制成品的不同，RTM可以将固化时间减少一半或更多。

迈凯伦于1981年率先将碳纤维用于一级方程式赛车，自那之后这家英国公司一直在用碳纤维制造跑车。如今所有F1赛车都由碳纤维制造。碳纤维的

保护作用让很多车手得以在严重撞车事故中免受伤害。在打造跑车时，迈凯伦从巨大的碳纤维底盘MonoCell入手，这是汽车的主体构成部分。

迈凯伦将MonoCell的制造交给了一家专业承包商。不过，未来新车型的MonoCell将在斥资5000万英镑（6500万美元）打造的、位于英国谢菲尔德（Sheffield）的迈凯伦复合材料技术中心（McLaren Composites Technology Centre）内生产。首批新MonoCell刚刚交付。值得称道的是，这些复杂的大型结构体是用RTM工艺一次性完成的。不过该公司拒不透露细节。该中心技术总监克劳迪奥·桑托尼（Claudio Santoni）表示：“我自己常常看着MonoCell惊叹这怎么可能造出来。”

迈凯伦表示，碳纤维未来将在混动和电动车型中发挥至关重要的减重作用。该公司预计，到2025年，技术中心每年将为约6000辆车生产MonoCell。作为一个高端品牌，迈凯伦不求以量取胜。但其他汽车厂商却不是这样。其中之一是宝马，它在德国莱比锡（Leipzig）运用一种类似RTM的工艺每天为其130多辆i3电动车制造车身。宝马还计划大幅提高这一产量。

另一种快速的生产工艺是“二次成型”。它把碳纤维布和注射成型的塑料制品相结合。注射成型是指将熔融聚合物挤压进模具，这种方法一直被用于生产塑料零部件，快速且精准。而二次成型则是在注射成型工艺的基础上，用碳纤维来选择性地增强某些塑料零部件。如此增强之后，这些零部件可被用作车门、飞机内饰等许多产品。NCC估算，他们在布里斯托尔使用的一套二次成型系统在短短60秒时间内就能生产出成品。

此外，在降低碳纤维成本方面也在取得进展。价格根据质量而浮动，但工业级碳纤维的价格每公斤要大概20美元，而航空级碳纤维还要更贵。相比之下，汽车用钢的价格每公斤只有约1美元。由于碳纤维比钢轻得多，也牢固得多，所以需要的材料更少。此外，产品在生命周期内的燃料消耗和排放会减少，这也足以抵消一部分增加的成本。尽管如此，只有价格降低，碳纤维在制造业中才会派上更大的用场。

位于美国田纳西州的橡树岭国家实验室（Oak Ridge National Laboratory）认为，更高效的生产工艺可以将工业级碳纤维的成本降低大约一半。根据一些估计，生产碳复合材料制品所需的能源中约有90%都消耗在制造纤维本身。橡树岭实验室正在研究使用更经济的PAN替代品和低温碳化工艺。

橡树岭实验室还使用部分由碳纤维碎片制成的大型3D打印机来制造结构件。近期该实验室使用了这套方法，为纽约布鲁克林新建的42层多米诺大厦（Domino tower）的预制混凝土立面打印模具。

碳纤维碎片可由工业边料或再生材料制成。一旦有更多碳纤维汽车、飞机、轮船、风力涡轮机和其他产品的使用寿命到期，回收利用将变得更加重要。届时将会有堆积如山的碳纤维需要处理。各公司正在想方设法回收碳纤维，通常是通过加热或化学处理。碳纤维有时也可以被重新纺成线；即使是很短的纤维，也仍适合用来编织受压更小的零部件。一旦低成本的大规模生产工艺和碳纤维的高效回收利用相结合，将会有越来越多的贝莎投身编织事业，玩命地工作。 ■



Free exchange

It's complicated

How economists are grappling with the unpredictable outcomes of simple interactions

CONSIDER THE task economists have set themselves. The global economy is the outcome of near-constant interaction between billions of unique individuals. To attempt to model even a small corner with a few equations is bold, even foolhardy. That economists have made as much progress as they have is impressive.

Might a radically different approach do better? In February the *Boston Review*, a quarterly magazine, convened a forum to discuss prospects for an “economics after neoliberalism”. “What we call ‘the economy’”, read one of the entries, “is in fact a highly complex, multi-level system. It must be studied as such.” The authors represent “complexity economics”. Though still a niche within the field, its potential impact is profound.

Most economics is centred on equilibrium: an economy’s natural resting state. Solving a set of equations that describes a market, conceived of as populated by predictably self-interested individuals who face various constraints, yields that equilibrium—the prices that balance supply and demand, say, and the level of welfare generated. A researcher can subject such a toy economy to an external shock, such as a new technology or a change in tax policy, and watch it return to a new equilibrium. But no matter how much these models are perturbed, they cannot generate the strangeness of economic events seen in the real world.

Complexity economics draws on strands of the discipline less enamoured of equilibrium. Joan Robinson, a British economist, worried that equilibrium models understated the role of history in determining outcomes. Joseph

Schumpeter, an Austrian economist, saw the economy as undergoing constant change, powered by innovation. And Friedrich Hayek, another Austrian, wrote on how the separate actions of individuals could generate “spontaneous order” of incomprehensible complexity.

But a bigger influence is the multidisciplinary study of complex systems, the components of which are well understood but interact to produce unexpected large-scale phenomena. The whole is weirder than the sum of the parts. Flowing water can produce unpredictable turbulence, for example, even though the molecules are obeying simple, deterministic physical laws. In 1984 a group of scientists, most of them fundamental physicists at the Los Alamos National Laboratory, a nuclear-research facility in New Mexico, founded the Santa Fe Institute, a centre devoted to the study of complex systems. In 1987 scientists there met with a group of economists, among them Kenneth Arrow, a Nobel prizewinner, to consider how the study of complex systems might be of use in economics.

The meeting was timely. In the 1970s critics of Keynesian economic models had argued that important macroeconomic relationships, such as that between unemployment and inflation, were not fixed but would change as people observed and adjusted to government policy. A reliable model of the macroeconomy, they reckoned, should have “microfoundations”. It should derive its descriptions of the economy as a whole from mathematical characterisations of individuals’ behaviour. It has become fashionable to scorn such models because they rely on unrealistic assumptions—in particular, that people are rational and purely self-interested. Some scholars are working to improve them by incorporating the insights of behavioural economists. Complexity economists say the project was doomed from the start. Even models based on more realistic descriptions of human behaviour would fail to capture the odd outcomes that can emerge out of interactions among billions of people.

The complexity approach begins with more human humans. People are not purely rational or self-interested, but reason with limited information and follow rules of thumb. Those rules evolve as people learn from and adjust to the world around them. Out of countless interactions complex structures emerge, such as firms and political institutions. These constitute a “meso”, or middle, layer between the microeconomy and the macroeconomy, which affects both. There is no single guaranteed equilibrium: neither a tendency towards a particular outcome nor a point at which everything settles down and scholars can take stock.

How such a system plays out is exquisitely sensitive to the starting position; you have to run history forward to know the result. But much can still be understood. Economists can use powerful computers to see what sorts of things might happen. They can specify decision rules for algorithms that stand in for the people in an economy, choose a starting position and see how the algorithms interact. For example, work by Brian Arthur, a founding scholar of complexity economics, has explored how one of a number of competing technologies can come to dominate a market, even if it is not technically superior. Such exercises show how much history matters. They reveal how seemingly stable systems can flip from one state to an entirely different one: from stasis to industrialisation, say, or from placid financial markets to crisis. César Hidalgo and Ricardo Hausmann, for instance, have explored the link between an economy's complexity, as determined by bilateral export links, and growth in income per person.

Orthodox economists also study such matters. Models incorporating increasing returns to scale explain how one firm among many can rise to become a monopolist, or how the actions of self-interested individuals can transform one town into a megacity while another withers. But complexity economists reckon that these oddities are not zigzags away from a path towards a single predictable outcome. Rather, they are the norm.

Complexity has yet to up-end economics. It still provides more metaphors than results. But it offers new approaches to hard questions. In time its contributions will grow—until, perhaps, economics suddenly flips from one way of doing things to another. ■



自由交流

这很复杂

经济学家如何努力破解这样一个难题：简单互动带来不可预测的结果

想想经济学家给自己设定的任务吧。全球经济是数十亿独特个体之间几乎不停互动的结果。想用几个方程式去模拟哪怕一个小小的角落都是大胆甚至鲁莽的。这么看来，经济学家已经取得的进展令人赞叹。

另辟蹊径是否能做得更好？2月，《波士顿评论》季刊（Boston Review）举办了一个论坛，讨论“新自由主义之后的经济学”的前景。其中一篇文章写道，“我们所说的‘经济’实际上是一个高度复杂的、多层次的系统。对它的研究也必须基于这样的认知。”该文作者们代表的是“复杂经济学”。尽管这在经济学领域仍属小众，但有着深远的潜在影响。

大部分经济学的核心是均衡：一个经济体自然的稳定状态。假设一个市场诚如所料是由利己且面临各种约束的个人组成的，那么解一组描述该市场的方程就会得出均衡解，比如让供求平衡的价格，以及所产生的福利水平。研究人员可以让这样的模拟经济经受外部的冲击，譬如一项新技术或税收政策的改变，然后观察它回归新的均衡。但无论这些模型受到多大的干扰，都无法生成现实世界中所见的经济事件的奇异。

复杂经济学关注的是经济学中不那么注重均衡的部分。英国经济学家琼·罗宾逊（Joan Robinson）担心，均衡模型低估了历史在决定结果上起到的作用。奥地利经济学家熊彼特认为，经济是在创新的推动下不断变化的过程。另一位奥地利人弗里德里希·哈耶克（Friedrich Hayek）曾论述个体的独立行为如何能产生一种复杂到难以理解的“自发秩序”。

但带来更大影响力的是对复杂系统的多学科研究。这些复杂系统的组成部分很好理解，但它们的相互作用会产生意想不到的大规模现象。整体结果比各部分之和更奇怪。举例来说，虽然水分子遵循简单而确定的物理定律，但水流却会产生不可预测的湍流。1984年，一群科学家——其中大多

数是位于新墨西哥州研究核能的洛斯阿拉莫斯国家实验室（Los Alamos National Laboratory）的基础物理学家——成立了圣达菲研究所（Santa Fe Institute），这是一个专门研究复杂系统的中心。1987年，研究所的科学家们和一群经济学家见了面，其中有诺贝尔奖得主肯尼斯·阿罗（Kenneth Arrow），讨论对复杂系统的研究如何能在经济学中发挥作用。

这次会面很及时。上世纪70年代，凯恩斯经济模型的批评者辩称，重要的宏观经济关系，如失业与通胀之间的关系，并非一成不变，而是会随着人们观察政府政策并相应做出调整而发生变化。他们认为，一个可靠的宏观经济模型应该有“微观基础”。它应该根据个人行为的数学特征得出对整个经济的描述。鄙视这些模型已经成为一种时尚，因为它们依赖于不切实际的假设，尤其是相信人是理性的和完全利己的。一些学者正努力吸收行为经济学家的洞见，以期改善这种模型。复杂经济学家说，这个方案从一开始就注定要失败。即使模型是基于对人类行为更为现实的描述，也无法捕捉到数十亿人之间的互动可能产生的奇怪结果。

复杂经济学方法从考虑更贴近人性的人入手。人并不是完全理性或利己的，而是利用有限的信息来推理，遵循经验法则。随着人们对周围世界的学习和适应，这些法则也会逐渐演变。在无数次的互动中，复杂结构出现了，例如公司和政治体制。它们构成了微观经济和宏观经济之间的“中观”层，对两者都有影响。这其中并不确保存在一种均衡：既没有一种趋向特定结果的趋势，也没有一个让一切都平定下来、可供学者们评估归纳的点。

这样一个系统的运行情况对起始位置极为敏感，你必须向前推进历史才能知道结果。但仍有很多东西是可以理解的。经济学家可以使用强大的计算机来观察可能发生的情况。他们可以用算法来代替经济体中的人，再为算法指定决策规则，选择一个起始位置，看算法如何互动。例如，复杂经济学的奠基学者布莱恩·阿瑟（Brian Arthur）研究了在多种相互竞争的技术中，一种技术如何脱颖而出，成为一个市场的主宰，即使它在技术上并不优越。这些研究显示了历史的重要性。它们揭示了看似稳定的体系是如何从一种状态转变为完全不同的另一种状态：比如从停滞期进入工业化，或

者从平稳的金融市场进入危机。塞萨尔·伊达尔戈（César Hidalgo）和里卡多·豪斯曼（Ricardo Hausmann）对双边出口关系决定的经济复杂性与人均收入增长之间关系的研究就是个例子。

正统经济学家也研究这类问题。规模收益递增模型解释了一家公司如何从众多公司中崛起而成为垄断者，或者个人的利己行为如何将一个小城镇变成一座大城市，却让另一座城市走向衰败。但复杂经济学家认为，这些奇特现象并不是偏离那条产生单一可预测结果的大路的曲折小路。相反，它们才是常态。

复杂性尚未颠覆经济学。它提供的隐喻仍然多于结果。但它给出了解决难题的新方法。随着时间的推移，它的贡献将不断增加——也许有一天，经济学的研究方法会突然转向。 ■



Tech stars

The trouble with tech unicorns

Millions of users, cool brands and charismatic bosses. Tech's latest stars have everything—except a path to high profits

INVESTORS OFTEN describe the world of business in terms of animals, such as bears, bulls, hawks, doves and dogs. Right now, mere ponies are being presented as unicorns: privately held tech firms worth over \$1bn that are supposedly strong and world-beating—miraculous almost. This week Uber will raise some \$10bn in what may turn out to be this year's biggest initial public offering (IPO). It will be America's third-biggest-ever tech IPO, after Alibaba and Facebook. Airbnb and WeWork could follow Lyft, which has already floated, and Pinterest, which did so two weeks ago. In China, an IPO wave that began last year rumbles on. Thanks to fashionable products and armies of users, these firms have a total valuation in the hundreds of billions of dollars. They and their venture-capital (VC) backers are rushing to sell shares at high prices to mutual funds and pension schemes run for ordinary people. There is, however, a problem with the unicorns: their business models.

As we have recently reported, a dozen unicorns that have listed, or are likely to, posted combined losses of \$14bn last year. Their cumulative losses are \$47bn. Their services, from ride-hailing to office rental, are often deeply discounted in order to supercharge revenue growth. The justification for this is the Silicon Valley doctrine of “blitzscaling” in order to conquer “winner-takes-all” markets—or in plain English, conducting a high-speed land grab in the hope of finding gold.

Yet some unicorns lack the economies of scale and barriers to entry that their promoters proclaim. At the same time, tighter regulation will

constrain their freedom to move fast and break things. Investors should demand lower prices in the IPOs, or stay away. Tech entrepreneurs and their backers need to rethink what has become an unsustainable approach to building firms and commercialising ideas.

Today's unicorn-breeding industry would not have been possible 25 years ago. In 1994 only \$6bn flowed into VC funds, which doled out cheques in the single-digit millions. Before Amazon staged its IPO in 1997 it had raised a total of only \$10m. Three things changed. Growing fast became easier thanks to cloud computing, smartphones and social media, which let startups spread rapidly around the world. Low interest rates left investors chasing returns. And a tiny elite of superstar firms, including Google, Facebook and China's Alibaba and Tencent, proved that huge markets, high profits and natural monopolies, along with limited physical assets and light regulation, were the secret to untold riches. Suddenly tech became all about applying this magic formula to as many industries as possible, using piles of money to speed up the process.

Make no mistake, the unicorns are more substantial than the turkeys of the 2000 tech bubble, such as Pets.com, which went bust ten months after its IPO. Ride apps are more convenient than taxis, food delivery is lightning quick, and streaming music is better than downloading files. Like Google and Alibaba, the unicorns have large user bases. Their core businesses can avoid owning physical assets by outsourcing their IT to cloud providers. As IPO documents point out, their sales are growing fast.

The big worry is that their losses reflect not temporary growing pains but markets which are contested and customers who are promiscuous. In the key digital monopolies, the network becomes more valuable to each user the more people use it—hence Facebook's 67% market share in social networking. The unicorns' dynamics are not as compelling. Despite subsidies, ride-sharing customers are not locked in to one firm. No wonder

Lyft's shares have fallen by over 20% below their IPO price. Anyone can lease an office and rent out desks, not just WeWork. Some unicorns have to fight other richly funded rivals and established firms. Spotify, which listed in 2018, has a 34% share of music streaming in America and is going head-to-head with Apple.

Because the unicorns' markets are contested, margins have not consistently improved, despite fast-rising sales. Managers are terrified of cutting their vast marketing spending, for fear of losing customers. Many firms are scrambling to develop ancillary products to try to make money from their users. And without deep moats around their businesses a permanent question-mark hangs over the unicorns: if Uber really is worth \$100bn, after investing only \$15bn or so, why wouldn't its rivals keep trying their luck, or an established tech giant be tempted in?

External forces will make blitzscaling harder, too. The earlier generation of firms did not face many rules—few legislators had imagined the internet—so they could charge ahead first and beg forgiveness later. The unicorns followed suit: Airbnb sidestepped taxes on hotels and Uber drove through regulations on taxi-licensing. Today a reaction is in full swing, including over digital taxes and data and content laws. The unicorns' investor circulars have pages dedicated to their legal dangers and gory regulatory risks.

All this is good for consumers. Money is being thrown at them; the subsidy to the public from the dozen firms amounts to \$20bn a year. Whereas the commanding heights of the tech industry, such as search and social media, have been monopolised, the unicorns are at least creating competition in other areas.

Investors, meanwhile, need to hold their nerve. It is tempting to extrapolate the triumph of Google and Alibaba to an entire new group of firms. In fact,

most unicorns face a long war of attrition and soggy margins. Eventually, struggling firms may be bought. And here another risk arises: most unicorns cap outside investors' voting rights (Uber is an exception), and many have "poison pills" too, making takeovers hard and constraining investors' ability to intervene if the firms do not eventually find a way to make enough profits to justify their IPO valuations.

And what of Silicon Valley and China's bustling tech hubs, where the unicorn idea was dreamed up? Billions of dollars are flowing to VCs, tech founders and employees. The familiar question is how many luxury homes, philanthropic vanity projects and personal space programmes they will pay for. The urgent question is how this capital will be recycled into new technology firms. The blitzscale philosophy of buying customers at any price is peaking. After the unicorns, a new and more convincing species of startup will have to be engineered. ■



科技明星

科技独角兽之困

用户数以百万计，品牌炫酷，老板魅力四射。新晋明星科技企业万事俱备，只欠生财之道

投资者常借用动物来描绘商界，例如熊、牛、鹰、鸽、狗。如今连小马驹也变身为“独角兽”，用来指称那些据信实力强大、领先全球、估值超过十亿美元的私营科技公司——它们已堪称奇迹。预计本周优步将上市融资约100亿美元，可能会是今年最大的IPO，也是继阿里巴巴和Facebook之后美国有史以来第三大科技股IPO。爱彼迎和WeWork可能紧随Lyft（已上市）和Pinterest（两周前上市）的脚步上市。在中国，去年掀起的一股IPO浪潮还在汹涌翻滚。凭借时尚的产品和庞大的用户群，这些公司的总估值达数千亿美元。它们和它们的风险投资者正在争相向共同基金和普通民众的养老金计划出售高价股份。然而，独角兽们的商业模式是个大问题。

正如我们近期所报道的，已上市或很可能将上市的十几家独角兽企业去年共报称亏损140亿美元。累计亏损达470亿美元。从网约车到办公室租赁，这些公司的服务往往靠提供大幅折扣来推动营收增长。这么做的依据是硅谷那套发起“闪电战”来征服“赢家通吃”市场的理论，简单来说就是要快速圈地，抢占掘金的机会。

然而，一些独角兽缺乏其造势者宣称的规模经济和准入壁垒。与此同时，更严格的监管将限制它们快速行动和打破秩序的自由。投资者应要求降低IPO价格，否则就应敬而远之。它们的商业模式已成为一种不可持续的创办企业和让创意商业化的方式，对此，科技企业家及其支持者们需要做出反思。

放在25年前，如今的独角兽孵化产业是不可想象的。1994年只有60亿美元流向了风投基金，而这些基金向单个企业开出的支票只有几百万美元。亚马逊在1997年的IPO之前总共只融资一千万美元。有三方面发生了变化。云计算、智能手机和社交媒体使得创业公司得以在全球迅速扩展，让它们

更容易快速扩张。低利率促使投资者追逐回报。而包括谷歌、Facebook、中国的阿里巴巴和腾讯在内的一小撮超级明星企业的例子表明，获取无尽财富的秘诀在于庞大市场、高额利润、自然垄断、有限的实体资产以及放松的监管。突然间，科技行业变得只顾把这一神奇公式运用到尽可能多的行业，并大举烧钱加速进程。

毫无疑问，这些独角兽比2000年科技泡沫中的那些“火鸡”（例如在IPO后十个月就破产的Pets.com）要来得实在。网约车应用比出租车更方便，外卖速度快如闪电，流媒体音乐更胜下载文件。与谷歌和阿里巴巴一样，这些独角兽拥有庞大的用户群。通过将IT外包给云供应商，其核心业务可以避免拥有实体资产。正如其IPO文件所称，它们的销售增长迅猛。

最令人担忧的是，它们的亏损并非成长期的一时阵痛，而是反映了市场的激烈竞争和顾客的低忠诚度。在最大的那几家数字垄断企业中，越多人使用，其网络对用户的价值越大，所以 Facebook能在社交网络上占据67%的市场份额。独角兽们的态势则没有这么让人信服。尽管有优惠补贴，但坐网约车的乘客并不会锁定一家公司。难怪Lyft的股价比IPO发行价下跌超过20%。任何人都可以租用办公室并出租办公桌，并不是只有WeWork能做到。一些独角兽必须与其他资金充裕的对手和成熟企业争夺市场。于2018年上市的Spotify在美国音乐流媒体市场拿下了34%的份额，目前正与苹果公司正面交锋。

由于独角兽所处的市场竞争激烈，尽管销售快速增长，利润却没能持续提升。公司管理者担心客户流失，不敢削减庞大的营销支出。许多公司都在争相开发副线产品，以期从用户那里赚到些钱。而由于没有深深的“护城河”守卫其业务，独角兽的头上永远悬着一个问号：如果优步在仅仅投资约150亿美元后就真的值一千亿美元，那它的竞争对手们为什么不继续碰运气，而老牌科技巨头又为什么没被吸引进来？

外力也会使闪电战变得更难打。上一代公司没受到太多规则制约——毕竟很少有立法者预想到互联网的出现，所以它们可以先横冲直撞，过后再求宽恕。独角兽也纷纷效仿：爱彼迎规避酒店税，优步碾压出租车许可证规

定。今天，制约正全面铺开，包括对数字服务征税，就数据和内容的使用立法。独角兽的投资者通告中有连篇内容专门解释其法律风险和吓人的监管风险。

这一切对消费者而言都是好事。钱都是砸在他们身上的：十几家公司向公众提供的补贴每年总计200亿美元。虽然搜索引擎和社交媒体等科技行业的制高点已被垄断，但独角兽至少在其他领域制造了竞争。

与此同时，投资者需要保持冷静。将谷歌和阿里巴巴的成功推广到一批全新的公司，这种想法是诱人的。但事实上，大多数独角兽面对的是一场持久战——消耗不断，利润疲软。最终，经营不力的公司可能会被收购。而这又滋生了另一个风险：大多数独角兽都会限制外部投资者的投票权（优步是个例外），而且它们中有许多还有“毒丸”防御计划，假若它们最终无法实现与IPO估值相称的利润，那么外部收购或投资者干预就会很难进行。

而在独角兽理念的发源地——硅谷和中国生机勃勃的科技中心——情况又会如何？数十亿美元正流向风投公司、科技公司创始人和员工。老生常谈的问题是，这些钱会为多少豪宅、虚荣的慈善项目和个人太空计划买单。而迫切的问题是，这些钱又将如何回流到新科技公司身上。不惜代价揽取客户的闪电战理念已近强弩之末。在独角兽之后，人们必须创造出一种更具说服力的创业公司。■



Technology and security

The right call on Huawei

Britain's measured approach to dealing with the controversial Chinese firm is a model for other countries

ON APRIL 24TH the news broke that Britain's government had decided to permit parts of the country's 5G mobile networks to be built by Huawei, a Chinese firm. Many Americans and other friends of Britain will be appalled by its decision and fear that the country is being naive and toadying up to China. Huawei has, after all, become one of the most controversial firms in the world and sits at the centre of a geopolitical storm. America worries that the telecoms equipment-maker is a Trojan horse for China's spies and autocrats and poses a grave threat to Western interests. It has been urging its allies to ban it.

Britain's decision matters: it is a member of the "Five Eyes" intelligence-sharing alliance led by America, and was one of the first Western economies in which Huawei built a presence. Britain also has experience of electronic spying and knows Huawei well. Far from being a betrayal, Britain's approach, of using the firm's gear on the edges of 5G networks, under close supervision, offers a sensible framework for limited commercial engagement while protecting Britain's security and that of its allies.

Huawei has annual sales of \$105bn from 170 countries. It is a leading supplier of equipment for new 5G networks that will connect a vast array of devices and become deeply embedded in the economy. Rumours have long circulated that Huawei is cosy with China's army, and worries about the firm have intensified in the past two years. In February Mike Pompeo, America's secretary of state, threatened to limit co-operation with countries that used Huawei gear. America is also trying to extradite a Huawei executive (the

daughter of its founder) from Canada for sanctions-busting.

The easiest option for Britain would have been to ban Huawei from 5G networks, as Australia has. But that would be wrongheaded. One reason is technical. Refusing to use Huawei hardware does relatively little to eliminate the risk of cyber-attacks by hostile governments. State-backed hackers and saboteurs usually gain access to networks through flaws in software coding. This is why Russia can cause mayhem abroad, despite having no commercial role in Western telecoms networks.

A ban would also have geopolitical costs. If an open system for global commerce is to be saved, a framework has to be built for countries to engage economically even if they are rivals. No evidence of spying via Huawei gear has been made public. Most emerging economies have no intention of prohibiting it. A ban by a few American allies risks splitting the world into two blocs. And a system without rules could be abused to hobble other Chinese firms engaged in legitimate activity.

For a calibrated policy to succeed, Britain and other countries will need to observe three principles. The first is continual monitoring for hidden back doors and bugs. Since 2010 Britain has had a system for vetting Huawei's software and systems. This should continue and be extended to other 5G providers, with the aim of minimising the sloppy coding that creates vulnerabilities.

The second principle is to limit the scope of Huawei's activities. Britain will exclude its gear from the network "core", where the most sensitive processing takes place, and from government networks. Military communications should also be kept isolated. And the use of other equipment vendors means that if a problem emerges, it is easy to switch firms.

The final principle is that a U-turn is always possible. Britain should demand that Huawei continually raises standards in its software and improves its opaque governance—and should have no qualms about chucking it out if it does not. No one should be naive about Huawei. But neither should anyone be complacent about the dangers of a trading system racked by confrontation and ad hoc bans. The right path is to mitigate the risks Huawei presents and avoid an escalating trade war that makes economic engagement between the West and China impossible. ■



技术与安全

对华为的正确决定

英国对这家备受争议的中国公司的审慎做法可作为其他国家的典范

上月24日，有新闻报道称英国政府已决定允许中国企业华为参与建设英国部分5G移动网络。许多美国人和英国的其他盟友会为这个决定感到震惊，担心英国太过天真，是在讨好中国。毕竟，华为已经是世界上最具争议的企业之一，并处于一场地缘政治风暴的中心。美国担心这家电信设备制造商是中国间谍机构和独裁者的特洛伊木马，对西方利益构成严重威胁，一直在敦促其盟国抵制华为。

英国的决定影响重大：英国是美国领导的“五眼”情报共享联盟的成员，也是华为打开的首批西方市场之一。英国有电子间谍方面的经验，也很熟悉华为。英国的决定远远谈不上背叛。它在自己5G网络的非核心部分使用华为的设备，并加以严密的监视。这给华为有限的商业参与提供了一个合理的框架，同时保护了英国及其盟友的安全。

华为在170个国家的年销售额共计1050亿美元。它是新5G网络设施的一个领先的供应商。这种网络将连接各种各样的设备，从而深深嵌入到经济发展中。一直有传言称华为与中国军方关系密切，过去两年里对华为的担忧有所加剧。2月，美国国务卿迈克·蓬佩奥（Mike Pompeo）威胁要限制与使用华为设备的国家的合作。美国还在试图从加拿大引渡一名华为高管（华为创始人的女儿），以使其就违反美国制裁禁令的指控受审。

对于英国而言，最简单的选择就是像澳大利亚那样禁止华为参与其5G网络建设，但那样就错了。这有技术方面的原因。相对来说，拒绝使用华为的硬件对于消除敌对政府开展网络攻击的风险并没有什么用处。政府支持的黑客和破坏分子通常都是通过软件编码中的漏洞进入网络。这就是为什么俄罗斯尽管没有参与西方电信网络的商业化建设，却仍可以在国外制造混乱。

而且抵制华还会带来地缘政治上的代价。如果要拯救开放的全球商业体系，就必须建立一个能让各国都参与全球经济的框架，即使它们互为竞争对手。目前尚未有任何通过华为设备进行间谍活动的证据被公开。大多数新兴经济体无意抵制华为。少数美国盟友的禁令可能会导致世界分裂成两个阵营。而且一个没有规则的体系可能会被滥用，致使其他从事合法经营活动的中国企业受到妨碍。

要让一项慎重调校的政策获得成功，英国和其他国家将需要遵守三个原则。首先是持续监控隐藏的后门和漏洞。2010年以来，英国已经为审查华为的软件和系统建立了一个系统。应该继续使用它并将其扩展至覆盖所有5G供应商，以最大限度地减少不严谨的编码，避免产生漏洞。

第二个原则是限制华为的运作范围。英国将把华为的设备排除在处理最敏感信息的网络“核心”和政府网络之外。军事通信网络也应与之隔离。而且，如果同时还使用其他设备公司，等到出现问题时也比较容易转换供应商。

最后一个原则是决定总是可以逆转的。英国应该要求华为不断提高其软件标准并改进其不透明的治理。如果华为达不到要求，就应毫不犹豫地踢其出局。对待华为不应天真，但面对贸易体系会受国家间彼此对抗和即兴禁令冲击的风险，谁都不能满不在乎。正确的选择是既要降低华为带来的风险，还要避免贸易战不断升级导致西方和中国之间无法继续经济往来。■



Trade wars

You get what you give

Why you should never start a trade war with an autocracy

ECONOMISTS OFTEN argue that trade wars cannot be won. Yet they will be among the few beneficiaries from America's barrage of tariffs. For decades, rich countries' sound trade policies denied academics cases of tit-for-tat protectionism to study. But new American taxes on many goods from China and metals from everywhere have produced the data set of their dreams.

America's government seems unfazed by the damage its tariffs do to the economy. One study by scholars at the Federal Reserve and Princeton and Columbia Universities found that the new levies have raised costs for consumers by \$1.4bn per month.

However, Donald Trump is devoted to his voters. And his trading rivals have retaliated where it hurts. A paper by Joseph Parilla and Max Bouchet of the Brookings Institution, a think-tank, estimated that 61% of jobs affected by retaliatory tariffs are in counties that voted for Mr Trump.

Is this a coincidence? If a country's imports from America already come from mostly Republican areas, those regions will bear the brunt of a trade war. However, a new paper by Thiemo Fetzer and Carlo Schwarz of the University of Warwick finds that America's rivals probably did consider politics when crafting their policies.

To test if recent tariffs were politically motivated, the authors needed to compare them with alternatives that were not. They devised this benchmark by creating at random 1,000 hypothetical bundles of targeted goods for each trading partner, all worth the same as the actual trade facing tariffs.

The authors then compared real-world policies with these alternatives. First, they assessed the political impact of each plan, by measuring how closely its targeted areas matched Republican gains when Mr Trump was elected. Next, they estimated how much each policy would harm a retaliating bloc's own economy, by counting the share of its imports of the chosen goods that come from America. The more a country relies on one supplier, the more switching to a less efficient source is likely to hurt.

The study found that the EU prioritised minimising such damage. Its tariffs deftly protected domestic consumers, causing less disruption than 99% of alternatives. The bloc targeted Trump voters as well—its tariffs matched the election of 2016 more closely than in 87% of simulations—but not at the cost of upsetting its own citizens.

In contrast, China focused on punishing Trump voters. Its tariffs tracked the election better than 99% of alternatives. They also disrupted China's own economy more than in 99% of simulations. Even among plans including soyabeans—one of China's main imports, grown mostly in Republican areas—China's policy was just slightly more politically targeted than similar options, but far worse for its economy.

China's choice of tariffs seems designed to deter escalation at any cost. Only regimes with no voters to satisfy can run that risk. The lesson is clear: if you start a trade war, fight a democracy, not an autocracy. ■



贸易战

伤人伤己

为什么永远不该对专制国家发动贸易战

经济学家常指出“贸易战没有赢家”。不过他们自己将成为从美国的关税轰炸中受益的极少数群体之一。几十年来，富裕国家实行合理的贸易政策，因而并没有针锋相对的贸易保护主义案例供经济学家研究。但现在，美国对许多中国商品和世界各国的金属开征新关税，为他们提供了梦寐以求的数据集。

对于关税给经济造成的影响，美国政府似乎表现得泰然自若。而美联储、普林斯顿大学和哥伦比亚大学的学者所做的一项研究发现，新关税让美国消费者每月增加了14亿美元的总成本。

然而，特朗普一心要忠于支持他的选民。而他的贸易对手们已经在以牙还牙了。智库布鲁金斯学会的约瑟夫·帕里拉（Joseph Parilla）和马克斯·布切特（Max Bouchet）在一篇论文中估计，因报复性关税受影响的工作岗位有61%出自特朗普的“票仓”县。

这是不是巧合呢？如果一国从美国进口的商品本来就来自主要支持共和党的地区，那么这些地区肯定会首当其冲受到贸易战的冲击。然而，华威大学的蒂莫·费策尔（Thiemo Fetzer）和卡洛·施瓦兹（Carlo Schwarz）在一篇新论文中指出，美国的对手在制定贸易政策时可能确实考虑了政治因素。

为了检验近期的关税是否出于政治动机，两位作者需要将这些关税与其他没有政治动机的关税做比对。他们为每个贸易伙伴随机虚构了1000批被征收报复性关税的商品，以此作为对照基准。所有这些商品集的总价值与实际面临关税的商品总价值相同。

然后，作者将真实的政策与这些假设的政策做比较。首先，他们衡量了受

关税政策冲击的地区与特朗普当选时共和党获胜地区的匹配度，以评估每项政策的政治影响。其次，他们估算了各项政策会对报复性关税实施国自身的经济造成多大损害，方法是计算美国货在所选商品进口总额中所占的份额。一国对另一商品供应国的依赖程度越高，在转而选择供应能力逊色的别国时，其经济就越容易受到损害。

研究发现，欧盟优先考虑的是将此类损害降到最低。其关税巧妙地保护了各成员国的消费者，所带来的损害小于99%的模拟政策。受欧盟关税影响的地区与2016年大选时共和党获胜地区的匹配度超过了87%的模拟结果，可见欧盟也将矛头对准了支持特朗普的选民，但并未以损害成员国公民为代价。

与之不同的是，中国专注于惩罚特朗普的支持者。中国加征的关税比99%的模拟政策更紧跟选举情况，对本国经济的破坏也甚于99%的模拟政策。大豆是中国主要进口商品之一，基本种植于支持共和党的地区。即使在那些包括大豆在内的方案中，中国贸易政策的政治针对性比选择其他类似做法略多一点，但对中国自身经济的损害却要严重得多。

看来中国选择的关税方案是要不惜一切代价威慑对手，阻遏其继续升级贸易战。只有不需要取悦选民的政府才能冒这种风险。那么教训就很清楚了：如果要发动贸易战，找一个民主国家来战，而不是专制国家。■



Online education

Patient learning

A new kind of online school wants to teach nursing, and more

“I HAVE BEEN this close to buying a nursing school.” This is not a sentence you expect to hear from a startup founder. Nursing seems a world away from the high-tech whizziness of Silicon Valley. And, to use a venture-capital cliché, it does not scale easily. Austen Allred, boss of Lambda School, sees things differently. His two-year-old firm matches labour supply and demand by providing fast, efficient training to potential employees. It offers five online courses that prepare candidates to write software at technology firms. Training nurses, more of which are sorely needed to care for America’s ageing population, is not an illogical next step—especially when many nursing schools have to turn people away.

Instead of responding to the threat of joblessness posed by automation with a universal basic income, Mr Allred wants to help people to switch jobs faster. Unlike most online courses, Lambda does not charge students up front to attend (though admissions are competitive) and online tuition is live and interactive, not recorded. Full-time students attend for nine months, Monday to Friday, 8am to 5pm San Francisco time. Latecomers risk falling behind. In most recent classes, 85% of students who began a course finished it.

The school only starts getting paid back for its services after its students have landed a job which pays them more than \$50,000 a year, something Lambda expends significant energy to help them do. Around 70% of those enrolled do so within six months of graduation. Lambda then gets a cut of about a sixth of their income for the next two years, until they have paid about \$30,000. (Or they can pay \$20,000 up front.)

The firm devotes about a third of its time and resources to finding jobs for its graduates, an unusually high share. Another third goes to recruiting students and the rest to teaching. Courses are created with employers' requirements in mind. For its web-development programme, the list given to Lambda by companies runs to 280 items. Unlike coding, nursing cannot be taught entirely over the internet, so Lambda wants to co-operate with nursing schools across America that could provide the necessary hands-on instruction.

After nursing, Lambda plans to work its way down the list of professions with the biggest job shortages. It is also examining the problem from the other side, identifying available jobs that require skills akin to those of victims of automation—truckers displaced by self-driving lorries or call-centre workers replaced by robocalls.

Lambda's quirks set it apart in Silicon Valley, but Mr Allred is not the first to recognise the value of work-focused education and training. Germany is famed for its widespread vocational training and apprenticeships. Closer to California, the University of Waterloo, a technology-oriented Canadian institution, has had gainful employment within the field of study as one of its core goals since it was founded 62 years ago. Students seeking an internship can enroll in a special scheme which matches them with firms. Norah McRae, who runs the programme, says that most universities spend little time finding work for the graduates, or teaching the skills they need to prosper in the job market. Too often students are treated as cash cows to be milked for research funding.

But Ms McRae is also concerned that programmes like Lambda School, though well-meaning, risk undermining existing educational institutions by offering a quicker route to work. The kind of intense optimisation which Lambda espouses cannot, she worries, replace conventional learning, which strives to create not just capable workers but rounded individuals.

Such fears presuppose that Lambda can succeed beyond even Mr Allred's wildest dreams—or those of the venture capitalists who pumped \$30m into the firm in January, valuing it at \$150m. Student numbers, and so upfront costs, are growing faster than revenues. If Lambda can turn a profit by offering people a stab at a decent job, that would be a fine lesson in capitalism. ■



在线教育

学习护理

一种新型网校想要教授护理和其他很多职业技能

“我离收购一所护理学校只有一步之遥了。”人们不会想到这样的话竟是出自一位创业公司的创始人之口。护理行业似乎与硅谷的前沿科技风马牛不相及。而且用风险投资的套话来说，这个行业不容易很快做大。但兰姆达学校（Lambda School）的老板奥斯丁·奥尔雷德（Austen Allred）有不同的看法。成立于两年前的兰姆达提供快速、高效的培训，为职场输送新人，以此匹配劳动力供需。公司目前提供五门在线课程，为科技公司培训程序员。下一步它准备开展护士培训，这并非不合逻辑——人口老龄化的美国亟需更多护士，尤其是在当前很多护校无力招收更多学生的情况下。

奥尔雷德希望帮助人们更快地转行，而不是用所谓的“全民基本收入”来应对自动化带来的失业威胁。与大多数在线课程不同，兰姆达并不在开课前收学费（尽管入学竞争激烈），其在线教学也是实时互动，而不是事先录制的。全日制学生的学制为九个月，授课时间为旧金山时间周一到周五的上午8点至下午5点。中途入学者可能会跟不上进度。在近期大部分课程中，85%的学生修完了自己选的课程。

只有在学员谋得一份年薪超过五万美元的工作后，学校才开始收取服务回报。而为了帮学生找到一份这样的工作，兰姆达花费了大量精力。约70%的学员在毕业后六个月内达到了这个目标。在此后的两年里，兰姆达会抽取学员收入的约六分之一，最终累计收取约三万美元。如果学员一次性付清，则为两万美元。

兰姆达将三分之一左右的时间和资源花在为毕业学员找工作上，这么高的比重不常见。另外三分之一用于招生，三分之一用于教学。课程是根据雇主的要求而设计的。在它的网站开发课程中，企业开给兰姆达的需求多达280项。而护理有别于编程，不可能完全通过互联网教授，因此兰姆达希

望与全美各地能提供必要操作实训的护校合作。

在开展护理培训后，兰姆达还计划逐个进军其他人员最紧缺的职业。同时它也从另一面审视问题，为那些被自动化淘汰的人员（例如被无人驾驶货车取代的卡车司机，或者被自动语音呼叫取代的呼叫中心员工）找到需要类似技能的就业岗位。

兰姆达的另类做法在硅谷独树一帜，但要说认识到以工作为导向的教育与培训的价值的，奥尔雷德并非第一人。德国就以职业培训和学徒制的普及而闻名。离加州更近些的滑铁卢大学是加拿大一所技术型大学。自62年前创办以来，该校一直将找到与学生专业对口的较高收入工作作为自己的核心目标之一。想找实习机会的学生可以注册一个将他们与企业相匹配的特别项目。负责该项目的诺拉·麦克雷（Norah McRae）表示，多数大学很少花时间帮助毕业生就业，也很少教授他们在就业市场获得成功所需的技能。很多时候，学生们都被当成了捞取研究经费的摇钱树。

但麦克雷也担心，像兰姆达学校这样的培训项目虽然出发点不错，但可能会因为提供就业上的捷径而损害现有的教育体系。她担心兰姆达倡导的那种密集型的优化培训并非是对传统教育的一种好的替代，因为后者致力培养的不仅是能胜任工作的员工，还是全面发展的个体。

不过这种担忧成立的前提是兰姆达取得的成功要远远超出奥尔雷德本人的梦想——或者那些今年1月向兰姆达投资3000万美元、对其估值1.5亿美元的风险投资家们的想象。目前，学生人数的增长以及由此带来的前期成本的增速——超过了收入的增速。如果兰姆达能通过帮助人们拿下一份体面工作来赢利，那还真会是资本主义的一条有益经验。 ■



Global infrastructure

Seeds of suspicion

Belt-and-road lending is worrisome, but not because it is malevolent

CHINESE ENGINEERS are drilling their way through the green hills of Laos, clearing a path for a railway that one day may traverse South-East Asia. Each time they complete a tunnel—at least three times in the past month—they hold a brief ceremony, waving Chinese flags for the cameras. They are celebrating not just their engineering success but also the evidence before them that the Belt and Road Initiative (BRI), China's global infrastructure-building scheme, is making progress. The full railway is a long way off. Work has barely begun in Thailand, the next link. But the section in Laos should be in use by 2021.

It will be a test of what many see as a big economic danger of the BRI: that it will saddle poor countries with unmanageable debts. China insists that its tens of billions of dollars in loans and investments are fostering global prosperity—a message it repeated to foreign leaders attending the second Belt and Road Forum held in Beijing in late April (pictured is a floral display marking the event). But worries about the cost of the BRI, a project closely linked with President Xi Jinping's foreign policy, have become widespread. Malaysia, Pakistan and Sierra Leone are among a growing list of countries that have delayed or scrapped China-led projects.

There are three main concerns about the BRI's financial consequences. The most extreme is that the scheme involves what is pithily described as “debt-trap diplomacy”. In this view, China is deliberately overloading weak countries with loans; when they buckle, it seizes their assets and influences their politics. This idea has featured in speeches by some American officials, including the vice-president, Mike Pence, who see BRI as an attempt to

undermine America's global influence.

Yet the investments funded by Chinese cash are not in China, so China has limited ability to grab assets when governments default. If it pushes too hard it may merely stoke antipathy. Instead, it usually responds by reducing the amount of money that debtors have to repay. Countries with longer records of lending to poor countries often do the same: the Paris Club of creditors was formed in 1956 to devise ways of reducing defaulters' debt loads. The Centre for Global Development, a think-tank in Washington, has counted more than 80 cases between 2000 and 2017 in which China provided relief to its debtors overseas.

An oft-cited example of China's supposedly predatory approach involves Hambantota, a Sri Lankan port which has flopped commercially. In 2017 Sri Lanka handed control of the port to a state-owned Chinese company on a 99-year lease. But Deborah Brautigam of Johns Hopkins University says that of more than 3,000 China-financed projects that she and others have tracked, Hambantota is the only one that is used in support of the debt-trap theory. It is the exception, not the rule.

What it lacks in malevolence, the BRI may make up in clumsiness. This is the second concern: that China is lending to vulnerable states without sufficient caution. Take a group of 37 poor countries monitored by the IMF. Loans from traditional bilateral lenders, including America and Japan, have declined from 7% of the debtors' GDP to 2% over the past decade. Loans from China, by contrast, have soared from virtually nothing to 4%.

It is welcome that China is supporting hard-up nations. But its enthusiasm generates foolhardiness. David Dollar of the Brookings Institution in Washington has found that Chinese development lending appears indifferent to political and economic risks. The Centre for Global Development has identified eight countries drowning in red ink that could

be further swamped by BRI projects (see chart). A report in December released by Peking University ranked 94 BRI countries based on measures such as the quality of their financial regulation and their openness to trade. Pakistan came second to last. That is awkward for China: Pakistan may receive as much as \$60bn in BRI loans, which would make it the biggest recipient of all.

There is truth to claims that BRI credit can be ruinously expensive. Consider China Eximbanks lending to Kenya for the Nairobi-Mombasa railway. Local reports say half the \$3.6bn loan was priced 3.6 percentage points above a floating market interest-rate. That is high for a poor country. It is just one of many such loans by Eximbank, which said last month that its outstanding BRI-related credit was more than 1trn yuan, or nearly \$150bn.

The BRI's success will depend on whether Chinese lenders can tighten their procedures for assessing creditworthiness while making their loans more affordable. There are some promising signs. Last month's forum in Beijing stressed the need for BRI debt to be sustainable. In the case of the railway in Laos, caution is already evident. The project involves \$6bn of Chinese lending, which is about one-third of the GDP of Laos. So a joint venture has been created. It draws 70% of its capital from China and 30% from Laos. To fund its portion, Laos took a \$465m loan from Eximbank. The loan was generous, according to local reports: it matures in 35 years at a 2.3% annual interest rate, well below the commercial price of such debt. Laos has five years before it has to begin making repayments. That is the kind of concession that it might have got from the World Bank. China may offer such generous terms more frequently. Last year it set up an agency to oversee its foreign aid, in part to turn the BRI into a more co-ordinated development programme.

But this points to another concern that will be harder for China to deal with

because it relates to the very nature of the BRI: its sheer ambition. Potential benefits look impressive. A recent study by the World Bank concluded that BRI transportation projects could lift global GDP by 3%. That is larger than the benefits that are usually shown to be generated by free-trade agreements. It could yet bear out China's notion that Westerners (save Donald Trump) just want to lower tariffs, whereas China is trying to build the roads that let trade happen.

This, though, is where the risks come in. The World Bank's rosy analysis assumes that BRI projects are completed and work efficiently. The scale of the effort is a huge challenge, and such projects are a magnet for graft. Vast sums are being spent quickly in badly run places. The railway in Laos ought to make the landlocked country more accessible. But for it to prove effective, much more will be needed: better roads to link it to existing transport, new urban centres around the stations and freer trade with other countries.

China cannot achieve this alone, but its often overweening approach to the BRI has alienated potential partners. America, India and Japan want little to do with it. One reason is that China is, in effect, asking others not only to sign up to its infrastructure plans but also to endorse Mr Xi's worldview. It does not help that China reveals so little about its lending and that contracts go mainly to Chinese firms.

Some analysts in China have started to express unease. Economists at the Chinese Academy of Social Sciences, a think-tank, argued in a paper last year that the government must entice other countries to back BRI projects in order to share the risks. Otherwise, it could be China that finds itself trapped. Conservative estimates are that China will spend \$1trn within the next decade on its monumental scheme—about as much as it holds today in American government bonds. Mr Xi would be wise not to let such an outlay turn sour. ■



全球基建

怀疑的种子

“一带一路”贷款令人担忧，但不是因为其背后有险恶用心

中国的工程师正在老挝的苍翠山岭中开山劈石，为日后可能穿越东南亚的一条铁路开辟道路。每打通一条隧道（过去一个月内至少已有三次），他们都会举行一个简短的庆祝仪式，向镜头挥舞中国国旗。他们不仅是在庆祝工程上的胜利，还是为中国的全球基建计划“一带一路”倡议取得的进展欢呼。离这条铁路全部完工的日子还很遥远。位于泰国境内的下一路段的工程才刚刚开始。但老挝段应该会在2021年前投用。

这项工程将检验许多人眼中的一项重大经济风险：“一带一路”倡议会令贫穷国家陷入失控的债务漩涡中。中国坚称其数百亿美元的贷款和投资正在促进全球繁荣发展——在出席上月底在北京召开的第二届“一带一路”国际合作高峰论坛（上图是为论坛布置的主题花坛）的外国领导人面前，这一点被反复强调。但是，对于这个与习近平的外交政策密切相关的计划，人们对其代价的忧虑已经蔓延。越来越多国家推迟启动甚至取消了中国主导的项目，包括马来西亚、巴基斯坦和塞拉利昂等。

围绕“一带一路”的财政后果有三大忧虑。最极端的一种是认为该计划利用了“债务陷阱外交”——一种简洁有力的称法。这一观点认为中国故意让弱国承受巨额贷款，等到它们被压垮，便可趁机夺取其资产并左右其政治。一些美国官员在发言中表达了这种观点，包括美国副总统彭斯。他们认为中国企图用“一带一路”破坏美国的全球影响力。

但这些中资项目并不位于中国国内，因一旦他国政府违约，中国夺取资产的能力也有限。追逼太紧或许只会招致反感。相反，中国通常都会削减债务人的还债额。更早开始为穷国提供贷款的国家往往也这样做：1956年，主权债权人组织巴黎俱乐部（Paris Club）成立，旨在制定方案来减轻违约者的债务负担。据华盛顿智库全球发展中心（Centre for Global

Development) 统计，2000年至2017年期间，中国共80多次对海外债务人提供减债方案。

一个常被拿来证明中国所谓“豪夺”做派的例子是商业亏损严重的斯里兰卡港口汉班托塔（Hambantota）。2017年，斯里兰卡以99年期的租约将港口控制权交给了一家中国国有企业。但约翰·霍普金斯大学的德博拉·布劳特格姆（Deborah Brautigam）表示，在她和其他学者追踪研究的3000多个中国投资项目中，汉班托塔港是唯一被用作“债务陷阱论”例证的项目。这是一个例外，不是常态。

“一带一路”虽无恶意，却可能因行事笨拙而办坏事。这就是第二大忧虑：中国对弱国的贷款不够谨慎。以国际货币基金组织追踪的37个贫困国家为例。过去十年，包括美国和日本在内的传统双边贷款国发放的贷款已经从占债务国GDP的7%下降到2%。相比之下，来自中国的贷款从几乎为零增长到4%。

中国扶助穷国是好事，但这一腔热情导致了鲁莽。华盛顿布鲁金斯学会的杜大伟（David Dollar）发现，中国的发展贷款似乎对政治和经济风险漠不关心。全球发展中心指出八个赤字严重而可能被“一带一路”项目进一步拖垮的国家（见图表）。北京大学去年12月发布了一份报告，按金融监管质量和贸易开放程度等指标对94个“一带一路”国家进行了排名，巴基斯坦排在倒数第二。这对中国来说是个尴尬的发现，因为巴基斯坦可能会获得高达600亿美元的“一带一路”贷款，成为最大的贷款接受国。

有关“一带一路”贷款成本之高昂可能带来毁灭性后果的说法不无道理。以中国进出口银行向肯尼亚提供的内罗毕-蒙巴萨铁路贷款为例。当地报道称，这36亿美元的贷款中有一半的利息比浮动市场利率高出3.6个百分点。这对穷国而言算是高价贷款。而这只是中国进出口银行众多同类贷款之一，该银行上月表示其“一带一路”未偿贷款额超过一万亿元，即将近1500亿美元。

“一带一路”倡议的成功将取决于中国的贷款机构能否收紧资信评估程序及

下调贷款利率。已经有一些这样的迹象。上月在北京举行的论坛强调了“一带一路”的贷款需注重可持续性。老挝的铁路项目已经变得更为谨慎。该项目涉及60亿美元的中国贷款，约为老挝GDP的三分之一。为此成立了一家合资企业，中国出资70%，老挝出资30%。为了这30%的出资，老挝从中国进出口银行贷款4.65亿美元。据当地报道，这笔贷款的条款优厚：35年内还清，年利率2.3%，远低于此类债务的商业价格。老挝有五年的还款宽限期，这与从世界银行可能获得的贷款优惠类似。中国可能会更频繁地提供这类优厚条件。去年，中国成立了一家机构监督对外援助项目，一定程度上是要让“一带一路”成为更协调合作的发展计划。

但这又引出了另一个忧虑。这将让中国更难以应对，因为它涉及“一带一路”的本质：其雄心壮志。潜在的好处看起来相当可观。世界银行最近一项研究认为，“一带一路”的运输项目可以使全球GDP提高3%，大于自由贸易协定通常可显现的好处。该计划还能证实中国的说法：西方人（特朗普除外）只想到降低关税，而中国则在努力修建道路，方便贸易。

然而风险也源自这里。世界银行的上述乐观分析是假设“一带一路”所有项目已完成并高效运作。该倡议的规模之大是一个巨大的挑战，而且这类项目是贪污腐败滋生的温床。大量资金正被投放到管理糟糕的地方迅速消耗掉。老挝的新铁路应该会使这个内陆国家的对外交通变得更方便，但要真正起到作用还需要做相当多的工作：要建设更好的道路把铁路与现有交通线路连接起来，在车站周边打造新城市中心，并与其他国家开展更自由的贸易。

中国单凭自身无法完成这一切，但它在“一带一路”计划上的态度往往又很自负，疏远了不少潜在合作伙伴。美国、印度和日本不愿参与。其中一个原因是，实际上中国要求其他国家参与认同的不仅是其基建计划，还有习近平的世界观。另外，中国很少公开贷款细节，合同又往往给了中国企业和这些对吸引外国合作伙伴都没有帮助。

中国的一些分析人士已开始表达不安。智库中国社科院的经济学家去年在一篇论文中指出，政府必须吸引其他国家支持“一带一路”项目以分担风

险。否则，最终陷入困境的可能就是中国自己。据保守估计，中国将在未来十年花费一萬亿美元用于这一宏大计划，大概与它现在持有的美国国债总额相当。习近平可别把这么庞大的支出搞砸为好。 ■



US-China trade

Shock therapy

How much harm have tariffs done?

A YEAR AFTER the start of trade skirmishes between America and China, America's economy—and the world's—seem to be holding up. Are trade wars, as President Donald Trump believes, not so costly after all?

The immediate impact was always going to be hard to spot. Though special tariffs now cover more than half of China's exports to America, those exports account for less than 2% of American personal consumption and only around 5% of American business investment. Surveys suggest that tariffs are suppressing investment in America, but how much is unclear.

As with all taxes, much of the effect is to shuffle costs and resources around. Taxing imports hurts companies and consumers by making their foreign purchases more expensive, and as domestic producers respond to weaker foreign competition by raising prices. Exporters may lose out from retaliatory tariffs. But there are also winners, including domestic companies shielded from foreign competition and thus able to enjoy fatter profits—and the US Treasury, which gains new revenues.

A recent study by Pablo Fajgelbaum of the University of California, Los Angeles, Pinelopi Goldberg of the World Bank, Patrick Kennedy of the University of California, Berkeley and Amit Khandelwal of Columbia University totted up all such effects for the tariffs imposed by the Trump administration in 2018. The bulk of these fell on imports from China. They found that the welfare losses to producers and consumers from higher prices came to 0.4% of GDP, but when the gains to others were included, the economy-wide net cost was just 0.04% of GDP.

However, the tariffs have clearly caused disruption and higher prices for American importers, while Chinese exporters and their suppliers have lost business. The value of affected imports crashed just after they came into effect (see chart). According to numbers crunched by economists at the Institute of International Finance, an industry group, China lost market share for those products hit by tariffs of 25% last July.

Lower underlying prices (that is, excluding tariffs) might have helped. But where trade has continued, American firms seem to have gone on paying full whack, in addition to the new levies. Their Chinese suppliers' margins have been spared. Importers may not have had time to renegotiate contracts, or they may have expected the tariffs to be temporary. (They may also have stockpiled imports before an increase in the tariff rate, from 10% to 25%, that was once planned for January.) In time contracts could adjust, or American firms could find alternative suppliers, further mitigating the economic fallout.

So far, then, tariffs on China seem to have disrupted business and geopolitics more than they have harmed the economy at large. But further escalation would bring rising costs. Mr Trump just raised a tariff of 10% on \$200bn of Chinese imports to 25% on Friday morning. And he had threatened to impose a 25% tariff "shortly" on a further \$325bn-worth. American businesses would find the former tough to handle, and consumers would struggle to escape the latter. So far, consumer goods have been only about a fifth of the imports from China covered by tariffs. Escalation would add items such as toys and clothes. Economists at the New York Federal Reserve reckon that the effect of tariffs on core inflation (excluding food and energy) would rise from 0.1 percentage points to 0.4 percentage points.

The Chinese would surely retaliate, raising the costs. According to the IMF,

tariffs of 25% on all trade between America and China would knock 0.3-0.6% off America's GDP, and 0.5-1.5% off China's. Financial markets would reel. Economists at Morgan Stanley, an investment bank, put the downside risk for the value of equities in Asia and emerging markets at 8-12%.

Faced with such harms, policymakers would feel pressure to act. If faltering American growth threatened to increase unemployment or push already-low inflation down further, the Federal Reserve could ease monetary policy. The Trump administration has already given billions of dollars in aid to farmers affected by China's retaliatory tariffs; it could hand out more. And China's government, which has already raised spending and cut taxes, could increase its stimulus. All this would help conceal the costs of tariffs. But it would not make those costs go away. ■



美中贸易

休克疗法

关税造成了多大危害？

美中之间的贸易冲突开始一年之后，美国的经济——以及世界经济——似乎都还稳定。贸易战是不是像特朗普总统所认为的那样，其实并没有那么昂贵？

直接影响总是很难发现。虽然目前特殊关税覆盖了中国对美出口的一半以上，但这些出口占美国个人消费的比例不到2%，仅占美国商业投资的5%左右。调查显示，关税抑制了美国境内投资，但尚不清楚影响到底有多大。

与所有税收一样，关税大部分的影响是将成本和资源重新洗牌。对进口产品征税会损害企业和消费者，因为他们购买的海外产品变得更昂贵了，而同时由于来自外国的竞争减弱，国内生产商也会相应提高价格。出口商可能因报复性关税而受损。但也有赢家，包括因不受外国竞争影响而获得更丰厚利润的国内公司——以及找到新财源的美国财政部。

加州大学洛杉矶分校的帕布洛·费加尔鲍姆（Pablo Fajgelbaum）、世界银行的高柏（Pinelopi Goldberg）、加州大学伯克利分校的帕特里克·肯尼迪（Patrick Kennedy）和哥伦比亚大学的阿米特·坎德瓦尔（Amit Khandelwal）最近的研究计算了特朗普政府2018年征收的关税带来的所有此类影响。大部分关税都落在了来自中国的进口商品身上。他们发现，生产者和消费者因价格上升所损失的利益占GDP的0.4%，但如果把其他人的收益计算在内，关税给整个经济体带来的净成本仅为GDP的0.04%。

然而，关税显然给美国进口商带来了混乱和价格上涨，而中国出口商及其供应商则丢了生意。在关税刚刚生效后，受影响商品的进口额暴跌（见图表）。根据行业组织国际金融研究所（Institute of International Finance）的经济学家分析的数据，去年7月被征收25%关税的中国产品失

去了市场份额。

较低的基础价格（即不含关税）可能有所帮助。但是，对于继续贸易的商品，美国公司除支付新征的关税之外，似乎继续支付了原价。其中国供应商的利润并未受损。进口商可能没有时间重新谈判合同，或者他们估计关税只是暂时性的。（他们也可能在政府原订于1月份将关税税率从10%提高到25%之前囤积了进口商品。）假以时日，合同可以调整，或者美国公司可以找到替代供应商，经济影响还会进一步减轻。

这样说来，到目前为止，对华关税对商业和地缘政治的干扰似乎要多过对整体经济的损害。但进一步升级会导致成本上升。周五上午，特朗普把原本征收10%关税的2000亿美元中国进口产品的关税上调至25%。他此前威胁将在这之后“不久”再对价值3250亿美元的其他产品征收25%的关税。美国企业会发现前者很棘手，而消费者则很难逃过后者的影响。目前，被征收关税的中国进口商品中只有五分之一左右是消费品。贸易战升级会把玩具和服装等物品纳入其中。纽约联邦储备银行的经济学家认为，关税对核心通胀（不包括食品和能源）的影响将从0.1个百分点上升到0.4个百分点。

中国人肯定会报复，从而推高成本。根据国际货币基金组织的报告，对中美之间所有贸易征收25%的关税将使美国的GDP下降0.3%至0.6%，中国的GDP下降0.5%至1.5%。金融市场也会遭受冲击。投资银行摩根士丹利的经济学家将亚洲和新兴市场股票价值的下行风险定为8%至12%。

面对这样的危害，政策制定者会感到采取行动的压力。如果美国经济增长步履蹒跚，眼看要推高失业率，或推动已经很低的通胀进一步下滑，美联储可能会放宽货币政策。特朗普政府已经向受中国报复性关税影响的农民提供了数十亿美元的援助，它还能派发更多。已经提高支出并减税的中国政府可以增加刺激措施。所有这些都有助于隐藏关税的代价，但不会让代价消失。■



Trade talks

Deal or no deal

America and China have become strategic rivals. Their trading relationship will be fraught for years to come

OVER THE past two years investors and executives watching the trade tensions between America and China have veered between panic and nonchalance. Hopes for a cathartic deal that would settle the countries' differences have helped global stockmarkets rise by a bumper 13% this year. But on May 5th that confidence was detonated by a renewed threat by President Donald Trump to impose more tariffs on Chinese imports. On May 10th Washington raised tariffs on \$200 billion of Chinese imports from 10% to 25%. Negotiations rumbled on, but no one should be under any illusions. Even if a provisional agreement will eventually be struck, the deep differences in the two countries' economic models mean their trading relations will be unstable for years to come.

Some trade spats are settled by landmark agreements. In the 1980s tensions between Japan and America were resolved by the Plaza Accord. In September Mr Trump agreed to replace NAFTA, which governs America's trade with Canada and Mexico, with a renamed but otherwise rather similar accord (although the new treaty has yet to be ratified by Congress). Even by those standards the China talks have been an epic undertaking involving armies of negotiators shuttling between Beijing and Washington, DC, for months on end. Yet they have never looked capable of producing the decisive change in China's economic model that many in Washington crave.

There is some common ground. China is happy to buy more American goods, including soyabeans and shale gas, in an effort to cut the bilateral trade deficit, a goal which is economically pointless but close to Mr Trump's

heart. It is willing to relax rules that prevent American firms from controlling their operations in China and to crack down on Chinese firms' rampant theft of intellectual property. Any deal will also include promises to limit the government's role in the economy.

The trouble is that it is unlikely—whatever the Oval Office claims—that a signed piece of paper will do much to shift China's model away from state capitalism. Its vast subsidies for producers will survive. Promises that state-owned companies will be curbed should be taken with a pinch of salt. In any case the government will continue to allocate capital through a state-run banking system with \$38trn of assets. Attempts to bind China by requiring it to enact market-friendly legislation are unlikely to work given that the Communist Party is above the law. Almost all companies, including the privately owned tech stars, will continue to have party cells that wield back-room influence. And as China Inc becomes even more technologically sophisticated and expands abroad, tensions over its motives will intensify.

This fundamental clash of economic systems has been made more combustible by politics. In an atmosphere of mistrust, both sides have sidelined the World Trade Organisation, the global framework for handling trade disputes, opting instead for a transactional approach to the talks replete with gimmicks and threats. Meanwhile the mood at home has changed. Strikingly, many Democrats now accuse Mr Trump of being too soft on China. Earning less than 5% of their combined profits in China, and enjoying a boom in their home market, America's big firms support a tough line, too. In Beijing, meanwhile, the call for economic self-reliance is gaining steam.

At some point this year Mr Trump and Xi Jinping, his Chinese counterpart, could well proclaim a new era in superpower relations from the White House lawn. If so, don't believe what you hear. The lesson of the past decade is that stable trade relations between countries require them to have much

in common—including a shared sense of how commerce should work and a commitment to enforcing rules. The world now features two superpowers with opposing economic visions, growing geopolitical rivalry and deep mutual suspicion. Regardless of whether today's trade war is settled, that is not about to change. ■



贸易谈判

一锤定音？

美国和中国已经变成战略对手。它们的贸易关系在未来多年里都将动荡不安

过去两年里，密切关注中美贸易紧张局势的投资者和高管们在恐慌和漠然之间来回摇摆。今年以来，人们期望一项能解决双方分歧、令众人解脱的协议终将达成，这种情绪推动全球股市大涨了13%。然而，5月5日，特朗普再次威胁对中国进口商品加征关税，将这种信心瞬间击溃。10日，美国政府将针对2000亿美元中国商品的关税从10%上调到25%。谈判还在继续，但谁都不该抱任何幻想。就算最终达成什么临时性协议，两国经济模式的深刻分歧决定了它们的贸易关系在未来多年里都将动荡不定。

有些贸易争端因里程碑式的协议而得以平息。上世纪80年代，日本和美国之间的紧张局面由《广场协议》终结。去年9月，特朗普同意用一项新协议取代管理美国与加拿大及墨西哥之间贸易的《北美自由贸易协定》（NAFTA）。这项尚待国会批准的新协议换了个名字，除此之外变化不大。即使与这些重大协议相比，与中国的谈判也堪称一项艰苦卓绝的工程。一批又一批谈判官员已经在北京和华盛顿特区之间不停地来来回回了几个月。但他们似乎总也无力让中国经济模式产生华盛顿许多人所渴望的那种决定性变化。

双方已经达成了部分一致。中国很乐意购买包括大豆和页岩气在内的更多美国商品以减少双边贸易逆差。这个目标从经济上说毫无意义，但能讨特朗普的欢心。中国愿意放松那些阻碍美国企业控制自己在华业务的规管，同时严厉打击中国企业大肆窃取知识产权的行为。任何协议还将包括中国政府限制自身在经济中扮演的角色的承诺。

但麻烦在于，无论白宫自称取得了什么成果，一张签了字的纸并不太可能扭转中国的国家资本主义模式。中国还会继续为生产者提供巨额补贴。它对限制国有企业的承诺也不能尽信。无论如何，中国政府还将继续通过拥

有38万亿美元资产的国有银行系统分配资金。靠要求制定有利于市场的立法来约束中国不大可能奏效——既然共产党凌驾于法律之上。几乎所有企业——私营科技明星企业也不例外——都将继续设有党支部来在背后施加影响。而随着中国企业在技术上变得更加先进并在海外扩张，围绕其背后动机的紧张态势还会加剧。

这种经济体制上的根本冲突因为政治而变得更易燃。在互不信任的氛围中，双方绕开了世贸组织这个处理贸易争端的全球框架，选择用一种交易性的方式展开充满了花招和威胁的谈判。与此同时，美国国内的情绪发生了变化。出人意料的是，许多民主党人现在指责特朗普对中国态度太软。而由于美国大公司在中国赚得的利润不到其利润总和的5%，美国本土市场却十分繁荣，它们也支持走强硬路线。与此同时，在北京，呼吁在经济上自力更生的声音越来越大。

今年某个时刻，特朗普和习近平很可能会在白宫的草坪上宣告两个超级大国的关系迎来了新时代。若是如此，不要相信他们说的。过去十年揭示的教训是，国家之间若想要有稳定的贸易关系，它们必须有许多共同点，包括对商业应如何运作的共识，以及对贯彻规则的承诺。如今世界的两个超级大国经济视野截然对立，地缘政治较量愈演愈烈，彼此怀疑猜忌深重。无论今天的贸易战是否能和解，这一点都不会改变。 ■



Carmaking

Track mentality

PSA Group's boss has revived its fortunes. He isn't done

CARLOS TAVARES likes to move quickly. The boss of PSA, maker of Peugeots and Citroëns, has a passion for motor racing and speed pervades his day-to-day activities, too. The intense Portuguese arrives abruptly for meetings and departs so swiftly that it takes a few seconds to realise that he has gone. His reputation as the most talented boss now running a car company is also built on speed—his rapid and remarkable turnaround of two struggling firms, first PSA itself and then Opel, acquired from General Motors (GM) in 2017. Steering his mass-market firm towards the future of carmaking will not be easy.

The permanent frown clouding Mr Tavares's brow is a testament to the tough jobs he has pulled off. First, after taking the wheel of PSA in 2014 after years of heavy losses, he rescued it from bankruptcy. To near-universal surprise, he restored the firm to the black in a year. Revenues and profits have since grown handsomely; profit margins now rival those of German premium carmakers.

As Maxime Picat, PSA's director of operation in Europe, drily observes, seeking profits first and volumes afterwards has “not always been the case” in an industry that has prioritised sales and market share. PSA sought to sell fewer cars at a bigger mark-up. It axed niche models that made little money and slashed costs by limiting the bewildering array of combinations of engines, body styles and the like.

When PSA was criticised for lacking the heft to make big investments in electric vehicles and self-driving cars, Mr Tavares paid GM €1.3bn (\$1.4bn)

for its struggling European arm. This added around 1m vehicles a year to the 2.8m the rest of the group built in 2018, making it Europe's second-biggest carmaker behind Volkswagen. He applied his tactics again, this time to a company which had suffered two decades of losses totalling around \$20bn under American ownership. In 2018 Opel reported an operating profit of over €860m.

The resurrection of two struggling car giants has propelled PSA's share price by 14% over the past year. Steering the combined firm through the next series of bends will take a different set of skills, however. Car sales in Europe, where PSA generates 80% of revenues, are less brisk than in the past. Markets such as India and Russia, which Mr Tavares is eyeing, are trickier to negotiate. PSA has struggled in China, where carmakers have done well in recent years. Making humdrum Opels (sold as Vauxhalls in Britain) desirable will require heavy spending. Placid unions, which recognised PSA's difficulties, may become less so as its health improves.

A plan to return to America has also met with scepticism. PSA's brands are largely forgotten there—the last one, Peugeot, departed 28 years ago. Rather than spending heavily on marketing, building a factory and losing money “like hell”, Mr Picat says, PSA will start with car-sharing services to reintroduce the marques gradually as part of a ten-year project that will “make money at every step”. This seems to be one place where Mr Tavares is content to go slowly.

Further down the road, he worries about the added costs of electrification to meet EU emissions targets. The American car-sharing venture will offer some experience in mobility services, but PSA lags behind many rivals in autonomous vehicles. All this will require heavy spending.

Greater scale would help. Mr Tavares is on the lookout for deals. A tie-up with GM or Fiat Chrysler Automobiles (whose chairman, John Elkann,

sits on the board of *The Economist*'s parent company) has been rumoured. So has a takeover of struggling Jaguar Land Rover from its Indian owners. Some industry-watchers think consolidation is imminent—and virtually all believe it is necessary to share the costs of developing electric vehicles, self-driving cars and mobility services. Since the death last year of Sergio Marchionne, Fiat Chrysler's legendary boss, and the legal travails in Japan of Carlos Ghosn, ejected from his leadership roles in the Renault-Nissan-Mitsubishi alliance, many observers see Mr Tavares as the only car boss with the skill to cut big and difficult deals. ■



汽车制造

赛道心态

PSA的老板已令集团重振雄风，但使命尚未完成

标致和雪铁龙汽车的制造商PSA的老板唐唯实（Carlos Tavares）喜欢快速行动。他热爱赛车，日常工作也是雷厉风行。在公司会议上，这位性情热烈的葡萄牙人会突然来到，又迅疾离去，大家要过几秒钟才能反应过来他已离场。他之所以被誉为最具才华的汽车公司老板，也是因为速度——他迅速扭转了两家公司的颓势，先是PSA自己，然后是PSA在2017年从通用汽车收购的欧宝，成绩惊人。不过，带领这家大众市场汽车公司迈向汽车制造业的未来并非易事

唐唯实终日眉头深锁，足以证明他成就的是何等艰巨的任务。首先，2014年，他在PSA严重亏损多年后掌舵，将公司从破产边缘拉回。几乎出乎所有人的意料，他在一年内便使公司扭亏为盈。之后收入和利润均大幅增长，到现在利润率已经可以媲美德国的高端汽车制造商。

PSA的欧洲运营总监毕高诚（Maxime Picat）淡淡地说，在这个向来强调销售和市场份额的行业，先求利润再谈销量“不是常见做法”。而PSA正是以较高的成本加成销售少一些的汽车。它砍掉了不怎么赚钱的小众车型，同时减少令人眼花缭乱的发动机、车身款式等配置选择以降低成本。

在PSA被批体量不足，无法对电动汽车和无人驾驶大笔投入时，唐唯实花费13亿欧元（14亿美元）收购了通用汽车陷入困境的欧洲业务。PSA在2018年的汽车年产量原本为280万辆，收购之后增加约100万辆，使之成为仅次于大众的欧洲第二大汽车制造商。唐唯实再次施展魔法，这次是对一家在美国人掌控下在20年间累计亏损约200亿美元的公司。而到了2018年，欧宝的营业利润超过8.6亿欧元。

两家陷入困境的汽车巨头成功逆袭，推动PSA的股价在过去一年里上涨了14%。然而，要驾驭合并后的公司顺利通过下一串弯道需要的是另一套技

能。在欧洲（为PSA创造了80%的收入），汽车销售已不如过去强劲。唐唯实目前紧盯印度和俄罗斯等市场，但在这些地方做生意的难度更大。在中国，近年来其他汽车制造商的业绩不俗，但PSA的中国业务却处境不佳。要让乏善可陈的欧宝（在英国名为沃克斯豪尔）受到买家青睐，不投入重金是不行的。随着PSA日渐复苏，以前体谅公司困境而保持温和的工会也可能有所动作。

集团重返美国市场的计划也受到了质疑。在美国，PSA的品牌基本上已被遗忘，它最后一个淡出美国市场的品牌是标致，那已经是28年前的事了。毕高诚表示，PSA不会砸大钱来营销和建厂，然后亏得“血本无归”，而是要实施一个“每一步都盈利”的十年期项目，先从汽车共享服务入手，逐步把品牌再次引入美国市场。在这方面，唐唯实似乎是乐意慢慢来的。

再向前推进，唐唯实还担心为满足欧盟排放标准而新增的电气化成本。在美国的汽车共享业务会为集团带来一些出行服务上的经验，但PSA在无人驾驶汽车这一块落后于许多竞争对手。这一切都需要大量投入资金。

扩大企业规模会有所帮助。唐唯实正在寻找并购机会。有传言称PSA打算与通用汽车或菲亚特-克莱斯勒（其董事长约翰·埃尔坎[John Elkann]为《经济学人》母公司董事）合并。还有传言称PSA将从印度人手中收购苦苦挣扎的捷豹路虎。部分行业观察人士认为整合迫在眉睫。而几乎所有人都认同必须分担开发电动汽车、无人驾驶和出行服务的成本。去年，菲亚特-克莱斯勒极富传奇色彩的总裁塞尔吉奥·马尔乔内（Sergio Marchionne）去世，卡洛斯·戈恩（Carlos Ghosn）又在日本因身陷官司而被迫从雷诺-日产-三菱联盟下台，自此许多观察人士认为，车厂老板中就剩唐唯实有能力斩获高难度的大型并购交易了。■



Helping kids learn finance

Coin of the virtual realm

Teaching children to value money they can neither touch nor see

IN 2009 A GROUP of parents in Lymington, an English coastal town, started sharing worries about their children's money-management skills. Pocket money was now stashed in a building society rather than a piggy bank; household shopping was done online; the children rarely saw their parents handling cash. They were spending online, too. Money had become intangible. How, then, were children to learn its value?

The answer they came up with was GoHenry, an app now available in America as well as Britain. It is designed to help young people learn good financial habits through real-world money management. Parents sign up with their own bank accounts and pay a monthly fee of £2.99 or \$3.99 for each child aged six or over. Adults and children download separate versions. At the end of last year 379,000 children had active accounts.

Parents can schedule pocket money and set chores. When those are marked as done, the child is paid the agreed amount. Parents can see what the child has bought and where. And they can choose where the card can be used: in shops, online or at ATMs.

Children get debit cards customised with their name (Henry was the first child to use one). They can put money in savings pots, view their spending and balances, and set savings targets. "They could decide to save ten dollars for a sibling's birthday in four weeks' time, or set a goal at 12 to have \$2,000 to buy a car at age 18," says Dean Brauer, one of GoHenry's founders. "The app tells them how much to save each week to meet their goal."

Mr Brauer compares GoHenry to a fitness app, giving children feedback on

their financial management and motivating them to spend better and save. It is just one of several money-management apps for parents and children; others include Osper, Nimbl and Pennybox. All charge subscription fees, since they lack banking licences and cannot make money by lending out deposits. They fill a gap left by banks, which do not serve such young customers or offer accounts that give parents oversight of children's spending.

A big benefit of such apps is that they inspire family conversations about money. According to research done in 2013 by academics at Cambridge University, more than half of British parents find the subject hard to discuss with their children. And yet most agree that children's attitudes to money are formed in their early years.

Some GoHenry customers are well-off parents who worry that their children will grow up financially careless and entitled, says Mr Brauer. Others have slender means but regard the subscription as an investment in their child's future. Some say that they have been in debt and want their children to avoid that mistake when they grow up; others that the app is cost-effective because their children learn to budget. Even though young people no longer touch and hold money, they can still be taught to handle it well. ■



帮助孩子学理财

虚拟王国的钱币

教导孩子们重视他们看不见、也摸不着的金钱

二〇〇九年，在英国的海滨小城利明顿（Lymington），一群家长分享了自己对子女理财能力的担忧。现在大家都把零用钱存在房屋贷款协会，而不是塞在储蓄罐里；家庭用品也都是在网上买，孩子们很少看到父母掏现金，他们自己也都会网购。金钱已变得看不见摸不着。那么孩子们还能如何去理解它的价值？

家长们得出的解决方案是一个叫GoHenry的应用，如今已在美国和英国推出。这款应用让年轻人体验真实的理财活动，帮助他们学习良好的财务习惯。父母们用自己的银行账户在应用上注册，为每名六岁或以上的子女交2.99英镑或3.99美元的月费。成人和孩子各自下载不同版本的应用。到去年年底，37.9万名儿童和青少年拥有了活跃账户。

父母可以安排发放零用钱的时间和设置家务杂事，当这些任务被标记为完成，子女就会获得约定数额的零用钱。父母能够看到子女在哪里买了什么，还可以选择允许子女在哪里刷卡：实体店、网络或是ATM机。

子女会获得以他们的名字开办的定制化借记卡（Henry是第一个使用这种卡的孩子）。他们可以把钱存起来，还可以查看支出和结余，设置储蓄目标。“他们可以决定在四周内存十美元，用来给兄弟姐妹买生日礼物，或者在12岁的时候订一个存2000美元的目标，等到18岁时再用这笔钱来买辆车，”GoHenry的创始人之一迪恩·布劳尔（Dean Brauer）说，“应用会告诉他们每周该存多少钱才能达成目标。”

布劳尔将GoHenry比作一个健身应用。它根据孩子们理财的现状给他们提供反馈，激励他们更合理地花钱和攒钱。供父母及其子女使用的理财应用并不只有GoHenry一个，还有Osper、Nimbl和Pennybox等。这些应用都收取会费，因为它们没有银行业务牌照，不能靠吸收存款并放贷来赚钱。

而银行并不向儿童和青少年提供服务，也不向父母提供能让他们监督子女消费情况的账户，因此这些应用填补了银行留下的一个空白。

这类应用的一大好处是促成家庭成员在一起谈论金钱。剑桥大学的一些学者在2013年开展的研究显示，在英国，超过一半的父母觉得很难跟子女开口谈钱，尽管他们大多数都同意孩子对金钱的态度是在他们很小的时候就形成了。

布劳尔说，GoHenry的部分用户是富裕的为人父母者，他们担心子女长大后对待钱财漫不经心，认为自己有钱是理所当然的。其他那些用户本身并不宽裕，但把订购GoHenry的服务当作投资于子女的未来。一些用户表示他们自己债务缠身，希望子女成人后能够避免犯同样的错误。还有一些用户觉得购买这项服务很划算，因为孩子靠它学会了精打细算地安排开支。尽管年轻人已不再触摸和持有现金，但仍然可以教他们明智地支配金钱。





Free exchange

Hitting the big time

New research asks whether, where growth is concerned, population is destiny

FOR CENTURIES prior to the Industrial Revolution, Asia's massively populous societies made the continent the world's centre of economic gravity. Industrialisation in Europe and North America in the 19th century briefly knocked it from its perch. But now their collective economic might, measured in real output on a purchasing-power-parity basis, is forecast to account for more than half of global production by 2020. Was the West's period of dominance an anomaly, which could only ever have been short-lived? Is population destiny?

It stands to reason that countries with larger populations might enjoy long-run economic advantages. People are the raw material of economic growth, after all. The more there are, the greater the likelihood that one becomes a Gutenberg or a Watt. In a world without much international trade, populous countries offer the largest markets, and comparatively more opportunity to boost economic output through specialisation and trade. Projecting economic growth rates is fantastically hard even over very short time horizons; over centuries, it is as good as impossible. But there are worse strategies than betting on the places with the most people.

Klaus Desmet of Southern Methodist University, Dávid Krisztián Nagy of CREI, a research institute, and Esteban Rossi-Hansberg of Princeton University do just that. In a paper that in March won them the Robert Lucas prize, which recognises excellent research in political economy, they build a model that yokes economic performance to population size, within which they can run time forward by hundreds of years to watch the balance of economic power change. Long-run growth, they suggest, is driven by

improvements in technology. And more populous countries should accumulate more innovation than smaller ones do because the return on developing a new technology is higher—there are more people to buy Edison's light bulb and to enrich Edison, and therefore more incentive to invent the light bulb in the first place.

Leaning against this force, however, is migration. Right now, the richest places are not the most populous. Should it become relatively easy to migrate, people will move from countries that are populous but poor to others that are rich. As migration swells the population of rich places, their long-run dominance is assured because of the link between population size and innovation.

But if there is very little migration, then the populous but poor countries will out-innovate the small but rich ones, and make their way up the income league table. The process is not quick; the authors reckon that convergence takes about 400 years. In practice, rich places tend not to allow much migration from poor ones. That could change, but assuming that it does not, the model delivers a striking forecast: half a millennium from now, Asia and sub-Saharan Africa will have become great engines of productivity.

Stranger things have happened. A millennium ago real output per person was significantly higher in China than in Britain (see chart). To predict that a European backwater would lead the world into the most transformative economic epoch in history would have seemed like madness. Over very long time horizons the world's poorest places can indeed become the world's richest, even if it does not happen often.

Still, if Britain did not have the upper hand over China 1,000 years ago, it did soon after, at least in terms of real output per person. By 1400 incomes in Britain were meaningfully larger than in China (and higher still in the

Netherlands and Italy), according to work by Stephen Broadberry of Oxford University, Hanhui Guan of Peking University and David Daokui Li of Tsinghua University. By 1700 the diverging trajectories of China and north-west Europe were clear (though it was anything but obvious just how much further apart they would become). In other words, population over the past millennium has not been destiny. If China's and India's masses did not raise them to prosperity during the past 600 years, what reason is there to believe the future will be different?

It is possible that population is destiny, other things equal, but other things are never equal. And so a plague here, or a fateful decision by a Chinese emperor there, can set a region down a path that wipes out the advantages of population. Perhaps those advantages must be harnessed by the right sorts of institutions, or an accommodating culture—which take far longer to develop or adopt than technologies do to emerge. There is no academic consensus regarding what determines economic fortunes over long time horizons, important though the question is. Alternatively, one might argue that conditions have changed in ways that amplify the power of population. A billion brains seem a more economically potent force in an era of mass education, in contrast to the mass illiteracy that prevailed in the past.

But crucially, Asia's recent rise has not been the result of a spurt of indigenous innovation given its impetus by the size of its population. Rather, it has happened as part of a wave of globalisation, which aided the transfer of technological know-how. Openness to exchanges of goods and ideas, or indeed to immigration, is not an immutable parameter, but subject to change based on human preferences. Mr Desmet and his co-authors reckon that eliminating all barriers to migration would raise global welfare threefold—an extraordinary figure that reflects yawning differences in output per person between countries, and the unrealised human potential they represent.

As intriguing as it is to consider the directions in which macro variables such as population or GDP are likely to nudge the world in coming centuries, it is human decisions that will determine which places and people are given the opportunity to become rich. National populations matter to the extent that borders do. It is a depressing notion, but a plausible one, that in half a millennium's time they will matter still. ■



自由交流

大放异彩

新研究探索就经济增长而言，“人口即是命运”是否成立

工业革命发生前的几百年里，亚洲国家人口众多，这片大陆因而成为世界经济的重心。到了19世纪，欧洲和北美的工业化短暂地将亚洲从其高位上拉下。但是，以根据购买力平价计算的实际产出衡量，预计到2020年亚洲各国的总体经济实力将占到全球产出的一半以上。西方占据主导会不会只是个反常现象，只可能是昙花一现？人口是否即是命运？

人口较多的国家也许能享有长期的经济优势，这是自然的。毕竟，人是经济增长的原材料。人口越多，其中某个人成为古腾堡或瓦特的可能性就越大。在一个没有太多国际贸易的世界里，拥有众多人口的国家提供了最大的市场，相对来说也更有机会通过专业化和贸易来提高经济产出。要预测即使是非常短期的经济增长率都是极困难的，若要预测几个世纪则近乎不可能。但是，比起押注于人口最多的地方，其他的策略更不靠谱。

南卫理公会大学（Southern Methodist University）的克劳斯·德斯梅特（Klaus Desmet）、国际经济研究中心（CREI）的大卫·克里斯蒂安·纳吉（Dávid Krisztián Nagy）和普林斯顿大学的埃斯特班·罗西-汉斯博格（Esteban Rossi-Hansberg）就把目光投向了人口。3月，他们的一篇论文获得了政治经济学领域的优秀研究奖“罗伯特·卢卡斯奖”。三位作者建立了一个模型，将经济表现与人口规模挂钩。在这个模型中，他们可以将时间向前推进数百年，观察各国经济实力变化的对比情况。他们认为，长期增长是由技术进步推动的。而人口较多的国家相比人口较少的国家应该能积累起更多的创新，因为在这样的国家中开发新技术的回报更高。举例来说，人口越多，就会有越多的人买爱迪生的灯泡，让爱迪生变富，所以爱迪生也就更有动力把灯泡发明出来。

然而，有一个因素会阻挠人口的这股力量：移民。如今最富裕的地方并不

是人口最多的地方。假如迁移变得相对容易，人们就将从人口多但贫穷的国家迁移到富裕的国家。由于人口规模与创新之间存在联系，一旦富裕地区因移民的到来而人口增长，便必定能享有长期的支配地位。

但是，如果移民数量很少，那么人口多但贫穷的国家就会在创新方面超越人口少但富裕的国家，在收入排行榜上的名次也会上升。不过这个过程不会很快。三位作者认为大约需要四百年才能实现这种趋同。而在现实中，富裕地区往往并不会接纳太多来自贫困地区的移民。这种情况可能会改变，但假设它不变的话，那么该模型就得出了一个惊人的预测：从现在起五百年后，亚洲和撒哈拉以南非洲将成为推动生产率提升的重要引擎。

更怪的事已经发生过。一千年前，中国的实际人均产出明显高于英国（见图表）。如果当时有人预测欧洲的一个落后地区会引领世界进入历史上最具变革性的经济时代，那简直是痴人说梦。在非常长的时间跨度里，世界上最贫穷的地方确实有可能成为世界上最富有的地方，虽然这并不常发生。

然而，尽管一千年前英国和中国相比并没有占到上风，它不久后就做到了，至少就实际人均产出而言是这样。根据牛津大学的史蒂芬·布劳德伯利（Stephen Broadberry）、北京大学的管汉晖和清华大学的李稻葵的研究，到1400年，英国的收入水平已经明确高于中国（荷兰和意大利的收入甚至更高）。到1700年，中国和西北欧明显踏上了不同的发展轨迹（尽管并不能看出两者日后会拉开多大的差距）。换句话说，从过去一千年来看，人口即命运的说法并不成立。如果中国和印度的广大民众在过去六百年里未能实现国家繁荣，那么有什么理由去相信未来会有所不同？

在其他条件相同的情况下，人口确有可能即命运，但其他条件从来都不会相同。如果某地爆发了一场瘟疫，或者某位中国皇帝做出了一个影响力巨大的决定，那么某个地方可能就会走上一条令人口优势消失殆尽的道路。或许，人口优势必须依靠合适的制度或富包容性的文化才能被善加利用；而要发展出或采用这样的文化和制度，所要花费的时间要远远久于新技术

出现所需的时间。那究竟是什么因素决定了一个国家或地区在较长时期内的经济命运呢？对于这个问题学界并没有达成共识，尽管它很重要。或者，有人会换个角度说，社会环境条件已经发生变化，增强了人口的影响力。与过去文盲始终占多数的时代相比，在大众教育的时代，十亿人的头脑似乎是一股更具经济影响力的力量。

但至关重要的是，亚洲近年的崛起并不是在其人口规模的推动下本土创新突飞猛进的结果。实际上，亚洲崛起是全球化浪潮的一部分，全球化助推了技术知识的转移。对于商品交换和思想交流的开放态度——或者实际上也是对移民的开放态度——不是一个不可改变的参数，而是会根据人的偏好发生改变。德斯梅特与其合著者认为，假如阻碍移民的壁垒全部被消除，全球福祉会提升三倍——这是一个非同寻常的数字，既反映了各国人均产出的巨大差异，也可从中看出这样的差异代表着人类尚有潜力未实现。

虽说考虑人口或GDP等宏观经济变量在未来几个世纪可能会推动世界走向何方这样的问题很有吸引力，然而决定哪些地方、哪些人有机会富起来的终究还是人的抉择。国家人口的重要性和疆域差不多。“五百年后人口依然重要”的观点令人沮丧，但似是而非。 ■



Aerospace

Down in flames

A tragedy casts doubt on Russia's civil-aviation renaissance

JUST BEFORE the fall of the Berlin Wall in 1989, the Soviet Union built 150 airliners a year, around a fifth of the world's total. By 2000 that number had fallen to almost nothing. In 2006 Russia's president, Vladimir Putin, nationalised United Aircraft Corporation (UAC) and asked it to develop a commercial jet. When the slender, fuel-efficient silhouette of the Sukhoi SuperJet was unveiled in 2007, Sergei Ivanov, Russia's first deputy prime minister of the day, told foreign investors that it was "more than a plane". It was meant to restore Russia's glory in the civil-aircraft business.

On May 5th these high hopes took a knock when one such aircraft caught fire and crash-landed at Sheremetyevo Airport in Moscow. At least 41 of the 78 people onboard died. Investigators have not yet reached any conclusions about what caused the tragedy. Sukhoi, the UAC's civil-aircraft arm which makes the plane, extended "its profound condolences for the families and friends of the victims".

Before the accident UAC was aiming to increase its share of global revenues from civilian aircraft, from 17% in 2017 to 40% by 2025. The target now looks unreachable. Yet even beforehand Sukhoi had been making only slow progress towards it. The company has grabbed 20% of the global market for regional jets and secured a similar number of orders as rival aircraft from Bombardier of Canada and Embraer of Brazil, the two firms which have historically dominated the sector. But although the SuperJet is cheaper to buy, even Russian airlines were already falling out of love with it, says Tom Chruszcz of Fitch, a rating agency. The lack of a global maintenance network made servicing Sukhois more expensive, and the amount of time

not in the air longer, than for the Canadian and Brazilian jets. Sanctions on Russia have crimped the availability of spare parts outside of Russia. Alexei Navalny, a former member of Aeroflot's board turned vocal critic of Mr Putin, has previously derided SuperJets as "always standing idle" and generating losses for the flag carrier.

Over the past year airlines have raced to pull SuperJets from service and to cancel future orders. CityJet of Ireland has dropped 15, Brussels Airlines of Belgium four, and Adria Airways of Slovenia 15, at a total cost to Sukhoi of up to \$1.5bn at list prices. In the wake of the crash, Yamal Airlines of Russia cancelled its order for ten such aircraft, worth up to \$500m.

Sukhoi's troubles will have ramifications beyond Russia. The planemaker was the last viable challenger in the near term to an industry increasingly dominated by two behemoths: Boeing of America and its European arch-rival, Airbus. Bombardier tried to break their duopoly in larger narrow-body aircraft with its C Series. Instead, Airbus took over the C Series programme in 2017. A year later Embraer announced a tie-up with Boeing to counter Airbus.

Boeing itself is dealing with the consequences of two recent crashes. On the day of the SuperJet accident the American firm said it knew about software problems two years ago on its 737 MAX jet, which have been linked to accidents that killed 346 people. The Embraer deal may fall by the wayside as Boeing contends with regulators and lawsuits. Airbus is worried that Bombardier could sell the technology for the C Series's lightweight wings, which the Canadian firm put on sale along with its factory in Belfast on May 2nd. Still, when the two giants put their current problems behind them, they may have no Russian rival to worry about. ■



航空工业

火中坠落

一场悲剧令俄罗斯民航业的复兴蒙上阴影

就在1989年柏林墙倒塌前，苏联的客机年产量还是150架，约占世界总产量的五分之一。而到了2000年，这一数字几乎降至零。2006年，俄罗斯总统普京将联合航空制造集团（UAC）收归国有，并要求其开发商用飞机。2007年，当机体修长又省油的苏霍伊超级喷气式飞机（Sukhoi SuperJet）首次亮相时，时任俄罗斯第一副总理的谢尔盖·伊万诺夫（Sergei Ivanov）向外国投资者表示，它“不只是架飞机”。它肩负着重振俄罗斯民航业辉煌的厚望。

本月5日，这一厚望遭受了沉重一击：一架SuperJet在莫斯科谢列梅捷沃机场（Sheremetyevo Airport）起火迫降。机上78人中至少41人遇难。调查人员还未就灾难原因得出任何结论。该飞机的制造商、UAC的民用飞机部门苏霍伊公司表达了“对遇难者亲友的深切哀悼”。

此次空难发生前，UAC的目标是到2025年将其民用飞机在全球收入中的份额从2017年的17%提高到40%。现在看来这一目标是遥不可及了。然而，即便在这之前，苏霍伊公司朝此目标迈进的速度也很缓慢。苏霍伊公司已经占据了全球支线客机20%的市场份额，并获得了与加拿大庞巴迪公司（Bombardier）和巴西航空工业公司（Embraer）生产的竞争机型差不多数量的订单。后两家公司长期以来处于该领域主导地位。但评级机构惠誉（Fitch）的汤姆·赫鲁什奇（Tom Chruszcz）表示，尽管SuperJet的价格更便宜，但是就连俄罗斯自己的航空公司也已经不再青睐它。由于缺乏全球性的维修网络，SuperJet的维修费用高于加拿大和巴西的客机，维修停飞的时间也更长。对俄罗斯的制裁影响了俄罗斯以外地区的零部件供应。俄航前董事、后来常公开批评普京的阿列克谢·纳瓦尔尼（Alexei Navalny）此前就曾嘲讽SuperJet“永远闲着”，导致这家国家航空公司亏钱。

过去一年里，各家航空公司竞相停飞SuperJet并取消了未来的订单。爱尔兰城捷航空（CityJet）、比利时布鲁塞尔航空（Brussels Airlines）以及斯洛文尼亚的亚德里亚航空（Adria Airways）分别取消了15架、4架和15架飞机的订单。按标价计算，这给苏霍伊公司带来的损失总计达15亿美元。此次事故发生后，俄罗斯的亚马尔航空公司（Yamal Airlines）又取消了10架SuperJet的订单，价值高达5亿美元。

苏霍伊的麻烦将波及俄罗斯以外地区。在日益被美国波音及其欧洲劲敌空客这两大巨头所主导的航空业里，苏霍伊公司是短期内最后一个可能的挑战者。庞巴迪曾经试图用其C系列飞机打破两大巨头在大型窄体客机上的垄断地位，但C系列项目却在2017年反被空客收购。一年后，巴西航空工业公司宣布与波音结盟以对抗空客。

波音自身正忙于处理近期两起坠机事件的后续事务。在SuperJet出事的当天，波音表示，公司两年前就知悉其737 MAX飞机的软件问题，这一问题与总共导致346人死亡的两起事故有关。由于波音要应对监管机构的调查并面临诉讼，它与巴西航空工业公司的交易可能会半途而废。空客则担心庞巴迪可能会出售C系列飞机的轻量机翼技术。5月2日，庞巴迪宣布将把该部分业务连同其位于爱尔兰贝尔法斯特（Belfast）的工厂一起出售。尽管如此，两大巨头若是抛开各自眼前的问题，可能已经不需要担心什么俄罗斯对手了。 ■



Learning from the past

The psychology of nations

A bold overview of major crises illuminates the slipperiness of history

BY ITS OWN lights, this book fails. And yet, as a meditation about a world on edge, it is also well worth reading.

Jared Diamond sets out to construct a diagnostic framework for political systems in turmoil. What enables some societies to cope with a crisis but condemns others to mayhem? Do past crises reveal patterns that could guide today's leaders as they gaze into the contemporary abyss? Mr Diamond readily acknowledges that his book is just a first stab at answering these questions. He hopes that "Upheaval" will encourage other scholars to take up his ideas and mould them into something more rigorous. It may instead convince them that the project is doomed.

Even so, the journey towards failure, via seven countries at turning-points in their pasts, is enjoyable and informative. Mr Diamond is the doyen of a class of scientifically literate, anthropologically aware and culturally astute thinkers. He is an enlightened guide and a sympathetic observer. Though "Upheaval" cannot achieve its implausible goals, this quixotic effort illuminates what it means to learn from history.

The idea at the heart of "Upheaval" is that the insights which help people cope with personal crises, such as crushing disappointment, divorce or bereavement, can also shed light on those that afflict states. Therapists seek to get their patients to acknowledge that they are in trouble and that they are empowered to do something about it. Individuals can learn from the behaviour of others. They can identify what it is about them that needs to change—and what should remain the same.

Countries are not people, of course. But Mr Diamond believes the parallels are instructive. Are a country's politicians and media honest about their situation? Do they take responsibility for fixing a problem, or simply blame others? Can they learn from what has happened elsewhere? Are they willing to adapt, even as they cleave to what makes their society work?

As the spectre of nationalist populism hovers overhead, "Upheaval" develops this framework by examining such crises as the modernisation of Japan after Matthew Perry's black ships sailed into Tokyo bay in 1853, the mass slaughter when Indonesia put down a communist revolt in 1965 and the coup against Salvador Allende in Chile in 1973.

Finland's dealings with the existential threat from the Soviet Union during and after the second world war are another good example. Mr Diamond reckons that Finnish leaders displayed many of the coping characteristics of resilient individuals. They were brutally realistic about their vulnerability. Finland is a small place that could not depend on help from other countries; its best chance of remaining independent was to persuade the Soviet Union that it was not worth conquering. That meant fighting to the last man when Soviet troops invaded during the war, but then working closely with Moscow in peace time, even though Stalin had just ravaged eastern Finland. By following this pragmatically deferential policy—which came to be known as "Finlandisation"—Finns conceded what they had to, but would not compromise over their independence.

Here Mr Diamond's method tells you plenty about Finland's travails in the 20th century. But as an exercise in political science it falls short. You cannot compress history into a self-help guide. For one thing, even if the grand sweep is relayed accurately, it is a superhuman task to gather the underlying facts—even the assiduous Mr Diamond labels Finland "Scandinavian" when Finns call themselves Nordic. For another, the notion that individual psychology can be projected onto nations is fanciful. People talk about a

“national character”, but it is a slippery metaphor that leads to cartoonish over-simplification.

Most of all, Mr Diamond’s approach depends upon a flawed understanding of what history is. For his scheme to succeed, he needs to be able to pin history down to an interpretation, as if it were a laboratory specimen. History is not so compliant. In a scientific sense it is unique—an experiment without controls. In another way it is too abundant, overflowing with facts that might or might not be salient. The past is endlessly open to interpretation, as historians rifle through it for the perspectives that grab them.

To crown it all, supposing you can agree on the meaning of the past, Mr Diamond’s method requires a consensus about the challenges of the present, too. Good luck with that in Westminster or Washington.

Those who do not want to repeat it should learn history. Mr Diamond is right about that. But the lesson it teaches comes as a parable, not an algorithm. ■



以史为鉴

国家心理学

对重大危机的大胆概述显现了历史的难以把握【《剧变》书评】

以它自身的目地来说，这本书是失败了。但是，它对一个处于焦灼不安中的世界作了一番沉思，从这个层面来说它仍然非常值得一读。

贾里德·戴蒙德（Jared Diamond）想要为处于动荡之中的政治体系构建一个诊断框架。是什么让一些社会能够应对危机，却让另一些陷入混乱？过去的危机是否能够揭示出什么模式，为今天凝视眼下深渊的领导者提供指引？戴蒙德欣然承认，自己的书只是为回答这些问题所做的首次尝试。他希望《剧变》（Upheaval）能鼓励其他学者从他的想法入手，构建出更严密的体系。但是，本书却可能让学者们确信那样的努力注定会失败。

即便如此，它对七个国家如何从各自的历史转折点上走向失败的描述读来有趣且信息丰富。戴蒙德是兼具科学素养、人类学意识和文化敏锐度的一批思想家中的元老。他是一位开明的向导，也是一个富有同情心的观察者。虽然《剧变》无法实现其难以置信的目标，但这番堂吉诃德式的努力显现出“以史为鉴”这件事意味着什么。

《剧变》一书的核心理念是，帮助人们应对个人危机（如极度失望、离婚或丧亲之痛）的洞见也可以为困扰国家的难题提供启示。心理咨询师试图让病人承认自己碰到了问题，而自己有力量去做出一些改变。个人可以从他人的行为中汲取经验。他们可以识别自身有哪些部分需要改变，哪些应该保持不变。

当然，国家和人不同。但戴蒙德认为两者间的这种类比是有益的。一个国家的政客和媒体是否诚实地面对自身处境？他们是否承担起了解决问题的责任，还是只知道责怪他人？他们能从别国的经验中学习吗？在坚持那些让他们的社会得以成功运作的方法的同时，他们是否也愿意做出调整去适应新形势？

在民族民粹主义的幽灵盘旋不散之时，《剧变》研究了历史上与此相关的一些危机，以求发展出这一诊断框架，如1853年马修·佩里（Matthew Perry）率领“黑船”驶入东京湾后日本的现代化过程；1965年印度尼西亚反共镇压期间的大屠杀；1973年智利发生的推翻了萨尔瓦多·阿连德（Salvador Allende）政府的一场政变。

芬兰在二战期间及战后如何应对被苏联亡国的威胁是另一个很好的例子。戴蒙德认为，芬兰领导人展现出许多适应力强的人的应对特征。他们对自己的弱点有着极为现实的认识。芬兰是个小国，不能依赖其他国家的帮助；要保持独立，最好的办法是让苏联认为芬兰根本不值得费力征服。因此在二战期间苏联军队入侵时，芬兰顽强抗争到底，但随后在和平时期却与莫斯科密切合作——尽管斯大林刚刚蹂躏了芬兰东部。芬兰人为了生存采取了这种恭顺的实用主义政策——这种做法后来被称为“芬兰化”（Finlandisation）。他们接受在有些问题上不得不让步，但在独立的问题上绝不妥协。

在这个案例中，戴蒙德用类比法呈现了芬兰在20世纪经历的种种苦难。但把它运用到政治学上就有所不足了。历史无法被压缩成一本励志自助指南。一方面，即使重要历史事件能被准确地陈述记载，要收集那些背后的、深层的事实也是一项超人的任务——即便是刻苦钻研的戴蒙德也会把芬兰归为“斯堪的纳维亚”国家，而芬兰人却自称北欧人。另一方面，将个人心理投射到国家层面的想法不切实际。人们经常谈到“民族性格”，但这个比喻概念模糊，常导致卡通式的过度简化。

最重要的是，戴蒙德这种类比是基于对何为历史的误解。要让这种方法成功，他需要能够像解释实验室标本那样阐释历史。但历史不是可以轻松驾驭的实验标本。从科学角度而言，历史是独一无二的，没有实验对照组。另一方面，历史又太过丰富，充满了可能有、也可能没有重要意义的事实。对历史可以做出数不清的诠释，历史学家遍寻其中只是为了找到吸引他们的视角。

更糟的是，就算大家能对历史的意义达成一致认知，戴蒙德的方法还需要

人们就现在面临哪些挑战达成共识。在伦敦或华盛顿，要做到这一点可要靠老天保佑了。

不想重蹈覆辙的人应该学习历史。在这一点上戴蒙德没错。但历史的教训只能当作一种寓言来学，而不是可运用的精确算法。 ■



China v America

A new kind of cold war

How to manage the growing rivalry between America and a rising China

FIGHTING OVER trade is not the half of it. The United States and China are contesting every domain, from semiconductors to submarines and from blockbuster films to lunar exploration. The two superpowers used to seek a win-win world. Today winning seems to involve the other lot's defeat—a collapse that permanently subordinates China to the American order; or a humbled America that retreats from the western Pacific. It is a new kind of cold war that could leave no winners at all.

As our special report in this week's issue explains, superpower relations have soured. America complains that China is cheating its way to the top by stealing technology, and that by muscling into the South China Sea and bullying democracies like Canada and Sweden it is becoming a threat to global peace. China is caught between the dream of regaining its rightful place in Asia and the fear that tired, jealous America will block its rise because it cannot accept its own decline.

The potential for catastrophe looms. Under the Kaiser, Germany dragged the world into war; America and the Soviet Union flirted with nuclear Armageddon. Even if China and America stop short of conflict, the world will bear the cost as growth slows and problems are left to fester for lack of co-operation.

Both sides need to feel more secure, but also to learn to live together in a low-trust world. Nobody should think that achieving this will be easy or quick.

The temptation is to shut China out, as America successfully shut out the

Soviet Union—not just Huawei, which supplies 5G telecoms kit and was last week blocked by a pair of orders, but almost all Chinese technology. Yet, with China, that risks bringing about the very ruin policymakers are seeking to avoid. Global supply chains can be made to bypass China, but only at huge cost. In nominal terms Soviet-American trade in the late 1980s was \$2bn a year; trade between America and China is now \$2bn a day. In crucial technologies such as chipmaking and 5G, it is hard to say where commerce ends and national security begins. The economies of America's allies in Asia and Europe depend on trade with China. Only an unambiguous threat could persuade them to cut their links with it.

It would be just as unwise for America to sit back. No law of physics says that quantum computing, artificial intelligence and other technologies must be cracked by scientists who are free to vote. Even if dictatorships tend to be more brittle than democracies, President Xi Jinping has reassured party control and begun to project Chinese power around the world. Partly because of this, one of the very few beliefs which unite Republicans and Democrats is that America must act against China. But how?

For a start America needs to stop undermining its own strengths and build on them instead. Given that migrants are vital to innovation, the Trump administration's hurdles to legal immigration are self-defeating. So are its frequent denigration of any science that does not suit its agenda and its attempts to cut science funding (reversed by Congress, fortunately).

Another of those strengths lies in America's alliances and the institutions and norms it set up after the second world war. Team Trump has rubbed norms instead of buttressing institutions and attacked the European Union and Japan over trade rather than working with them to press China to change. American hard power in Asia reassures its allies, but President Donald Trump tends to ignore how soft power cements alliances, too. Rather than cast doubt on the rule of law at home and bargain over the

extradition of a Huawei executive from Canada, he should be pointing to the surveillance state China has erected against the Uighur minority in the western province of Xinjiang.

As well as focusing on its strengths, America needs to shore up its defences. This involves hard power as China arms itself, including in novel domains such as space and cyberspace. But it also means striking a balance between protecting intellectual property and sustaining the flow of ideas, people, capital and goods. When universities and Silicon Valley geeks scoff at national-security restrictions they are being naive or disingenuous. But when defence hawks over-zealously call for shutting out Chinese nationals and investment they forget that American innovation depends on a global network.

America and its allies have broad powers to assess who is buying what. However, the West knows too little about Chinese investors and joint-venture partners and their links to the state. Deeper thought about what industries count as sensitive should suppress the impulse to ban everything.

Dealing with China also means finding ways to create trust. Actions that America intends as defensive may appear to Chinese eyes as aggression that is designed to contain it. If China feels that it must fight back, a naval collision in the South China Sea could escalate. Or war might follow an invasion of Taiwan by an angry, hypernationalist China.

A stronger defence thus needs an agenda that fosters the habit of working together, as America and the USSR talked about arms-reduction while threatening mutually assured destruction. China and America do not have to agree for them to conclude it is in their interest to live within norms. There is no shortage of projects to work on together, including North Korea, rules for space and cyberwar and, if Mr Trump faced up to it, climate change.

Such an agenda demands statesmanship and vision. Just now these are in short supply. Mr Trump sneers at the global good, and his base is tired of America acting as the world's policeman. China, meanwhile, has a president who wants to harness the dream of national greatness as a way to justify the Communist Party's total control. He sits at the apex of a system that saw engagement by America's former president, Barack Obama, as something to exploit. Future leaders may be more open to enlightened collaboration, but there is no guarantee.

Three decades after the fall of the Soviet Union, the unipolar moment is over. In China, America faces a vast rival that confidently aspires to be number one. Business ties and profits, which used to cement the relationship, have become one more matter to fight over. China and America desperately need to create rules to help manage the rapidly evolving era of superpower competition. Just now, both see rules as things to break. ■



中美抗衡

新型冷战

如何应对美国和崛起的中国之间日益增长的对抗

贸易战只是冰山一角。从半导体到潜艇，从电影大片到探索月球，美国和中国正在每一个领域展开角逐。过去，这两个超级大国寻求的是一个双赢的世界。如今却似乎是有赢就必有输——要么中国崩溃，永久臣服于美国秩序；要么美国失利，撤出西太平洋地区。这是一种新的冷战，可能根本不会有赢家。

正如本周的特别报道阐述的那样，两个超级大国之间的关系已经恶化。美国抱怨中国靠窃取技术作弊上位，而且通过强化控制南海、欺凌加拿大和瑞典等民主国家，对全球和平造成威胁。中国既梦想重新夺回自己在亚洲应有的地位，又担心疲惫又嫉妒的美国因为不能接受其自身的衰落而阻止它崛起。

灾难的阴云在逼近。威廉二世统治下的德国将世界拖入了战争的漩涡；美国和前苏联差点就爆发了世界末日式核大战。即使中国和美国不发生战争，经济增长也将放缓，国家间缺乏合作将导致各种问题恶化，全世界都将为此买单。

双方都需要更有安全感，但也需要学会在一个缺乏信任的世界中共存。任何人都不该以为这是能够很容易或很快做到的。

美国面临的诱惑是像成功孤立了苏联那样孤立中国——不仅是针对上周被两项禁令封杀的5G电信设备供应商华为，而是针对几乎所有的中国技术。然而，面对中国这样的对手，此举可能会带来政策制定者们都在力图避免的那种破坏。全球供应链确实可以绕过中国，但代价高昂。按名义价值计算，上世纪80年代后期的美苏贸易额为每年20亿美元；现在美中之间的贸易额每天就有20亿美元。在芯片制造和5G这样的关键技术中，很难划清商业运营和国家安全之间的界限。美国在亚洲和欧洲的盟国在经济上依赖

与中国的贸易，只有明白无误的威胁才能说服它们切断与中国的联系。

但美国坐视不理同样也非明智之举。没有任何物理法则限定量子计算、人工智能和其他技术必须由享有自由投票权的科学家来破解。即便独裁政权一般比民主国家脆弱，习近平也已重申了共产党的统治地位，并开始在全世界范围内投射力量。这在一定程度上让共和党和民主党形成了少有的共识，即美国必须对中国采取行动。但该怎么做呢？

首先，美国需要停止削弱自己的优势，而应该依仗它们。鉴于移民对创新至关重要，特朗普政府对合法移民设置的障碍是弄巧成拙。特朗普政府还经常诋毁任何不符合其政治主张的科学项目，并试图削减科研资金（幸而被国会推翻了），这也会有同样的反作用。

美国的另一个优势是在二战后建立起的联盟、机制和准则。特朗普政府非但没有巩固那些机制，反而批驳了很多准则；没有与欧盟和日本联手向中国施压迫使其改变，反而在贸易上攻击它们。美国在亚洲的硬实力让其盟友放心，但特朗普往往忽视了软实力在巩固联盟方面的作用。他应该指责中国在西部省份新疆针对维吾尔族建立的监控制度，而不是引发人们对美国内外法治的质疑，或在从加拿大引渡华为高管的问题上讨价还价。

除了关注自己的优势，美国还需要加强防御。中国正在武装自身，美国也需要在包括太空和网络空间等新领域内加强硬实力。但这也意味着需要在保护知识产权和维持思想、人员、资本和商品的流动之间取得平衡。当高校和硅谷极客嘲笑那些为国家安全而设的限制时，他们要么是太天真，要么是虚伪。但是，当军方鹰派过度热切地呼吁抵制中国国民和投资时，他们忘记了美国的创新靠的是全球性的网络。

美国及其盟国拥有广泛的权力来评估谁在买什么。然而，西方对中国投资者和合资伙伴以及它们与中国政府的联系知之甚少。对什么行业算敏感行业做更深入的思考应该能抑制实施一刀切禁令的冲动。

与中国打交道还意味着要找到办法建立信任。美国出于防御而采取的行动在中国人看来可能是想要遏制它的攻击行为。如果中国觉得必须反击，南

海的军事冲突可能就会升级。如果中国被激怒，在极端民族主义的推动下入侵台湾，就可能引发战争。

因此，要增强防御就需要一个能促进合作习惯的议题。就像在冷战期间，美国和前苏联一边相互威胁毁灭对方，一边谈裁减军备。中国和美国不需要达成一致也知道按照准则办事符合它们各自的利益。两国之间不乏可以合作的议题，包括朝鲜问题、太空和网络战的规则，以及气候变化问题（如果特朗普愿意正视它的话）。

这样的议题需要政治才干和眼界。目前这两点都不够。特朗普不屑顾及全球利益，他的支持者也厌倦了美国扮演世界警察的角色。与此同时，中国的国家主席想要利用成为强国的梦想来让共产党的全面控制正当化。他领导的体制认为美国前总统奥巴马的接触政策是可利用的工具。也许未来的领导人会更愿意接受开明的合作，但这一点并不能保证。

前苏联解体30年后，单极时代结束了。满怀信心地渴望成为第一大国的中国成了美国庞大的竞争对手。过去巩固两国关系的商业纽带和利益已成为双方要一争高下的又一个问题。中国和美国亟需创建规则，帮助世界应对快速演变的超级大国竞争时代。而眼下，双方都认为规则是要打破的。■



Memories

Down on the farm

Why Iowa is Xi Jinping's favourite corner of America

WHEN RICK KIMBERLEY showed Xi Jinping around his farm in Iowa in 2012, he explained how modern seeds, big machines and computers had doubled crop yields since he began farming in 1972. His Chinese guest, who was then vice-president and months away from assuming the leadership of the Communist Party, pronounced the farm a model to study. When he speaks, China acts.

A replica of Mr Kimberley's property is being built in Hebei province, northeast of Beijing, as a demonstration farm. He is now honorary dean of the Kimberley Agricultural Business School in Shaanxi province. Thousands of Chinese visitors have trekked to his farm in Iowa, many eager to be photographed on the John Deere tractor on which their leader sat. Mr Kimberley would have traded it in by now, but Chinese firms have asked about shipping it to the motherland.

Mr Xi's first visit to Iowa was in 1985, as leader of a five-man agricultural delegation. His business cards said he was the director of an animal-feed association. His hosts took him to farms and feed mills. He ate roast hog and went on a cruise on the Mississippi River. Iowa's then governor, Terry Branstad, received the Chinese guests. This Iowan kindness was a lucky investment. Unbeknown to his hosts, young Mr Xi (pictured) was party secretary of a county in Hebei and son of a member of China's politburo, Xi Zhongxun, who had visited Iowa in 1980.

Today, Mr Branstad is America's ambassador to China, and delights in talking up his long friendship with Mr Xi. China's president seems attached

to those memories, too. During his second visit in 2012 he spent an hour with Iowans who had hosted him in 1985. “For me, you are America,” Mr Xi enthused.

China has duly showered Iowa with demonstrations of amity. For the past four years orchestras on American concert tours have given free concerts in Muscatine, the town of 24,000 where, in 1985, Mr Xi stayed with a local family, the Dvorchaks. Grateful Muscatine high-school students have enjoyed free study tours of China, funded by Wanxiang, a Chinese maker of car parts.

Gary Dvorchak was at college when China’s future ruler borrowed his teenage bedroom, complete with Star Wars figures on the shelves. His reward came in 2015 when his family was invited to Beijing to dine with President Xi, his wife and his daughter. Today Mr Dvorchak is a business consultant in Beijing. In the face of continued unequal treatment for foreign firms, the impatience of American businesses is at “boiling point”, he laments. Often asked to meet delegations of Iowan farmers and entrepreneurs, he tries to warn them about cultural differences. Chinese business partners learn to trust slowly. Americans are in a hurry, and trust strangers until given cause not to—but once disappointed will walk away.

Mr Dvorchak’s former home in Muscatine is now the Sino-US Friendship House, a museum displaying photographs of Mr Xi in Iowa. Its developer, Cheng Lijun, owns several properties in Iowa and is bringing up his children there. He thinks that ordinary Americans still welcome Chinese investment. But Chinese businesses feel “a lot of invisible pressure” from America’s government, which sees a spy scandal in every bid for a business that uses technology, he sighs.

In 2017 America sold China soyabeans worth \$12.4bn, many from Iowa. Then Mr Trump launched his trade war and China slapped tariffs on

American soyabean. Tim Maxwell grows them near Muscatine. He backs the president even if his sales are hit: "We're going to feel a bit of a sting for a couple of years, because he is not going to let anyone push him around, and I'm all for that."

Sarah Lande (pictured) helped to organise Mr Xi's visit in 1985, giving him a lift in her red convertible (she regrets declining his request to drive it). She hosted him again in 2012. But this pioneer of engagement senses a new wariness among her neighbours. "People are influenced by what they read in the papers, that China is spying on us," she says. If a young Chinese official were to visit today, she is not sure his delegation would get the same sort of welcome: "What we show them might be a bit broad-brush now." ■



往事

在农场上

为什么爱荷华州是习近平最喜欢的美国一隅【专题报道《中国和美国》系列之一】

二〇一二年，瑞克·金伯利（Rick Kimberley）带习近平参观了他在爱荷华州的农场。他解释了自1972年开始种植以来，现代种子、大型机械和计算机如何让作物的产量翻了一番。他的中国客人说，这片农场是一个值得学习的范本。这位客人当时担任国家副主席，几个月后成了共产党的最高领导人。他说一句话，中国就会按他说的行动。

在位于北京东北方向的河北省，中国正在建设金伯利农场的复制品作为示范田。金伯利现在是陕西省金伯利农商发展中心的名誉院长。成千上万的中国游客已经辗转来到他在爱荷华州的农场，很多人都想要在他们的领导人坐过的约翰迪尔拖拉机上拍照。金伯利本来要把它折价换购的，但一些中国公司提出想把它运回祖国。

习近平首次访问爱荷华州是在1985年。当时他率领了一个五人农业代表团。他名片上的头衔是某个动物饲料协会的主任。东道主带他参观了农场和饲料厂。他吃了烤全猪，之后乘船游览了密西西比河。时任爱荷华州州长特里·布兰斯塔德（Terry Branstad）接待了中国客人。爱荷华州的善意是一项幸运的投资。他的东道主不知道的是，年轻的习近平（见图）是河北省的一个县委书记，还是中国政治局委员习仲勋的儿子。习仲勋曾在1980年访问爱荷华州。

如今，布兰斯塔德是美国驻华大使，并乐于谈起他与习近平的长期友谊。中国国家主席似乎也很念旧。2012年第二次访问期间，他和1985年接待他的爱荷华人一起待了一个小时。“对我来说，你们就是美国。”习近平热情地说。

中国向爱荷华州充分展示了友好。过去四年中，在美巡回演出的管弦乐团

为仅有24,000居民的马斯卡廷镇举办了多场免费音乐会，习近平在1985年正是与这里的德沃查克一家住在一起。在中国汽车零部件制造商万向集团的资助下，马斯卡廷的高中生享受了免费的中国游学，对此十分感激。

当中国未来的统治者借用他少年时的卧室时，加里·德沃查克（Gary Dvorchak）正在上大学，卧室的架子上还摆着星球大战的玩偶。他的回报在2015年到来——当时他全家被邀请到北京与习主席及其妻女共进晚餐。今天，德沃查克是北京的一名商业顾问。他叹息道，面对外国公司持续遭受的不平等待遇，美国企业的不耐烦达到了“沸点”。他常被请去会见爱荷华州的农民和企业家代表团，他尝试提醒他们注意文化差异。中国的企业合作伙伴往往是慢慢才学会信任。美国人则风风火火，并且相信陌生人，直到有理由不相信——但一旦失望就会离开。

德沃查克在马斯卡廷的故居现在是“中美友谊之家”，这座博物馆展览着习近平在爱荷华时的照片。它的开发商程立军在爱荷华州拥有多处房产，并在那里养育子女。他认为普通美国人仍然欢迎中国的投资。但是，中国企业感受到来自美国政府“很大的无形压力”。他叹了口气说，美国政府觉得中国企业对涉高科技的业务的每次投标背后都有间谍丑闻。

2017年，美国向中国出售了价值124亿美元的大豆，其中许多来自爱荷华。然后特朗普发动了他的贸易战，中国继而对美国大豆征收关税。蒂姆·麦克斯维尔（Tim Maxwell）在马斯卡廷附近种大豆。即使自己的生意受到打击，他也支持总统：“我们几年内都会感受到一点刺痛，因为他不会受任何人左右，对此我全力支持。”

莎拉·兰德（Sarah Lande，见图）帮助组织了习近平1985年的访问，让他搭乘了她的红色敞篷车（她后悔拒绝了他的驾驶请求）。她在2012年再次接待了他。但这位实践美国对华“接触政策”的先锋人士觉察到邻居当中开始出现了一种新的警惕。“报纸上说中国正在监视我们，人们看到了就会受影响。”她说。如果今天再有哪个年轻的中国官员到访，她不确定他的代表团会得到同样的欢迎：“现在我们向他们展示的东西可能会更粗泛一些了。”■



Foreign investment

What's up?

Brexit makes firms think twice

HAS THE Brexit vote put foreign investors off Britain? Remainers point to cancelled plans by Japanese carmakers, American banks and others. But Leavers say Britain is more alluring than ever. Last month the country topped a ranking by EY, an accountant, of attractiveness for investors. Earlier this month Facebook chose London as its base for expanding its WhatsApp messaging service. Who is right?

Countries compete hard for foreign direct investment (FDI). When overseas firms enter a domestic market they tend to make it more competitive, which is good for consumers. And when they take over domestic businesses they often boost their productivity. That, in turn, raises wages.

The Leavers' case appears strong. In 1995-2015 Britain attracted a tenth of global cross-border mergers and acquisitions. Since the referendum of 2016 the proportion has barely budged. Warren Buffett, the world's most famous capitalist, recently told the *Financial Times* he was "ready to buy something in the UK tomorrow". Low corporation tax and a stable legal system continue to draw business to Britain.

A common counter-argument is that much of the inward FDI since the referendum has been little more than asset-stripping. Foreigners have taken advantage of a weak pound to buy British companies on the cheap and make off with their intellectual property, the argument goes. Yet even FDI in more concrete things, such as offices and research facilities, has risen since 2016.

So have investors brushed off Brexit? Not quite. Some industries have noticeably cooled on Britain. It was the top destination for cross-border

mergers and acquisitions involving American tech firms in 2014-17. But in 2018 it tumbled to eighth place. In October the UK Trade Policy Observatory at Sussex University modelled a counterfactual Britain that had voted Remain, and found that the Leave vote had reduced inward FDI by a fifth.

Brexit affects domestic firms, too. In January Barclays bank received legal approval to move €190bn (\$213bn) of assets to Dublin, fearing no-deal. The London School of Economics recently found the Brexit vote had caused a 12% rise in investment by British firms in the rest of the EU. That capital might otherwise have been used at home. FDI remains strong, but it would be stronger minus Brexit. And Britain has not even left yet. ■



外国投资

情况如何？

面对英国脱欧，企业三思而后行

英国脱欧公投是否已让外国投资者对英国望而却步？留欧派指出，日本汽车制造商、美国的银行等企业已纷纷取消了在英投资计划。但脱欧派却说英国比以往任何时候都更具吸引力。在安永会计师事务所上个月发布的对投资者吸引力排名中，英国位居榜首。本月稍早时，Facebook选择伦敦作为扩展其WhatsApp即时信息服务的大本营。两派到底孰是孰非？

各国在争取外国直接投资（FDI）方面竞争激烈。海外公司进入国内市场往往会展开加大国内市场的竞争，这对消费者来说是好事。海外公司收购国内企业通常会提高这些企业的生产率，进而提升工资水平。

脱欧派的理由似乎很充分。1995年至2015年，英国吸引了全球十分之一的跨境并购。自2016年脱欧公投以来，这一比例几乎没有变化。全球最著名的资本投资家巴菲特近期对《金融时报》表示，他“很乐意来日在英国买点什么”。较低的公司税和稳定的法律体制依旧在吸引企业入驻英国。

一种常见的反面观点是，自公投以来，流入的外国直接投资中很多不过是资产拆卖。该观点认为，外国投资者趁英镑疲软之机低价收购英国公司并拿走它们的知识产权。然而，即便是对更具体的有形资产的外国直接投资，比如办公楼和研究设施，自2016年以来也有所上升。

那么，投资者对英国脱欧就无动于衷吗？并非完全如此。一些行业对英国的兴趣明显下降了。2014至2017年，英国是美国科技公司跨国并购的首选地。但在2018年却跌至第八位。去年10月，苏赛克斯大学（Sussex University）的英国贸易政策观察组织（UK Trade Policy Observatory）模拟了与现实相反的情形，也就是假设英国选择了留欧。对比后发现，脱欧的投票结果导致外国直接投资流入减少了五分之一。

脱欧也影响到了英国本土公司。今年1月，巴克莱银行取得合法审批，将1900亿欧元（2130亿美元）资产转移到都柏林，以防可能发生无协议脱欧。伦敦政治经济学院最近发现，脱欧投票导致英国公司在欧盟其他国家的投资增加了12%，而这些资金原本可能用于英国本土。外国直接投资依然强劲，但不脱欧的话会更强。再说这会儿英国都还没离开欧盟呢。 ■



Competing in technology

One-party tech

America is still ahead, but China is catching up fast

A RARE THING happened in an industrial park near Washington, DC, last November. Construction began on a \$3bn extension to a semiconductor foundry owned by Micron Technologies, a maker of advanced memory chips, based in Idaho. “A few years ago, opening that sort of extension would have people saying, well, that is going to be moving to China soon, isn’t it?”, observes James Mulvenon, an expert on Chinese cyber-policy and espionage.

Not now. Instead, that Micron foundry is a glimpse of the future. Trust in China has collapsed among American government and business bosses, and a consensus has grown that Chinese firms have closed the technological gap with Western rivals with indecent speed and by illicit means.

Today’s tensions make the original cold war look simple. In 2018 China accounted for 57% of Micron’s net sales. In the 1960s and 1970s American tech companies did not rely on Soviet customers. But Micron is a symbol, several times over, of how commercial competition is turning into a zero-sum contest, in which one side wins at the other’s expense. In 2015 Micron rebuffed a \$23bn takeover bid from a Chinese state-backed investment fund, saying that it thought such a deal would be blocked on national-security grounds by the Committee on Foreign Investment in the United States (CFIUS). In 2018 the Department of Justice indicted a state-owned Chinese firm, its Taiwanese partner and three individuals on charges of stealing trade secrets relating to Micron’s memory chips—technology worth tens of billions of dollars. That followed lawsuits and countersuits in which the accused Chinese firm asserted that it owned the relevant patents in

China and was therefore Micron's victim. A Chinese court sided with it, then Micron was hit with an antitrust probe.

China hawks in Washington say the zero-sum game is about broken laws. "Put plainly, China seems determined to steal its way up the economic ladder at our expense," declared Christopher Wray, the director of the FBI, on April 26th, adding that nearly all the agency's 56 field offices are working on economic spy cases "that almost invariably lead back to China". Between March and November 2018, the Department of Justice indicted a dozen individuals and entities it says were directed by the Chinese government to obtain commercial secrets from 15 companies, predominantly in aerospace and high technology.

Others say the zero-sum game involves broken promises to American workers. They recall American political leaders assuring workers that high-value manufacturing would stay in America, even as globalisation carried cheap jobs to China.

Using his chairmanship of the Senate committee on small business and entrepreneurship as a bully pulpit, Senator Marco Rubio of Florida in February issued a report condemning China's plans to become a global powerhouse in ten high-tech fields, from artificial intelligence (AI) to aviation, as laid out in the "Made in China 2025" (MIC2025) plan issued by the State Council in 2015. Should America let China become the global leader in innovation and manufacturing, "this would be an unacceptable outcome for American workers," Mr Rubio writes in his report.

In a mark of these populist times, Mr Rubio is not afraid to argue that government has a direct role to play in defending blue-collar factory jobs. Manufacturing provides more stable employment than services, the Rubio report avers. It urges America to use industrial policies, including tax changes and export controls, to defend industries from robotics to tractor-

making.

Not all senators are as vocal as Mr Rubio, nor as keen on export controls. But deepening distrust of China is a bipartisan norm in Congress. The views of American businesses in China are a bit more nuanced, as shown by the 2019 business-climate survey of the American Chamber of Commerce there, issued in February. Nearly 70% of firms say they are profitable. Still, there are warning signs. In the AmCham survey, half of all American technology firms say they limit investments in China because of inadequate protection of intellectual property (IP), even after years of Chinese promises to get serious about it.

China has become tougher on acts of piracy, from fake consumer goods to breaches of patents. But foreign executives still tell horror stories about pressure to share secrets with local partners and cyber-attacks on company servers back home. Depressingly, 13% of member firms in the AmCham survey said that their greatest IP risk was theft by their own employees.

There are several ways in which economic competition can become zero-sum, and all can be seen in China today. Theft is just one. Another is the pursuit of import substitution, aiming to replace imports with domestic alternatives, by fair means or foul. America is in a funk about losing its edge, but it is still home to global champions from aerospace and semiconductors to software and self-driving vehicles. Its officials worry that MIC2025 commits China to being world-class in all those sectors.

Since 2015 supporting plans and road maps published by government research agencies set out hundreds of market-share targets for Chinese firms, declaring, for instance, that 80% of electric or hybrid “new energy” vehicles sold in China must be domestically produced by 2025. Chinese officials, facing a worldwide backlash, now downplay those targets. Strictly-censored state media have stopped using the term MIC2025. But the policy

itself has not been repealed. Speeches by party chiefs ring with calls for “self-reliance” and “indigenous innovation”. Other Chinese technology sectors are being encouraged to comply with a policy called “civil-military fusion”, a national strategy backed by top leaders and funding from opaque national-security budgets.

That militarisation of some Chinese technology imposes costs as well as benefits, notes Mr Mulvenon. Those costs include the risks for Western firms of doing work that supports the brutal techno-dystopia that China has built in Xinjiang. “The good news is that the Chinese are going to discover that autarky is hard,” says Mr Mulvenon. Americans have watched China stealing and reverse-engineering one generation of technology, he says, then having to steal the next after failing to master the underlying science. “That model is incredibly inefficient.”

China is willing to spend what it takes, showering would-be champions with billions of dollars in subsidies and prodding local firms to place orders. Among the beneficiaries is the Commercial Aircraft Corporation of China, whose C-919 commercial airliner is intended as a direct competitor to Boeing’s 737. State planners have set a goal of a 10% domestic market share for Chinese airliners by 2025. The C-919 has had teething troubles, making that timetable ambitious. But success for China could quickly feel zero-sum in America, whose top export category to China in 2017 was civilian aircraft, worth \$16.3bn. The Rubio report laments that at least ten American firms supply vital parts to the C-919.

China has created big brands in such fields as electric vehicles and batteries, in part by shutting foreign rivals out. Protectionist barriers have also allowed Chinese internet firms to grow. In 2009 the ten largest internet companies by revenue were American. Now several are Chinese (see chart).

Still, it is a mistake to exaggerate China's strengths in big-data analysis and AI, according to Dieter Ernst of the East-West Center, a think-tank in Hawaii. A near-total lack of privacy protection may help sweep up lots of data, but American firms are better at advanced algorithms that make AI less dependent on big data sets, Mr Ernst wrote. Big Chinese applications are still mostly powered by American-designed chips, which remain world-beating.

America has other advantages. Joy Dantong Ma of MacroPolo, the in-house think-tank of the Paulson Institute, examined the origins of leading speakers at the most prestigious AI gathering. Most came from American universities and tech firms, she found. Crucially, though, more than half those American stars were foreign-born. Team Trump's visa clampdown imperils that.

Some forms of competition can be fair but still end with the gains going mostly to one side. Notably, some technological fields give a "first-mover advantage" that offers huge rewards to countries or businesses that take an early lead, allowing them to set standards that later entrants have little choice but to follow. In April the Defence Innovation Board, a Pentagon advisory committee of Silicon Valley luminaries, issued a report warning that China is on track to pull off this feat in the race to dominate 5G mobile telecommunications. This next generation of wireless technology promises to revolutionise existing industries and invent whole new ones with data speeds about 20 times those of 4G.

A decade ago American firms took an early lead in 4G, setting standards for new handsets and applications that spread worldwide. That dominance helped Apple, Google and other American businesses generate billions of dollars in revenues. China learned its lesson, investing \$180bn to deploy 5G networks over the next five years and assigning swathes of wireless spectrum to three state providers. In America the same part of the spectrum is largely off-limits commercially because it is used by the federal

government. American firms are experimenting with a different part of the spectrum that has some advantages under laboratory conditions but is easily blocked by buildings and trees. For this reason, in spite of American pressure on allies, much of the world is likely to adopt China's handsets, chips and standards, the Pentagon board concludes. Since America's armed forces are expected to operate worldwide, they must prepare to send data through a "post-Western" world of wireless technology and through "zero-trust" networks, studded with components from such Chinese firms as Huawei. That will mean more focus on encryption and security.

Some technology contests look more benign. As China and America wall off their respective digital markets from one another, each will look for growth in the rest of the world. A divided world wide web, or "splinternet", is already a reality, as China's internet grows behind a great firewall of censorship. American champions like Amazon are promoting payment services in India. China's Alipay service is active in Brazil. China is exporting surveillance systems and censorship algorithms to police states from Ethiopia to Venezuela. With a change in direction, America could make a virtue of an internet that respects privacy. Western biomedical firms and gene-editing laboratories could make a virtue of stricter ethics.

It is unhelpful that Mr Trump is a techno-curmudgeon. He has proposed budgets that slash scientific-research funds, though Congress reversed them. After two recent crashes of Boeing 737 Max airliners, he tweeted that "airplanes are becoming far too complex to fly". Still, last year Mr Trump signed a bipartisan bill authorising \$1.3bn for quantum-computer research. The aim is to keep ahead of Chinese work on computers that harness the laws of quantum physics to achieve processing speeds out of a science-fiction film. America leads this field, but Xi Jinping deems it a national priority, quizzing scientists who have returned from quantum laboratories in America and Europe. Should China succeed, it could develop almost unhackable satellite communications and quantum radar to detect the

stealthiest planes and submarines.

Such a success would turn a technology contest into an arms race. America would then have to decide whether this China can be deterred or whether one day it might use its new capabilities. ■



技术竞争

一家独大

美国仍领先，但中国正迅速赶上【专题报道《中国和美国》系列之二】

去年11月，华盛顿特区附近的一个工业园里发生了一件稀罕事。总部位于爱达荷州的先进存储芯片制造商美光科技公司（Micron Technologies）旗下的一家半导体代工厂耗资30亿美元的扩建项目开工。研究中国网络政策与间谍活动的专家詹姆斯·穆文农（James Mulvenon）观察说：“几年前，如果搞这种扩建，人们会说，好吧，但这很快就会搬到中国去，不是吗？”

如今不是了。从这家美光代工厂可以一窥未来的景象。美国政府和商界老板对中国的信任已经崩塌，逐渐形成的共识是中国公司已经以过分的速度和不正当的手段缩小了与西方竞争对手之间的技术差距。

和今天的紧张局势相比，当年的冷战看起来太简单了。2018年，中国占了美光净销售额的57%。在上世纪六七十年代，美国科技公司并不依赖苏联客户。但美光成了一个代表，一次又一次地展现了商业竞争正如何变成零和竞争——一方赢，另一方就要输。2015年，美光拒绝了一个由中国政府支持的投资基金230亿美元的收购要约，并表示它认为美国外国投资委员会（CFIUS）会以国家安全为由阻止这样的交易。2018年，美国司法部起诉一家中国国有企业、其台湾合作伙伴和三名个人，称其涉嫌窃取涉及美光内存芯片的商业机密——该技术价值数百亿美元。在此之前发生了多起诉讼和反诉讼，这家被控告的中国公司声称其在中国拥有相关专利，因此是美光公司的受害者。它得到了一家中国法院的支持，然后美光遭到了反垄断调查。

华盛顿的对华鹰派人士表示，这种零和游戏缘于对法律的破坏。4月26日，联邦调查局局长克里斯托弗·雷（Christopher Wray）称：“明白地说，中国似乎决意要牺牲我们的利益，以偷窃来攀登经济阶梯。”并补充说，

FBI的全部56个地方办事处几乎都在研究“几乎无一例外指向中国”的经济间谍案。2018年3月至11月间，司法部起诉了十几个个人和实体，称他们受中国政府指使获取15家公司的商业机密，主要是在航空航天和高科技领域。

其他人说，这种零和游戏还违背了对美国工人的承诺。他们回忆说，美国政治领导人向工人们保证，即使全球化把廉价工作带到了中国，高价值制造业还将留在美国。

今年2月，佛罗里达州参议员马克·卢比奥（Marco Rubio）利用他作为参议院小型企业和创业委员会主席的显赫身份发表了一份报告，谴责中国意图在从人工智能到航空的十个高科技领域成为全球强国的计划。中国国务院于2015年颁布的《中国制造2025》纲领罗列了这些领域。如果美国让中国成为创新和制造业的全球领导者，“这对美国工人来说将是一个不可接受的结果。”卢比奥在他的报告中写道。

这果然是个民粹主义的时代——卢比奥干脆地表示政府应该在捍卫蓝领工厂职位方面发挥直接的作用。卢比奥的报告称，制造业提供的就业比服务业更稳定。它敦促美国利用包括税收改革和出口管制在内的产业政策，来保护从机器人到拖拉机制造的诸多工业。

并非所有参议员都像卢比奥那样大声抨击和热衷于出口管制。但是，对中国越来越不信任是国会两党共有的常态。美国商会在今年2月发布的2019年商业环境调查显示，在华美国企业的看法要稍微微妙些。近70%的公司表示他们在华有利可图。但也有警告信号。在这项调查中，有一半美国科技公司表示，即使中国承诺认真贯彻知识产权保护已有多年，但保护仍然不足，它们因此限制了对中国的投资。

从仿冒消费品到专利侵权，中国已经加强了对盗版行为的打击。但外企高管仍然在讲述被迫与地方合作伙伴分享机密，以及总部服务器遭到网络攻击的恐怖故事。令人沮丧的是，在美国商会的调查中有13%的成员公司表示，它们最大的知识产权风险是遭自己的员工窃取机密。

经济竞争成为零和游戏的方式有几种，这些在今天的中国都可以看到。盗窃只是其中一个。另一个是寻求进口替代，旨在通过或公平或不公平的手段用国内替代品取代进口。美国对失去优势感到惊恐，但它仍然拥有从航空航天、半导体到软件和无人驾驶汽车的全球冠军企业。其官员担心《中国制造2025》会让中国在所有这些领域都跻身世界一流。

自2015年以来，由政府研究机构发布的支持计划和路线图为中国企业制定了数百个市场份额目标。例如，它宣布到2025年，在中国销售的电动或混合动力“新能源”汽车中80%必须为国产。面对全球的反弹，中国官员现在淡化了这些目标。受到严格审查的国家媒体已经停止使用“中国制造2025”这个提法，但政策本身并没有废除。共产党领导人的演讲反复呼吁“自力更生”和“自主创新”。中国的其他技术部门被鼓励遵循名为“军民融合”的政策，这是一项受到最高领导层支持、获得不透明的国家安全预算资助的国家战略。

穆文农指出，一些中国技术的军事化会带来收益，也会有代价。这些代价包括西方公司的工作有可能支持了中国在新疆建立残酷的技术敌托邦。“好消息是中国人会发现自给自足很难。”穆文农说。他说，美国人已经看到中国窃取和用逆向工程获得了一代技术，但由于未能掌握底层科学，之后不得不再去偷下一代技术。“这种模式极其低效。”

中国愿意投入所需的花费，把数十亿美元的补贴撒向未来的领军企业，并敦促本地公司多下订单。受益者包括中国商用飞机公司，其打造的C-919商用客机意图成为波音737的直接竞争对手。国家规划部门已为中国客机制订了到2025年拿下10%国内市场份額的目标。C-919在开发初期遇到了一些小麻烦，让这个时间表看起来有点过于激进。但中国的成功很快就会让美国感到零和——它在2017年对中国的最大出口类别就是民用飞机，价值163亿美元。卢比奥的报告叹道，至少有十家美国公司为C-919供应重要部件。

中国已经在电动汽车和电池等领域打造出了大品牌，部分是靠把外国竞争对手挡在家门外。保护主义壁垒也使中国的互联网公司得以发展。2009

年，以收入计算的全球十大互联网公司全部是美国公司。现在有几家是中国公司了（见图表）。

尽管如此，位于夏威夷的智库“东西方中心”（East-West Center）的迪特·恩斯特（Dieter Ernst）表示，夸大中国在大数据分析和人工智能方面的实力是错误的。恩斯特写道，几乎完全缺乏隐私保护可能有助于攫取大量数据，但美国公司更擅长先进的算法，使人工智能更少依赖大数据集。中国的大型应用仍然主要由美国设计的芯片驱动，这些芯片仍然是世界顶尖的。

美国还有其他优势。保尔森基金会内设智库“马可波罗”（MacroPolo）的马丹彤（音译）查看了那些最负盛名的人工智能会议上主要发言人的背景。她发现他们大多数都来自美国的大学和科技公司。然而，至关重要的是，这些美国明星中有超过一半是在国外出生的。特朗普政府收紧签证危及了这一点。

某些形式的竞争可能是公平的，但最终仍会导致大部分收益归于一方。值得注意的是，一些技术领域有“先发优势”，为早期领先的国家或企业带来了巨大的回报，使它们能够设定标准，让晚到者别无选择而只能跟随。国防创新委员会是五角大楼的一个咨询委员会，由硅谷名流组成，它在4月发布了一份报告，警告称中国有望在争夺5G移动通信主导地位的竞争中取得这样的优势。这种下一代无线技术的数据传输速率约为4G网络的20倍，有望彻底改变现有行业并造就全新的行业。

十年前，美国公司早早在4G网络上取得了领先，为全球普及的新手机和应用设定了标准。这种主导地位帮助苹果、谷歌和其他美国企业创造了数十亿美元的收入。中国吸取了教训，投资1800亿美元来在未来五年内部署5G网络，并给三个国有运营商分配了大量无线频谱。在美国，同样的频段被联邦政府占用，基本上无法商用。美国公司正在试验另外一部分频段，它在实验室条件下具有一定优势，但很容易被建筑物和树木阻挡。因此，国防创新委员会得出结论称，尽管美国向盟国施压，但世界上大部分国家

都很可能采用中国的手机、芯片和标准。由于美国的武装部队预期会在全球范围内行动，他们必须准备好在一个“后西方”的无线技术世界里，通过充斥着华为等中国公司的零部件的“零信任”网络发送数据。这将意味着要更加关注加密和安全性。

一些技术竞赛看起来更温和些。由于中国和美国各自的数字市场相互隔离，两国都将寻求在世界其他地区取得增长。一个分裂的万维网——或称“分裂网”（splinternet）——已经成为现实，因为中国的互联网是在一个巨大的审查防火墙背后生长的。亚马逊等美国一流企业正在印度推进支付服务。中国的支付宝服务则在巴西很活跃。中国正在向埃塞俄比亚和委内瑞拉等警察国家出口监控系统和审查算法。如果方向改变，一个尊重隐私的互联网可以让美国获益。更严格的伦理标准也可让西方生物医药公司和基因编辑实验室获益。

特朗普面对科技时是个倔老头，这没什么好处。他曾提出大幅削减科研基金预算，虽然被国会推翻了。在最近两次波音737 Max客机坠毁后，他发推特说“飞机已经复杂到没法飞了”。不过，去年他签署了一份两党支持的法案，授权投入13亿美元用于量子计算机研究，目标是在这方面持续领先中国。这种计算机利用量子物理来获得科幻电影中才有的那种处理速度。美国在这个领域处于领先地位，但习近平视其为国家优先项目，并向从美国和欧洲的量子实验室回国的科学家询问信息。如果中国取得成功，它就可以开发出几乎牢不可破的卫星通信和量子雷达系统，用它们探测到最隐蔽的飞机和潜艇。

这样的成功将使技术竞赛变成军备竞赛。然后美国必须决定，眼前的这个中国是否可以阻挡，还是有一天它可能会利用中国新获得的能力。 ■



Trade

On your bike

The trouble with tariffs

DONALD TRUMP is not the first American president to promise a tougher line on China, but he is the first to make a trade war sound like a rent renegotiation. “I am a Tariff Man,” he tweeted last December, boasting that America is “taking in \$billions” thanks to tariffs he has imposed (never mind that tariffs are a tax, mostly paid by American consumers). Mr Trump makes America’s markets sound like a valuable piece of real estate which foreigners should pay more to access. Or as he puts it: “When people or countries come in to raid the great wealth of our Nation, I want them to pay for the privilege of doing so.”

As China grew, politicians typically accused it of not “playing by the same rules”. Mr Trump is different. He is not very fussed about rules. He says that he does not blame China for putting its interests first and for stealing American jobs. He blames his predecessors who allowed that theft to take place.

When China’s business and policy elite ponders the trade war, it is not uncommon to hear Mr Trump described as a pragmatic businessman under the control of a cabal of crazed economic nationalists. In fact, trade is one of the few policy issues on which Mr Trump came into office with fixed beliefs, forged in the 1980s at a time of trade tensions with Japan and Germany. In contrast, his inner circle has spent a lot of time squabbling over trade policy, occasionally in full hearing of stunned Chinese negotiators. Officials in China are slightly obsessed with the president’s chief trade adviser, Peter Navarro, an abrasive academic who would like to decouple the Chinese and American economies. In truth, Mr Navarro’s influence is limited. His main

strength is that he represents the world view of trade-union Democrats whose votes Mr Trump needs to be re-elected.

The United States Trade Representative, Robert Lighthizer, was raised in a rustbelt railway town and sees fighting to protect manufacturing workers as the proper work of government. He cut his teeth negotiating with Japan for the Reagan administration. What unites this odd bunch is a shared narrative: that China schemed and cheated its way to stealing American jobs and that those jobs could be dragged home by using enough force, just as it happened with Japan two generations ago.

Back then Japan and Germany placated America by agreeing to strengthen the yen and the D-mark against the dollar, making American goods a bit more competitive. Japan was bullied into voluntarily restricting exports of everything from textiles to cars. More constructively, Japanese firms opened car factories in America, bringing Japanese quality management with them.

Alas for the odd bunch, the solutions imposed on Japan are inapplicable to China, and history will not repeat itself. For one thing China is not about to let its currency strengthen by 50% or more against the dollar. For another, Chinese carmakers or telecommunications giants like Huawei are not very welcome to invest in America, where they stand accused of stealing technology and threatening national security.

Team Trump's narrative also refuses to acknowledge the logic of global supply chains. The popular history of how American jobs migrated to China overplays the cunning of Chinese officials and underplays the role of multinational companies from Asia and beyond. In many low-end manufacturing industries, the forces of globalisation sent jobs to China when it offered low wages, cheap land and tax breaks. Foreign firms trained Chinese managers to run export-quality plants.

Now, as Chinese wages are rising and Mr Trump's tariffs are creating unmanageable political risks, manufacturing jobs are leaving after a 30-year sojourn, heading for South-East Asia and beyond. Getting history right matters because Mr Trump's trade rhetoric is so steeped in nostalgia. Douglas Paal, who held top Asia posts in the Reagan and first Bush White Houses, sees a defect in every fight based on trade law: "The structure doesn't allow for the voices of the industries of the future."

Sometimes a single industry's fate sums up an era. In the 1970s American factories produced over 15m bicycles a year. Today over 95% of bikes sold in America are imported, overwhelmingly from China. They use decades-old technology, but the Trump administration wielded special "section 301" powers, meant to safeguard the most precious intellectual property, to slap a 10% tariff on Chinese bicycles last September, raised to 25% on May 10th.

For anyone seeking evidence that trade wars are good for American workers, the bicycle aisle of the Walmart Supercentre in Moline, Illinois, looks promising. Alongside Chinese-made cycles from brands like Huffy or Kent, the racks hold stirringly patriotic machines: mountain bikes carrying the shield-shaped logo of the Bicycle Corporation of America (BCA) and tags in the colours of the American flag, bearing the slogan "Bringing Jobs Back to America!" and giving a factory address in South Carolina.

That Walmart aisle is misleading. Arnold Kamler is chief executive of Kent International, a family firm based in New Jersey that sells about 3m bicycles a year to Walmart, Target and other shops. He remembers how, in the late 1980s, Chinese-made bikes sold in America at prices that made no sense and then kept falling by a further 5-10% each year. Kent closed its New Jersey plant in 1991. A few years later the remaining American bikemakers applied to have anti-dumping tariffs slapped on Chinese imports. Government trade regulators declined to help. "The United States was trying to endear itself to

China back then,” Mr Kamler charges. It sounds like one of Mr Trump’s sagas of Chinese cheating and American passivity. Yet real life is less tidy, as a trip to the Yangzi delta shows.

Most Kent bicycles are made in Kunshan, near Shanghai, by a contractor called Shanghai General Sports. It is run by Ge Lei, an amiable 43-year-old. The company patriarch is his father, Ge Yali, who ran a state-owned bicycle plant in the 1980s. In the elder Mr Ge’s telling, Kunshan owes its rise to Taiwanese and Japanese manufacturers who transformed production standards. If followers of Mr Trump were to find themselves in the Ge family boardroom in Kunshan, decorated with Kent children’s bikes already bearing Walmart labels, they might yearn for BCA machines from South Carolina to wipe them out.

Except that BCA is a subsidiary of Kent. The firm was opened by Mr Kamler in 2014 after Walmart launched a buy-American drive. And rather than making bicycles from scratch, BCA assembles and paints imported frames and parts, many from Kunshan. A few years ago the Ge family bought 49% of Kent. In other words, those patriotic BCA bikes are half-Chinese.

There is worse news for America Firsters. Because Mr Trump’s tariffs apply to finished bikes and components, they have raised Kent’s and BCA’s costs by \$20m a year. Meanwhile, a separate series of Trump tariffs on steel and aluminium have so disrupted markets that plans to expand BCA are on hold, costing American jobs.

In 2015 South Carolina’s then governor, Nikki Haley, hosted Chinese and Taiwanese parts-makers at the BCA plant, urging them to open branches in her state to create a bike-making cluster. Mr Kamler urged Chinese suppliers to see that low-technology manufacturing is profitable in America. “Candidly, it was not successful,” he sighs. BCA assembled 310,000 bikes last year, and Mr Kamler believes that low production volumes put Chinese

investors off. Ge Lei sees a deeper problem. Even ignoring labour costs, he thinks that America has forgotten how to run labour-intensive factories. He is too tactful to call American workers lazy, saying only that they move “slower.”

Instead Mr Ge is building a plant in Cambodia, seeking lower wage bills. Bicycles made there will escape Mr Trump’s anti-China levies as they ship to Moline and other Walmarts. Every one of his new Cambodian workers will learn something that Mr Trump refuses to accept: tariffs rarely work as intended. ■



贸易

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关税的困境【专题报道《中国和美国》系列之三】

特朗普不是第一个承诺对中国采取强硬路线的美国总统，但他是第一个让贸易战听起来像是在重谈房租的。“我是个关税人。”去年12月他在推特上写道，并夸口说由于自己征收的关税，美国正把“数十亿美元收入囊中”（不用介意关税是一种税收，主要由美国消费者支付）。特朗普让美国市场听起来像是一块珍贵的地产，外国人要付更多钱才能进来。或者像他说的：“当其他人或国家进来抢掠我国的巨大财富时，我要让他们为拥有这么做的特权而付费。”

在中国经济腾飞之时，政客们通常指责它没有“按同样的规则办事”。特朗普不一样。他不大在意规则。他说，他不怪中国把自身利益放在第一位和窃取美国的就业机会。他怪他的前任们允许这种盗窃发生。

当中国的商业和政策精英们思索贸易战时，常会听到他们把特朗普描述成受到一小撮疯狂的经济民族主义者控制的实用主义商人。而事实上，贸易是特朗普带着固有观念入主白宫的少数议题之一，他这种信念早在上世纪80年代美国与日本及德国发生贸易摩擦期间就已形成。相反，他的核心圈子倒是花了很多时间争论贸易政策，偶尔还是当着中国谈判代表的面，把他们惊得目瞪口呆。中国官员有点太过重视特朗普的首席贸易顾问彼得·纳瓦罗（Peter Navarro）——这个对中国言辞很不友善的学者想要让中美两国经济脱钩。事实上，纳瓦罗的影响力有限。他的主要优势在于他代表了工会民主党人的世界观，而特朗普在争取连任时需要这些人的选票。

美国贸易代表罗伯特·莱特希泽（Robert Lighthizer）在铁锈地带的一个铁路沿线城镇长大，把捍卫制造业工人的岗位视为政府的正当职责。他在为里根政府与日本谈判时积累了经验。特朗普的这个古怪的团队能联合在一起靠得是同一套叙事：中国策划了作弊的方式，窃取了美国人的就业机

会；施以足够大的力量将能把这些工作重新拖回美国国内，就像两代人以前美日之间发生的那样。

当年，日本和德国为安抚美国，同意让日元和德国马克兑美元升值，让美国商品的竞争力稍微提高。日本受到威吓，自愿限制从纺织品到汽车的各类出口。更具建设性的补偿是日本公司在美国开设了汽车工厂，把日本的品质管理一并带去那里。

可惜，会让特朗普的古怪团队失望的是，当年强加给日本的解决方案并不适用于今天的中国，而历史也不会重演。一方面，中国不会让人民币兑美元升值50%或更多。另一方面，美国并不怎么欢迎中国汽车制造商或华为这样的电信巨头在美国投资，在这里它们被指控窃取技术和威胁国家安全。

特朗普团队的叙事也拒绝承认全球供应链的逻辑。关于美国就业机会如何迁移到中国的流行历史叙事夸大了中国官员的狡猾，淡化了来自亚洲及其他地区的跨国公司的作用。在许多低端制造业中，全球化的力量把工作岗位送到了提供低薪劳动力、廉价土地和税收优惠的中国。外国公司培训中国的管理人员经营工厂，生产符合出口标准的商品。

现在，随着中国工资上涨而特朗普的关税正在制造无法控制的政治风险，制造业岗位在逗留了30年后开始从中国撤出，转往东南亚等地。鉴于特朗普的贸易言论如此沉浸于怀旧，正确陈述历史是重要的。曾在里根政府和老布什政府掌管亚洲事务的包道格（Douglas Paal）认为在每场基于贸易法的斗争中都存在一个缺陷：“这种结构不让未来的行业发声。”

有时，某个产业的命运可以概括一个时代。上世纪70年代，美国工厂每年生产超过1500万辆自行车。今天，在美国卖出的自行车95%以上都是进口的，绝大部分来自中国。它们使用的是几十年前的技术，但特朗普政府却动用原本为保护那些最宝贵的知识产权而设定的“301条款”的特殊权力，在去年9月对中国自行车征收10%的关税，在5月10日又将其提高到了25%。

任何人若想找寻证明贸易战对美国工人有利的佐证，伊利诺伊州莫林市（Moline）的沃尔玛购物广场内卖自行车的那排货架似乎是个不错的选择。除了赫菲或肯特等中国制造的品牌外，货架上还摆放着激动人心的爱国机器：一批山地车上镶着带有美国自行车公司（BCA）的盾形标牌和美国国旗颜色的标签，写着“将工作带回美国！”的口号，以及一个南卡罗来纳州的工厂地址。

这排沃尔玛货架具有误导性。总部位于新泽西的家族企业肯特国际（Kent International）每年向沃尔玛、塔吉特（Target）等商店出售约300万辆自行车。其首席执行官阿诺德·卡姆莱尔（Arnold Kamler）记得，上世纪80年代后期，中国制造的自行车以不可思议的价格在美国出售，而且每年还继续降价5%到10%。肯特国际在1991年关闭了新泽西的工厂。几年后，美国尚存活的自行车制造商申请对中国进口自行车征收反倾销税。政府贸易监管部门拒绝帮忙。“美国当时正努力讨好中国。”卡姆莱尔指责道。这听起来很像特朗普那些有关中国作弊上位而美国处于被动的长篇故事之一。然而，现实并非那么简单，去一趟长江三角洲就知道了。

大部分肯特自行车都是在上海附近的昆山由一家名为上海吉纳尔运动器材公司的承包商生产。公司老板葛雷今年43岁，亲切友善。公司的“大家长”是他的父亲葛亚力，他在上世纪80年代经营一家国营自行车厂。据葛老先生说，昆山的崛起要感谢改变了生产标准的台湾和日本制造商。假如特朗普的拥趸置身于昆山的葛氏家族会议室，看到其中摆放着已经贴有沃尔玛标签的肯特儿童自行车，可能会希望来自南卡罗来纳的BCA自行车把它们赶尽杀绝。

但BCA是肯特的子公司。沃尔玛启动购买美国货的运动后，卡姆莱尔在2014年开办了这家公司。BCA并不从零开始制造自行车，而是组装和涂装进口框架和零件——其中许多来自昆山。几年前，葛氏家族买下了肯特49%的股份。换句话说，那些BCA爱国车有一半中国血统。

对“美国优先”的支持者来说，有一个更糟糕的消息。由于特朗普的关税适用于成品自行车和零部件，它们使得肯特和BCA的成本每年增加了2000万

美元。与此同时，特朗普针对钢铁和铝征收的另一系列关税严重扰乱了市场，导致BCA的扩建计划搁浅，令本来将新增的美国职位流产。

2015年，南卡罗来纳州时任州长尼基·黑利（Nikki Haley）在BCA工厂接待了中国和台湾的零部件制造商，敦促他们在南卡开设分部，创建一个自行车制造集群。卡姆莱尔劝说中国供应商相信低技术制造业在美国有利可图。“坦率地说，我没有成功。”他叹了口气。BCA去年组装了31万辆自行车，卡姆莱尔认为是低产量让中国投资者望而却步。葛雷看到了更深层的问题。他认为，即便忽略劳动力成本，美国已经忘记了如何经营劳动密集型工厂。他言语委婉地不肯说美国工人懒，只说他们动作“更慢”。

葛雷正在柬埔寨建厂，以求降低工资成本。在那里制造的自行车在运往莫林等地的沃尔玛时将逃过特朗普的对华征税。他在柬埔寨新雇的每个工人都将学到特朗普拒绝接受的一件事：关税极少能带来预期的效果。■



Students

Slow boat

Ordinary Americans and Chinese appear to be drifting apart

DURING A STATE visit to Beijing in November 2017 President Donald Trump invited his Chinese counterpart, Xi Jinping, to watch a video of his young granddaughter, Arabella, singing and reciting poetry in Mandarin. The daughter of Ivanka Trump and Jared Kushner learned her language skills from a nanny and at a private school. Many parents think that having studied Chinese looks good on a college application alongside ballet or violin lessons, says Scott McGinnis, a professor of Chinese at the Defence Language Institute, speaking in a personal capacity.

A survey in 2017 by American Councils for International Education estimated that 227,000 school-age Americans regularly wrestle with Chinese tones and radicals. At roughly the same time 363,000 students from China were hosted by American colleges and schools. Those numbers make talk of a cold war seems outlandish. Beyond trade, people-to-people exchanges look like sturdy guardrails to keep relations on track. From Deng Xiaoping on, the past four Chinese leaders all sent a child to study in America (Mr Xi's daughter was at Harvard). Soviet leaders did not enroll their young in Ivy League institutions.

Alas, those guardrails are weaker than they may appear. In many places, Chinese student numbers are dropping. The University of Iowa, for example, had seen Chinese enrolments rise five-fold between 2007 and 2015, with the effects still visible in the streets of Iowa City, where bubble-tea outlets and noodle bars cater to thousands of Chinese students.

But numbers peaked in 2015 and have since fallen by about 39%. Sydney Ji, a

graduate student from Shanghai, says that it has become harder for Chinese students to secure or renew visas (rules are especially tight for students in some high-tech fields). One of her own friends is returning home after failing to secure the right to stay and work. The American embassy in Beijing has begun issuing leaflets to Chinese students who are granted American visas urging them to “learn with an open mind”, and enjoy the free thinking and debate of college life.

Visa rules are likely to get stricter still. In April Christopher Wray, the director of the FBI, urged academic institutions to be more mindful of how others may exploit America’s “open, collaborative research environment”, accusing China of sending graduate students and researchers, among others, to steal innovations. The FBI chief also expressed concern about Confucius Institutes (CIs), Chinese-funded outposts based in American universities, trying to win hearts and minds with Mandarin lessons and cultural events.

In 2018 Senator Marco Rubio, a Republican, urged universities in Florida to consider closing CIs on their campuses. Across America, at least ten have shut in the past year, leaving about 100. China’s influence on American campuses, via student associations with close links to diplomatic missions, is a frequent topic in congressional hearings. The State Department recently ceased funding a network of American Cultural Centres at Chinese universities in the face of official harassment—including an episode in which Terry Branstad, America’s ambassador, was denied access to one funded by his own embassy.

Though demand for language teaching for school-age children remains strong, the number of college-age students choosing Chinese fell to 53,000 in 2016, a 13% drop since 2013. That is telling because older students need to think that they may want to live or work in a country, says Mr McGinnis. China is becoming less attractive, he concludes with some sadness. The

number of Americans studying in China peaked in the 2011-12 school year at nearly 15,000 and was down to just under 12,000 in 2016-17.

Behind all such statistics lie real people. When asked about Chinese students who may feel under suspicion, Mr Rubio pauses. "That is one I struggle with," says the senator, himself the son of Cuban immigrants. America cannot ignore China's use of students to acquire technology, he argues. But students exposed to American freedoms may call for change at home. "I don't want to trigger xenophobia in which every Chinese student in America is presumed to be a spy until proven otherwise," he says. In these populist times, others may feel less squeamish. ■



学生

路远迢迢

普通美国人和中国人似乎渐行渐远【专题报道《中国和美国》系列之四】

二〇一七年11月特朗普在北京进行国事访问期间，曾邀请习近平观看他的外孙女阿拉贝拉用普通话唱歌和背诗的视频。伊万卡·特朗普（Ivanka Trump）和贾瑞德·库什纳（Jared Kushner）的女儿从她的保姆和一所私立学校学到了这项语言技能。国防语言学院（Defence Language Institute）的中文教授斯科特·麦金尼斯（Scott McGinnis）说（仅以个人身份发言），许多家长认为，孩子在填写大学申请表时，除了芭蕾舞或小提琴课程，如果还能写上学过中文，是很加分的。

美国国际教育委员会（American Councils for International Education）在2017年进行的一项调查估计，有227,000名美国学龄少年儿童在经常性地与中文的声调和部首“搏斗”。大约在同一时间，有363,000名来自中国的学生在美国的高校和中小学就读。这些数字会让有关冷战的言论显得不可思议。在贸易之外，两国民众之间的交流就像是坚固的护栏，把两国关系维持在正常的轨道。自邓小平起，中国的四位领导人都曾把一名子女送到美国读书（习近平的女儿曾在哈佛大学就读）。苏联领导人并没有让他们的孩子入读常春藤盟校。

可惜，这些护栏比它们看上去要脆弱。在许多地方，中国学生的人数在下降。例如，入读爱荷华大学的中国学生在2007年至2015年间增长了五倍。如今在爱荷华市的街道上仍然可以看到这种影响，那里的珍珠奶茶店和面馆就是为迎合成千上万的中国学生而开的。

但是，这个数字在2015年见顶，此后已下降了约39%。来自上海的研究生西德尼·季（Sydney Ji，音译）说，中国学生要拿到或续签签证变得更难了（某些高科技领域针对学生的规定尤其严格），她的一个朋友就因为没能获得留下来工作的权利，正准备打道回府。美国驻北京大使馆已经开始

向那些拿到美国签证的中国学生发放宣传页，敦促他们“以开放的心态学习”，享受大学生活的自由思考和辩论。

签证规则很可能还会进一步收紧。4月，FBI局长克里斯托弗·雷（Christopher Wray）敦促学术机构更小心防范美国“开放、协作的研究环境”可能被他人利用，指责中国派遣研究生和研究人员等人群前来窃取创新成果。他还对孔子学院表达了关切，担心这些开设在美国大学内的中资前哨试图通过普通话课程和文化活动赢得人心。

2018年，共和党参议员马克·卢比奥（Marco Rubio）敦促佛罗里达州的大学考虑关闭校园内的孔子学院。过去一年中，美国各地已关闭了至少十所，剩余约100所。国会听证会上的一个常见话题是中国通过与外交使团联系密切的学生协会对美国校园施加影响。而在中国，开设在大学里的一批美国文化中心受到了中国官方的干扰，其中包括美国大使特里·布兰斯塔德（Terry Branstad）被拒绝访问他自己的大使馆资助的一个文化中心。美国国务院为此已经停止资助这些中心。

虽然学龄儿童学习中文的需求依然强劲，但2016年选修中文的大学生人数下降至53,000人，比2013年减少了13%。这很说明问题，因为年龄较大的学生需要考虑他们是否想在某个国家生活或工作，麦金尼斯说。中国的吸引力已经下降，他语带伤感地总结道。在中国读书的美国人在2011-12学年达到近15,000人的峰值，在2016-17学年降至略少于12,000人。

在所有这些统计数据背后是一个个鲜活的人。当被问及中国学生可能会感到自己被怀疑时，卢比奥停顿了一下。“这是我纠结的一个问题。”这位参议员说。他自己是古巴移民的儿子。他认为，美国不能对中国利用学生来获取技术置之不理。但是接触到美国自由文化的学生可能会在自己的祖国呼吁改变。“我不想引发仇外心理，把每个中国学生都假定为间谍直到他被证明不是。”他说。在这个民粹主义时代，其他人可能不会有这么多顾虑。 ■



Schumpeter

How to rev up Unilever

A new boss confronts an old question

IN A COMPOUND in Shanghai two rising stars in the marketing world used to share a beer together. One was Alan Jope, who in January became the boss of Unilever, a 130-year-old Anglo-Dutch consumer-goods firm famous for its Knorr stock cubes and Dove soaps. The other was Miguel Patricio, the incoming chief executive of Kraft Heinz, the macaroni-to-ketchup deal machine that in 2017 choked in an attempt to swallow Unilever.

He may run a firm that is worth \$175bn, but Mr Jope seems the sort of bloke with whom it would be easy to have a pint. The 55-year-old Scot is refreshingly down-to-earth. He wears jeans and trainers, but no tie. He has good tales to tell. His first job was driving a butcher's van. His hobby is joining friends on an intermittent mission to circumnavigate the globe on a BMW 750 motorcycle—and he has bones, broken in the Gobi desert, to prove it. He is also loyal to former drinking buddies, such as Mr Patricio. There is, he has said, “no *Schadenfreude*” about the troubles at Kraft Heinz following its calamitous results in February.

In temperament, Mr Jope could not be more different from his predecessor, Paul Polman, a self-confessed “Calvinist Dutch” whose messianic belief in long-term sustainability gave him a haughty air. Unlike Mr Polman, who was famously dismissive of shareholders, Mr Jope has been listening to them. Among the most radical ideas out there is a perennial one: that he should take Unilever on the business equivalent of an off-road trip, abandoning the slow-growing food business and focusing exclusively on more exciting areas such as beauty and home products.

Mr Jope should resist the urge. There are other ways to rev up Unilever's engine.

Most consumer-goods behemoths are in the midst of soul-searching. For much of the post-war era, the mass marketing of strong brands to ever-wealthier Westerners was the epitome of a stable business. According to McKinsey, a consultancy, for 45 years to 2010 few industries could top the returns to shareholders of the slow-moving business of selling fast-moving consumer products.

In the past decade, though, firms like Procter & Gamble, Nestlé and Kraft Heinz have increasingly resembled overweight cyclists in a bike lane. They have looked sluggish next to smaller, more agile competitors. Social-media-obsessed millennials have shaken their understanding of consumer tastes. In the developed world, the toughest business is food and beverages, especially easily replicable items like dressings, spreads and builders' tea. Hence the pressure on Unilever to ditch the food business entirely.

Unilever is already on a diet. Food and refreshments have shrunk from more than half of sales when Mr Polman took over in 2009 to 36% (it shed its 90-year-old spreads business last year). Home and personal care, including soaps, deodorants and laundry liquids, are up. This was not just a case of breathing new life into old brands like Dove. Unilever has made 29 acquisitions since 2015, mostly in the personal-care division formerly headed by Mr Jope, including upmarket beauty products like Dermalogica and subscription services like Dollar Shave Club. Known inside Unilever as "speedboats", they are meant to bring more oomph to the mothership yet remain separate from it.

Analysts and some investors tout the merits of potentially seismic deals to enhance the focus. Martin Deboo of Jefferies, a brokerage, has long argued that Unilever should sell the rest of its food business and buy Colgate-

Palmolive, a potentially \$62bn mouthful of toothpaste and other home and personal-care businesses. Andrew Wood of Bernstein, a research firm, says Mr Jope should attempt to buy Reckitt Benckiser's smaller, \$20bn hygiene-and-home business, shedding more food brands in the process.

But there are three reasons why Mr Jope ought to avoid game-changing transactions. The first is Unilever's lack of experience in handling big acquisitions. Most of the recent ones cost less than €1bn (\$1.1bn). Unilever's biggest splurge was the disastrous \$24bn acquisition of Bestfoods in 2000, after which it wasted 15 years selling off unloved brands. Tastes are changing so fast that any big purchase could end up a dud.

The second reason is that Unilever's emerging-market ambitions are well served by having a food arm. Some 58% of sales come from developing countries. Fast-growing markets such as Bangladesh could provide as much growth in dollar terms as a region like Europe. Short of formal shops, such places rely on sprawling distribution networks that work best combining food, beauty and home products. People there have a growing appetite for nutritional items. That helps explain Unilever's recent €3.3bn purchase of Horlicks, a malt drink popular in India, from GlaxoSmithKline.

Third, food can be made more valuable. Mr Wood notes that Nespresso allows Nestlé to charge ten times more per cup of coffee than Nescafé Gold Blend. Other competitors are pushing teas and ice creams up market. Unilever has acquired a few trendy food companies such as the Vegetarian Butcher. Moreover, the line between food, beauty and health is blurring; brace for more nutraceuticals, such as dietary supplements, cosmeceuticals, such as acne deep cleanser, and nutricosmetics, to make hair thicker.

Ugly neologisms aside, such a bundle of salubrious brands would dovetail with Unilever's trademark pursuit of environmental and social responsibility that Mr Jope is keen to preserve. He would be wise to do so.

Though shareholders in Britain turned against Mr Polman when he tried to end Unilever's dual listing in London and Amsterdam, few want the firm to jettison the sense of purpose that he brought, if only because it helps win customers and keep staff committed. Mr Jope may be less preachy than his predecessor, more pragmatic and, possibly, more profit-oriented. He should resist Evel Knievel-ish leaps into the unknown. Otherwise he may have more than broken bones to reminisce about over a lager. ■



熊彼特

让联合利华加速

新老板遇上老问题

两位营销界新星曾在上海一座大楼内一起喝啤酒。其中一位是于今年1月成为联合利华老板的乔安路（Alan Jope）。联合利华是一家有着130年历史的英荷合资消费品公司，家乐浓汤宝和多芬香皂都是它的招牌产品。另一位是即将就任卡夫亨氏首席执行官的米格尔·帕特里西奥（Miguel Patricio）。2017年，这家生产通心粉、番茄酱等产品的并购专业户曾试图收购联合利华，未能成功。

尽管乔安路掌管着一家市值1750亿美元的公司，但他看起来却是那种很容易和人坐下来喝一杯的人。这位55岁的苏格兰人非常实在，令人耳目一新。他爱穿牛仔裤和运动鞋，不系领带。他经历丰富，第一份工作是屠宰场的货车司机。他的业余爱好是时不时和朋友一起骑上宝马750摩托车，断断续续地环游世界——他在戈壁滩摔断骨头的旧伤是证明。他对旧日酒友也很忠诚，比如帕特里西奥。今年2月卡夫亨氏发布了糟糕的财报，公司面临困境，对此乔安路表示“不会幸灾乐祸”。

在性情上，乔安路和他的前任保罗·波尔曼（Paul Polman）有着天渊之别。波尔曼自认是一名“信奉加尔文主义的荷兰人”，他对企业长期可持续发展有着救世主式的信念，这让他带有一种傲慢的姿态。他对股东的不屑是出了名的。而乔安路则相反，他一直听取股东的意见。在各种激进的进言中，有一个想法被反复提起：他应该带领联合利华展开一场“越野之旅”，放弃增长缓慢的食品业务，专注发展个人护理和家居用品等业绩更喜人的业务。

乔安路应该抵挡住这种催促。要让联合利华提速，还有别的途径。

大多数消费品巨头目前都在反省自己的模式。在战后大部分时间里，这些企业以强势品牌向日渐富裕的西方消费者大举营销，成就了稳定的业务。

据咨询公司麦肯锡的数据，在截至2010年的45年里，几乎没有哪个行业的股东回报比得上快消品这一行动缓慢的行业。

然而过去十年来，宝洁、雀巢、卡夫亨氏这类公司越来越像自行车赛道上的超重骑手。相比身边那些规模更小、更敏捷的对手，它们看起来笨重迟钝。痴迷社交媒体的千禧一代已动摇了这些企业对消费者口味的传统认知。在发达国家，竞争最激烈的是食品和饮料市场，尤其是易于复制的产品，如沙拉酱、涂抹酱和普通茶饮品。因此联合利华才会面临要完全放弃食品业务的压力。

联合利华已经开始“节食”。2009年波尔曼接任时，食品和饮料占公司总销售额的50%以上，如今已缩减至36%（去年出售了90年历史的涂抹酱业务）。香皂、香体剂、洗衣液等家庭及个人护理产品业务均有增长。这不仅仅是给多芬这类老品牌注入新商机那么简单。联合利华自2015年以来已经完成了29次收购，主要是在之前由乔安路主管的个人护理产品部门，收购对象包括高端美容产品品牌德美乐嘉（Dermalogica）和男士护理品订阅服务Dollar Shave Club。在联合利华内部，这些收购来的业务被称为“快艇”，在航母外独立运行但能为之增添吸引力。

分析师和部分投资者鼓吹开展重量级并购以加强重点业务的好处。券商杰富瑞（Jefferies）的马丁·德布（Martin Deboo）向来主张联合利华出售余下食品业务，同时收购价值可达620亿美元的牙膏及其他家庭和个人护理产品公司高露洁棕榄（Colgate-Palmolive）。研究公司盛博的安德鲁·伍德（Andrew Wood）表示，乔安路应尝试收购利洁时（Reckitt Benckiser）旗下规模相对较小、价值200亿美元的卫生和家居业务，同时进一步剥离原有食品品牌。

但是，乔安路应避免这类改变行业格局的大交易，有三方面原因。首先，联合利华缺乏开展大型收购的经验。其近期的收购交易大多花费不到10亿欧元（11亿美元）。联合利华砸钱最多的一次是在2000年以240亿美元收购了贝斯特食品公司（Bestfoods），结果是一场灾难——这之后它花了15年把一堆不受欢迎的品牌再剥离出去。如今消费者的口味变化飞快，任何

大型收购都可能以失败告终。

第二个原因是保留食品业务有利于实现联合利华在新兴市场的宏图。其销售额约58%来自发展中国家。以美元计算，像孟加拉国这样快速增长的市场带来的增长堪比欧洲这样的地区市场。这些地方正规商店不多，商品销售依赖庞大的分销网络，在混合销售食品、个人护理用品、家居用品时效果最佳。那里的人们对营养品的需求越来越大。这就是为何联合利华近期斥资33亿欧元，从葛兰素史克手上收购了在印度广受欢迎的麦芽饮料品牌好立克。

再则，食品可以变得更有价值。伍德指出，雀巢公司的胶囊咖啡品牌Nespresso的每杯售价比雀巢金牌速溶咖啡高十倍。其他竞争对手也在努力把茶饮品和冰淇淋推向高端。联合利华已经收购了几家时尚食品公司，如素食屠夫（Vegetarian Butcher）。此外，食物、美容产品和保健品之间的界线正在变得模糊，更多的营养保健品（如膳食补充剂）、药妆品（如抗痘深层清洁乳）及营养美容品（如生发增发产品）将登场。

先不管这些拗口的新名词，这类健康品牌与联合利华注重环境和社会责任的品牌理念相吻合。乔安路很想保留和传承这种理念。他这么做也是明智的。波尔曼当初试图终结联合利华在伦敦和阿姆斯特丹两地上市的现状，遭到了英国股东的反对，但并没有多少人希望这家公司放弃他带来的使命感，即便仅仅是因为这种使命感有助于赢得客户以及让员工尽心尽力地工作。乔安路或许不像他的前任那样爱滔滔不绝地讲道理，他更务实，可能也更看重盈利。他应该避免做出特技式的飞跃，冒险跳入未知世界。否则以后喝一杯时，他要回忆的可能就不止是摔断骨头的事了。■



Technology wars

Inglorious isolation

An American export ban will be excruciating for China's biggest tech firm

AMERICA IS NO fan of Huawei. Its officials have spent months warning that the Chinese giant's smartphones and networking gear could be Trojan horses for Chinese spies (something Huawei has repeatedly denied). They have threatened to withhold intelligence from any ally that allows the firm in. On May 15th they raised the stakes. President Donald Trump barred American firms from using telecoms equipment made by firms posing a “risk to national security”. His order named no names. But its target was plain.

For all the drama, the import ban hardly matters. Huawei has long been barred from America, in practice if not on paper. More significant was the announcement by the Commerce Department, on the same day, that it was adding Huawei to a list of firms with which American companies cannot do business without official permission. That amounts to a prohibition on exports of American technology to Huawei.

It is a seismic decision, for no technology firm is an island. Supply chains are highly specialised and globally connected. Cutting them off—“weaponising interdependence”, in the jargon—can cause serious disruption. When ZTE, another Chinese technology company, received the same treatment in 2018 for violating American sanctions on Iran, it was brought to the brink of ruin. It survived only because Mr Trump intervened, claiming it was a favour to Xi Jinping, China's president.

Huawei matters more than ZTE. It is China's biggest high-tech company, and is seen as a national champion. Its name translates roughly as “Chinese

achievement". Revenues of \$105bn put it in the same league as Microsoft. Only Samsung, a South Korean firm, sells more smartphones. Huawei holds many crucial patents on superfast 5G mobile networks, and is the largest manufacturer of telecoms equipment. Were it to go under, the shock waves would rattle all of tech world.

By May 20th the impact of the ban was becoming clear. Google said it had stopped supplying the proprietary components of its Android mobile operating system to Huawei. A string of American chipmakers, including Intel, Qualcomm and Micron, have also ceased sales. Later that day the Commerce Department softened its line slightly, saying that firms could continue to supply Huawei for 90 days, but for existing products—for instance, with software updates for Huawei phones already in use. New sales, on which Huawei's future revenue depends, remain banned.

Interdependence, of course, cuts both ways (see chart). Shares in American technology firms fell after the announcement, because Huawei is a big customer. Qorvo, which employs 8,600 people and makes wireless communication chips, derives 15% of its revenue from Huawei. Micron is in the memory business, of which Huawei is a big consumer. A report from the Information Technology & Innovation Foundation, a think-tank, also released on May 20th, guessed export controls could cost American firms up to \$56bn in lost sales over five years.

Unlike Intel, Qualcomm or ZTE, Huawei is privately owned, so lacks listed shares whose price swing would hint at the extent of its distress—though the price of its listed bonds has dropped to 94 cents on the dollar. In public, the firm is staying calm. Ren Zhengfei, Huawei's founder, said it would be "fine" without access to American technology. Huawei has spoken of activating a "Plan B" designed to keep it in business despite American sanctions. It has been stockpiling crucial components for months, and has

made a conscious push to become less reliant on American technology over the past few years. Its phones in particular make extensive use of chips designed by HiSilicon, its in-house chipdesign unit.

Yet few analysts are as sanguine as Mr Ren. Three business areas in particular look vulnerable. Without Google's co-operation, new Huawei phones will lack the latest versions of Android, and popular apps such as Gmail or Maps. That may not matter in China, where Google's apps are forbidden. But it could be crippling in Europe, Huawei's second-biggest market. Its telecoms business needs beefy server chips from Intel. The supply of software to manage those networks could dry up too. Huawei is developing replacements for all three, but they are far from ready.

Two questions will determine whether or not Huawei can weather the storm, says Dieter Ernst, a chip expert and China-watcher at the East-West Centre, a think-tank in Honolulu. The first concerns America's motives. The timing of the ban, a few days after broader trade talks between China and America had broken down, was suggestive. On one reading, it is a tactical move designed to wring concessions from China. If so, it might prove short-lived, and Huawei's stockpiles may tide it over.

Paul Triolo of Eurasia Group, a political-risk consultancy, is doubtful. Rather than a negotiating tactic, he sees the ban as "the logical end-game of the US campaign to take down Huawei". A long-lasting ban would force the firm to look for alternative chips and software that Chinese suppliers would struggle to provide.

The second question concerns the reach of American power. The tangled nature of chip-industry supply chains, says Mr Ernst, means that many non-American companies make use of American parts or intellectual property. They may therefore consider themselves covered, wholly or partially, by the ban. Take Arm, a Britain-based firm whose technology powers chips

in virtually every phone in the world, including those made by HiSilicon. Arm says that it will comply with the Commerce Department's rules. That suggests that Arm will not grant Huawei new licences. It is unclear if Arm will offer support for existing licences, however. As Arm's technology advances, Huawei risks being left behind.

Other non-American companies are as important. One industry insider with contacts in Taiwan says that American officials are pressing Taiwan Semiconductor Manufacturing Company (TSMC), a big and cutting-edge chipmaker, to drop Huawei, which is its third-biggest customer. That would be a crushing blow, for Chinese chip factories are not up to the task of manufacturing HiSilicon's sophisticated designs. TSMC's only peer is Samsung—and South Korea is another of America's allies. TSMC said on May 23rd that it would continue supplying Huawei for now.

Even if the optimists are right, and the ban is lifted in exchange for trade concessions, a return to business as usual seems unlikely. America has twice demonstrated a willingness to throttle big Chinese companies. Trust in American technology firms has been eroded, says Mr Triolo. China has already committed billions of dollars to efforts to boost its domestic capabilities in chipmaking and technology. For its rulers, America's bans highlight the urgency of that policy. Catching up will not be easy, believes Mr Ernst, for chips and software are the most complicated products that humans make. But, he says, if you talk to people in China's tech industry they all say the same thing: "We no longer have any other option." ■



科技战

不体面的孤立

美国出口禁令将令中国最大的科技公司倍感痛苦

美国可不是华为的粉丝。美国官员连月来不断警告，称这家中国科技巨头制造的智能手机和网络设备可能成为中国间谍的特洛伊木马（华为对此一再否认）。他们又威胁盟友抵制华为，否则美国将不再与之共享情报。5月15日，美国的行动进一步加码。总统特朗普颁布禁止美国企业使用对“国家安全构成风险”的公司制造的电信设备。禁令中没有指名道姓，但目标所指昭然若揭。

尽管搞得声势浩大，这项进口禁令并无多大实际影响。长期以来，虽无明文规定，华为实际上一直被挡在美国市场之外。影响更大的是美国商务部同日发表的一项声明，将华为列入了一个企业名单，任何美国公司未经许可不得与之开展业务。这相当于下了禁止向华为出口美国技术的禁令。

这项决定冲击巨大，毕竟没有哪家科技公司是一座孤岛。今天的供应链高度专业化和全球化。把它们切断——用行话来说就是“把相互依赖武器化”——会导致严重破坏。另一家中国科技公司中兴通讯在2018年因违反美国对伊制裁而遭到同样的封杀，几近毁灭。最终特朗普插手干预——说是看在中国国家主席习近平的份上——中兴才得以幸存。

相比中兴，华为的分量更重。它是中国规模最大的高科技公司，被视为国家冠军企业。公司名字的含义是“中华有为”。其年收入达1050亿美元，与微软处于同一等级。华为的智能手机销量仅次于韩国公司三星。华为在超高速5G移动网络技术上拥有许多关键专利，是全球最大的电信设备制造商。如果华为倒下，冲击波将震荡整个科技业。

到5月20日，禁令的影响开始显现。谷歌称已停止向华为提供其安卓手机操作系统的专有应用与服务。英特尔、高通和美光（Micron）等一连串美国芯片制造商也已停止向华为供货。当天晚些时候，美国商务部的立场略

有软化，称美国公司可继续向华为供货90天，但只限于既有产品，例如对使用中的华为手机提供软件更新。而华为未来收入所依赖的新的供货单仍旧被禁。

既然是“相互依赖”，那么这当然是把双刃剑（见图表）。商务部声明一出，美国科技公司股价下挫，因为华为是它们的大客户。拥有8600名员工的无线通信芯片制造商Qorvo有15%的收入来自华为。美光从事内存业务，而华为是内存产品的消费大户。智库信息技术与创新基金会（Information Technology & Innovation Foundation）同5月20日当天发布的一份报告估计，出口管制可能使美国公司在未来五年损失高达560亿美元的销售额。

不同于英特尔、高通或中兴，华为是私营企业，并未上市，所以没有股价波动来显示它的状况有多危急，但其上市债券的价格已降至94美分。对外，华为保持泰然自若。其创始人任正非表示，就算美国技术供应链被切断，华为也“没问题”。面对美国制裁，华为表示将启动“备胎”来保持业务正常运作。公司几个月来一直在囤积关键部件，过去几年也有意识地减少了对美国技术的依赖。它的手机更是已大量运用华为集团内部芯片公司海思半导体所设计的芯片。

然而，分析师们都不像任正非那么乐观。有三个业务领域显得尤为脆弱。没有了谷歌的支持，华为的新手机将缺少最新版的安卓操作系统以及Gmail或谷歌地图等流行应用。这在中国可能无关紧要，因为谷歌的应用本来也是被禁用的。但在华为的第二大市场欧洲，影响可能很严重。华为的电信业务需要英特尔供应的强大服务器芯片。这些电信网络的管理软件的供应也可能枯竭。华为正在开发这三方面的替代品，但远未准备就绪。

芯片专家、美国檀香山的智库东西方中心（East-West Centre）的中国观察家迪特尔·恩斯特（Dieter Ernst）表示，华为能否渡过难关将取决于两个问题。首先，要看美国的动机。禁令是在中美更广泛的贸易谈判破裂数日后出台，这个时间点值得玩味。一种解读认为这是逼中国让步的战略手

段。如果真是这样，影响可能是短暂的，而且华为可能凭库存就能渡过难关。

政治风险咨询公司欧亚集团（Eurasia Group）的保罗·特寥洛（Paul Triolo）对这一解读表示怀疑。他认为这项禁令并非谈判策略，而是“美国打击华为的战役中理所当然的终局之战”。长期禁令将迫使华为寻找替代芯片和软件，而中国供应商将难以提供这些。

第二个问题涉及美国的影响力范围。恩斯特表示，芯片业供应链复杂缠结的特性意味着许多非美国企业都会用到美国的零部件或知识产权。这些公司可能认为自己也完全或部分受到这项禁令的限制。以总部位于英国的科技公司安谋（Arm）为例，全球几乎每台手机的芯片都使用了它的技术，包括海思半导体设计的芯片。安谋表示将遵守美国商务部的规定。这表示它将不再授予华为新的许可。但安谋是否会为现有许可提供支持尚不明确。随着安谋的技术不断革新，华为有掉队的危险。

其他非美国企业同样重要。一位与台湾有联系的业内人士表示，美国官员正向大型尖端芯片制造商台积电施压，要求其放弃第三大客户华为。这将是个沉重的打击，因为中国大陆的芯片工厂还不具备制造海思半导体设计的精密芯片的能力。业内唯一与台积电齐驱并驾的是三星，而韩国是美国的又一盟友。台积电5月23日表示目前仍将继续向华为供货。

即便如乐观者所料，美国会取消禁令以换取贸易让步，生意往来也不太可能重回旧日光景。美国已两次展现出意欲扼杀大型中国企业。特寥洛表示，中国对美国科技公司的信任已被销蚀。中国已投入数十亿美元用于提高自身的芯片研发和制造能力。对中国领导层来说，美国的禁令凸显了这一政策的紧迫性。恩斯特认为，技术赶超不容易，毕竟芯片和软件是人类制造出的最复杂的产品。但他表示，如果你和中国科技业人士交流，他们会异口同声地说：“我们已别无选择。”■



Football and finance

Scouts' honour

How three middling clubs used clever hiring to beat the top dogs

IF YOU HAD told football fans in a pub 15 years ago that Manchester City, Liverpool and Tottenham Hotspur would one day dominate the Premier League, they might have told you to make it your last pint of the day. In 2004 City finished 16th, Spurs 14th and Liverpool a distant fourth. The ruling triumvirate of Arsenal, Chelsea and Manchester United were the only clubs to win the competition in 1996-2011.

Yet today the league tables are turned. The Premiership's new sultans are Manchester City, who on May 12th sealed their fourth title in eight seasons, to the delight of Abu Dhabi's royal family, who bought the club in 2008. One point behind were Liverpool, whose tally of 97 made them the best runners-up ever. On June 1st the Merseyside team will face Tottenham in the final of the Champions League, Europe's most prestigious tournament. What has allowed this new trio to dominate?

Money is part of the answer. In 2008-12 Manchester City splurged £520m (\$675m) on transfers. Fenway Sports Group, an American firm that bought a near-bankrupt Liverpool in 2010 for £300m, now spends that much a season on players' wages and transfer fees. But lots of English clubs are wealthy: nine of the world's 20 highest-earning clubs are English. City spend only 8% more per year on players than United, and Spurs pay 20% less than Arsenal.

In the past, Premier League clubs squandered their wealth. When 21st Club, a consultancy, plotted European teams' spending against their results, 16 of the 20 English sides sat below the trend line. Continental clubs charge higher transfer fees to affluent Premier League sides, who spend 80% more

than their rivals for the same level of talent. What's more, English clubs have a habit of buying ageing stars rather than nurturing talented youngsters.

Manchester City, Liverpool and Tottenham have learned from these mistakes. Since 2016 the players they have signed have been younger and from less flashy clubs than those bought by their rivals (see charts). City paid £55m for Kevin de Bruyne, a midfielder for Wolfsburg, a mediocre German team. Liverpool bought Mohamed Salah, an attacker for Roma, for £37m. Now in their peak years, each has become his team's best player. This season Spurs became the first club in Premier League history not to sign a single player, after years of recruiting young talents from lesser clubs. Many have matured into stars, such as Son Heung-min (from Leverkusen) and Dele Alli (from Milton Keynes).

Meanwhile Manchester United, Chelsea and Arsenal have made costly errors. United made 30-year-old Alexis Sánchez the league's highest earner, on £25m a year. But the striker scored just five goals in 45 games. Chelsea got rid of Álvaro Morata, a £60m striker from Real Madrid, after just a year. Arsenal have purchased several woeful defenders.

Challenges remain for the new trio at the top—not least an investigation by UEFA, Europe's football authority, into claims of financial irregularities at City, which could mean a season-long ban (City deny it). Either way, on June 1st an English side will win the Champions League for the first time in seven years. ■



足球与金融

球探的荣耀

三家中游俱乐部如何运用巧妙的选人策略击败豪门俱乐部

如果15年前你跟一间酒吧里的球迷们说，曼城、利物浦和托特纳姆热刺有一天会成为英超联赛的主宰，那他们可能会跟你说，行了行了，可别再喝了。曼城在2004年的排名是第16位，热刺第14，利物浦比较靠前，排在第四。当时称雄的是阿森纳、切尔西和曼联，从1996到2011年，只有这三家俱乐部赢得过英超冠军。

然而今天的排名已经转变。曼城成了英超的新苏丹。5月12日，曼城获得了八个赛季的第四个冠军，令在2008年收购了这家俱乐部的阿布扎比皇室甚为欣喜。利物浦落后一分，以97分的成绩成为有史以来分数最高的亚军。6月1日，这支来自默西赛德郡（Merseyside）的球队将在欧洲最负盛名的赛事欧洲冠军联赛的决赛中对阵热刺。是什么让这新三强笑傲英超？

金钱是部分答案。2008到2012年，曼城豪掷5.2亿英镑（6.75亿美元）用于支付转会费。2010年，美国公司芬威体育集团（Fenway Sports Group）以3亿英镑的价格收购了几近破产的利物浦，如今每个赛季要花费同样的金额支付球员的工资和转会费。但很多英国俱乐部都很有钱：全球收入最高的20个俱乐部中有9家来自英国。曼城每年在球员身上的花费仅比曼联多8%，热刺则比阿森纳少20%。

在过去，英超俱乐部大肆挥霍它们的财富。咨询公司21st Club研究了欧洲各支球队的支出与赛果的对比情况，绘制成图表。图表显示20支英国球队中有16支位于趋势线以下。欧洲大陆的俱乐部会向富足的英超球队收取更高的转会费，后者购买相同水平的球员要比竞争对手多花80%。另外，英国俱乐部习惯购买更成熟的球星，而不是培养有才华的年轻人。

曼城、利物浦和热刺从这些错误中吸取了教训。自2016年以来，它们签下的球员比竞争对手购买的球员更年轻，之前所属的俱乐部也没那么耀眼

(见图表)。曼城以5500万英镑签下了平庸的德国球队沃尔夫斯堡(Wolfsburg)的中场凯文·德布劳内(Kevin de Bruyne)。利物浦以3700万英镑的价格买下了罗马的前锋穆罕默德·萨拉赫(Mohamed Salah)。现在他们都处于各自的巅峰期，也都成了所在球队的最佳球员。本赛季热刺成为英超历史上首支一名球员也没有签下的俱乐部。多年来，热刺一直在从更低级别的俱乐部中招募年轻球员。当中的许多人已经成为明星，如孙兴慜(Son Heung-min，来自勒沃库森)和迪利·阿里(Dele Alli，来自米尔顿凯恩斯)。

与此同时，曼联、切尔西和阿森纳却犯下了代价高昂的错误。曼联给30岁的亚历克西斯·桑切斯(Alexis Sánchez)开出了2500万英镑的年薪，这使他成为英超收入最高的球员。但这位前锋在45场比赛中只打入了5球。切尔西之前以6000万英镑签下了皇家马德里的前锋阿尔瓦罗·莫拉塔(Álvaro Morata)，但仅仅一年之后就把他打发走了。阿森纳也买下了几名糟糕透顶的后卫。

傲立英超之巅的新三强仍面临挑战——特别是曼城因涉嫌金融违规而遭到欧洲足球管理机构欧足联的调查，这可能会招致禁赛一个赛季的处罚(曼城否认有违规行为)。不管怎样，6月1日，七年来将首次由一支英国球队捧走欧冠的冠军奖杯。 ■



Intel

Fear of missing out

The chipmaker's new boss wants to mix diversification with ruthlessness

"IT'S BEEN a couple of years since we've had you with us," Bob Swan told Intel's investors at its Californian headquarters on May 8th. "During that time, a lot has changed." Not least for Mr Swan. Two years ago he was chief financial officer. Then, in June last year, Brian Krzanich, the firm's previous boss, resigned after violating rules against romantic relationships between employees. Mr Swan, appointed regent while the firm hunted for a replacement, initially said he had no plans to make the arrangement permanent. By the end of January, though, he had decided that the view from the top was not so bad after all. He was duly appointed CEO.

He has inherited a company in an awkward position. Intel's business plan used to be simple. In 1971 it released the world's first commercial microprocessor. It then dedicated its existence to implementing, over and over again, the famous observation by Gordon Moore, its co-founder, that the number of components on such processors (and, roughly, their capabilities) would double every two years.

It worked, and very well. Intel dominates the market for chips that power desktop PCs. It is a virtual monopolist in the much more profitable market for the beefy server-class chips which power data centres around the world (see chart). The market for PCs is shrinking gently but demand for server chips is growing, propelled by the profusion of internet-connected gizmos, from smartphones to cars.

More recently, however, Intel has made mistakes. It missed the arrival of the smartphone, which has elbowed aside the PC as most people's computing

device of choice. It failed to capitalise on the rise of GPUs, specialised chips designed for video-game graphics which have found other uses accelerating the calculations used in AI and scientific computing.

And its manufacturing technology, which used to advance with such metronomic regularity that Intel called its business plan “tick-tock”, has stumbled. The firm’s latest generation of products, built on its “ten nanometre” manufacturing process, was due to arrive in 2016. They will not come until later this year. Such an unprecedented delay has allowed the world’s two other cutting-edge chipmakers—Samsung of South Korea and the Taiwan Semiconductor Manufacturing Company—to catch up. Worst of all, the magic of Moore’s Law seems to be fading. The performance gains from shrinking chips are not what they were, and the cost of doing so keeps rising.

Along with the rise of cloud computing, this has transformed the hardware landscape. GPUs were the first of a new wave of highly specialised chips. No longer able to rely on big performance boosts in the sort of general-purpose hardware sold by Intel, firms from Microsoft to Facebook to Tesla have begun designing custom chips specialised for the sorts of number-crunching their businesses need.

That is unlikely to harm Intel directly, since such accelerator chips are complements to its server chips, not replacements. Mr Swan could simply sit back and watch the profits roll in. But as he explained to the audience in California, he hopes to continue Mr Krzanich’s strategy of expanding the firm’s reach. He wants to use Intel’s almost unique position among chipmakers as both designer and manufacturer to mount an assault on both the accelerator market, and on data centres more generally. Intel’s old business, he said, eyed an annual market of perhaps \$52bn. Add these new areas, he reckoned, and you get \$300bn.

With that in mind, the firm has been on a buying spree. In 2015 it bought Altera, which makes reconfigurable server chips, for \$16.7bn. In 2017 it acquired Mobileye, which makes computer-vision chips for self-driving cars, for \$15.3bn. Internally, it has poured cash into everything from photonics (which uses light, not electricity, to shuffle data between chips) to Optane, a new kind of memory designed to keep chips fed with numbers to crunch. It is even developing a GPU of its own. In February Murthy Renduchintala, Intel's chief engineer, told *The Economist* that matching Nvidia, the market leader in GPUs, was "non-negotiable".

But Mr Swan hopes to pull off the tricky task of marrying ambition with discipline. "Intel's acquisitions have a long history of destroying value," says Joseph Moore, an analyst at Morgan Stanley (and no relation of Gordon's). Fittingly for a former CFO, Mr Swan was at pains to emphasise that, in future, Intel would be hard-headed about when to double down on a bet, and when to fold. Pierre Ferragu, an analyst at New Street Research, calculates that Intel has spent \$19bn since 2012 trying, and failing, to bully its way into the smartphone-radio market, which is dominated by Qualcomm, an American firm. One of Mr Swan's early acts as boss was to pull the plug.

When it comes to Moore's Law, fixing things will be harder. Mr Renduchintala has said that, with the "ten nanometre" hiccup, Intel's renowned engineers simply bit off more than even they could chew. The company insists it can carry on shrinking its chips for some time yet. But the physics will only get more finicky and expensive. As Moore's Law slows, and engineers look elsewhere for performance improvements, the chip industry will become even more fragmented. Mr Swan's fundamental diagnosis—that one of Silicon Valley's original darlings must learn to diversify, and fast—is surely correct.

Business and finance correspondent:*The Economist* is looking for a writer

to work at its headquarters in London. Applicants should combine a knowledge of finance with the ability to write informatively, succinctly and wittily. They should send a CV and an unpublished article suitable for publication in the Business or Finance and Economics section to financejob@economist.com by May 31st. (Telling us what you would do if stranded on a desert island is optional.) ■



英特尔

错失恐惧症

这家芯片制造商的新老板想要将多元化和冷酷无情结合起来

“在座的各位跟我们合作也有几年了。”5月8日，司睿博（Bob Swan）在英特尔加州总部对投资者说道。“这几年发生了很多变化。”对司睿博个人来说更是这样。两年前他还是公司的首席财务官。去年6月，公司前任老板科再奇（Brian Krzanich）因违反了公司禁止员工之间有亲密关系的规定而辞职。英特尔命司睿博代理主政，同时寻找替代人选。一开始司睿博表示没有计划长期掌管。不过到今年1月底，他又觉得从高处看风景还算不赖。他被正式任命为CEO。

他接手的这家公司处境尴尬。英特尔过去的商业规划很简单。1971年，它推出了全球第一个商用微处理器。之后它就致力于一次又一次地实现其联合创始人戈登·摩尔（Gordon Moore）的著名论断，即此类处理器上的电子元件数量（大致等同于它们的处理能力）每两年将翻一番。

这套规划奏效了，而且效果相当好。英特尔主导着台式个人电脑芯片市场。此外强大的服务器级芯片为全球数据中心提供计算力。在后者这个利润高得多的市场上，英特尔算得上垄断者（见图表）。个人电脑市场正在慢慢萎缩，但由于从智能手机到汽车等各种联网设备的大量涌现，对服务器芯片的需求在增长。

不过后来英特尔犯了一些错误。它没有预料到智能手机会兴起并取代个人电脑成为大多数人首选的计算设备。它未能把握住GPU崛起的机会。GPU是专为视频游戏图形设计的芯片，已被用于加速人工智能和科学计算中的运算。

与此同时，英特尔的制造工艺曾以非常稳定的节奏推进——它因此干脆把自己的业务计划命名为“嘀嗒”（tick-tock）。但现在它走得磕磕绊绊。公

司以其“10纳米”工艺制造的最新一代产品本该在2016年上市，结果却要拖到今年晚些时候。这么久的延迟前所未有，另两家尖端芯片制造商韩国三星和台湾台积电趁机迎头赶上。最糟糕的是，摩尔定律的魔力似乎正在消退。芯片体积缩小带来的性能提升已今非昔比，而为做到这一点付出的成本还在不断上升。

摩尔定律威力不再，加上云计算的兴起，改变了硬件领域的格局。GPU是新一批高度专门化芯片的先驱。从微软到Facebook再到特斯拉，许多公司无法再指望英特尔销售的通用硬件的性能会大幅提升，已开始根据自己业务所需的计算能力来设计定制芯片。

这不大可能直接损害英特尔，因为这类加速器芯片是服务器芯片的补充而非替代品。司睿博大可悠哉悠哉地坐等利润滚滚而来。但正如他在加州向投资者们解释的那样，他希望延续科再奇的战略，扩大公司的业务范围。他想利用英特尔在芯片制造商中几乎独一无二的设计者和制造者地位，对加速器芯片市场乃至更广泛的数据中心市场发起攻击。他表示，英特尔之前的业务预计年市场规模为520亿美元左右，再加上这些新领域，他估计能达到3000亿美元。

基于这样的构想，英特尔一直在大举收购。2015年，它以167亿美元的价格收购了可重构服务器芯片制造商Altera。2017年，它又花费153亿美元收购了无人驾驶汽车计算机视觉芯片制造商Mobileye。在公司内部，它将大量资金投入到各个领域，从光子学（用光而不是电在芯片之间传输数据）到Optane（一种新型内存，用于不断给芯片输送要处理的数据）。它甚至在开发一款自己的GPU。今年2月，英特尔的首席工程官任沐新（Murthy Renduchintala）告诉本刊，要与全球GPU市场领头羊英伟达一决高下“没有商量余地”。

但司睿博希望完成一桩棘手的任务：将野心与克制相结合。“长期以来英特尔的收购往往都在摧毁价值。”摩根士丹利的分析师约瑟夫·摩尔（Joseph Moore，和戈登·摩尔并非亲戚）说。作为一名前首席财务官，司睿博竭力强调，未来英特尔将在何时加倍押注、何时放弃的问题上保持冷

静。据New Street Research分析师皮埃尔·菲拉古（Pierre Ferragu）计算，自2012年以来，英特尔已斥资190亿美元试图强行进入由美国公司高通主导的智能手机基带市场，但未能如愿。司睿博当上老板后做的头几个决定之一就是放弃这一计划。

至于摩尔定律，这个问题解决起来难度会更大。任沐新曾经说过，在面对“10纳米”的小波折时，英特尔名声在外的工程师们可说是硬着头皮干。公司坚称它还可以在一段时间内继续缩减芯片的尺寸。但物理规律决定了这样做只会愈加陷入细枝末节而且成本高昂。随着摩尔定律减缓，工程师们试图通过其他方法改善性能，芯片行业将变得更加分散。硅谷最初的宠儿之一英特尔必须学会多元化，而且要快——司睿博这一基本诊断无疑是正确的。





Free exchange

You'll never ride alone

Single-passenger car rides are a luxury—an increasingly unaffordable one

UBER'S INITIAL public offering on May 10 was one of the largest in tech history. The hoopla cannot drown out uncertainty about the firm's future. Ride-hailing platforms have grown hugely in recent years, changing the face of urban transport. They have also been virtuosic losers of money. Lyft made an operating loss of nearly \$1bn in 2018; Uber, about \$3bn. The flow of red ink mainly represents subsidies from investors to riders: cash that allows average Joes to feel as though they have a personal car at their beck and call. It will not last. But Uber passengers are not the only road-farers facing straitened circumstances. Car-related subsidies of all sorts are becoming harder to sustain. Their loss could reveal mass travel in single-occupancy cars to be a no-longer-affordable luxury.

The mania for tech platforms that match cars with riders rests on the idea that they can turn car-hire into critical urban-transport infrastructure. Perhaps ride-hailing could spare millions of people the cost of owning cars that mostly sit idle, and allow vehicles and roads to be used more efficiently. But increased scale has yet to turn losses to profits. To remain viable, Uber and its peers must make more money per trip. They could increase fares. But cheap rides have been crucial to building their user bases. However dominant one or another becomes, competing transport options remain, from personal cars to public transport to travellers' own two feet. Higher fares will make those alternatives more attractive.

Perhaps instead the firms could cut their per-ride costs. Payments to drivers are the juiciest target, and indeed Uber is keen to develop a fleet of driverless taxis (as are other firms, including Waymo and Tesla). Yet even these may

struggle to turn a profit. A recent analysis by Ashley Nunes of the Massachusetts Institute of Technology and Kristen Hernandez, now at Securing America's Future Energy, an advocacy group, concludes that driving your own vehicle costs about \$0.72 per mile (inclusive of ownership costs and expenses such as fuel and parking charges), whereas the lowest break-even fare an operator of driverless taxis could expect to charge is \$1.31 per mile. While on duty, taxis rack up costs for items such as petrol, whether or not a fare-paying passenger is in the car. Furthermore, driverless cars would need some minding by human safety monitors, whose salaries must be covered by fares.

Until they turn profits, ride-hailing firms will be vulnerable to a loss of investors' patience. But drivers of private vehicles also receive plenty of implicit support. Drivers impose environmental hazards on others at no financial cost to themselves, from the health effects of local air pollution to the climate change resulting from carbon emissions. And then there is congestion. The right to use scarce road space is valuable. When it is given away, drivers overuse available roads, and clog them. The waste is colossal. An estimate by INRIX, a consulting firm, suggests that the value of time lost to traffic in 2018 in America alone reached \$87bn.

Removing the subsidy to drivers means pricing road space by levying tolls that increase with traffic. That would deter driving, and reduce congestion and other social costs of automobile use. Such charges are rarely popular with drivers. But governments' enthusiasm for new, untolled roads has dimmed. And they do not help much with traffic. Gilles Duranton of the University of Pennsylvania and Matthew Turner of Brown University posit a "fundamental law of road congestion": unless road space is priced appropriately, new capacity reduces the cost of driving, thereby inducing more of it, leading, eventually, to renewed congestion.

Uber passengers also benefit from subsidies to driving, and contribute to

the social costs. According to new research published in the journal *Science Advances*, from 2010 to 2016 time lost to congestion in San Francisco rose by 62% more than it would have in the absence of ride-hailing vehicles on the city's streets. Were dirty fuels to face stiffer taxes or road tolls to be increased, those additional costs would probably increase fares. But there is reason to think that eliminating subsidies, while reducing driving, would nonetheless boost the ride-hailing business. Congestion delays the response to a request for a ride, which inconveniences passengers. And it raises the cost of operating taxis by increasing the time spent between dropping off one rider and picking up the next. The more efficiently firms can serve customers, the better their cost proposition relative to driving alone. So total trips would fall, but a greater share would involve an app-hailed vehicle. Tellingly, both Uber and Lyft spent money advocating for a recent budget measure in New York City that will introduce congestion-charging in parts of Manhattan. Similar efforts in other traffic-choked cities are likely to follow.

Should congestion pricing spread, ride-hailing firms might gain room to raise fares and survive, even without fresh injections of capital. Urban transport would nonetheless be transformed. Ride-hailing services have gained passengers, in part, by luring them away from public options. Higher fares would induce some to switch back. Ride-hailing firms might retain users by improving their car-pooling options. Congestion pricing would reduce the delay associated with multiple stops. Indeed, in a subsidy-free world car-pooling of all sorts would increase. On a once congestion-clogged highway in Northern Virginia, for example, the number of cars with multiple occupants has risen by 15% since the introduction in 2017 of tolls that vary with the level of congestion.

For decades, the striving working class has dreamed of the freedom to commute in the splendid isolation of a private car. "A man who, beyond the age of 26, finds himself on a bus can count himself as a failure," Margaret

Thatcher is supposed to have said. The real failure may be a widespread, persistent reluctance to grapple with the cost of travel in vehicular solitude—whether with or without the aid of an app. ■



自由交流

永不寂寞的旅程

单人乘车出行是一种奢侈，越来越难以负担

优步于5月10日上市，是高科技行业融资规模最大的IPO之一。但这一番喧闹并不能掩盖这家公司未来的不确定性。近年来，网约车平台急速扩张，改变了城市交通的面貌。它们同时也是亏钱的能手。2018年，Lyft营业亏损达近10亿美元，优步约30亿。亏损主要缘于拿投资者的钱补贴乘客，好让普通人感觉自己有一部召之即来的私家车。这种补贴不会一直有。不过，优步乘客并不是唯一迎接困难期来临的出行者。与汽车相关的各种补贴都越来越难以维持。巨大的亏损可能表明单人乘车这种大众化出行方式将变成不再负担得起的奢侈行为。

将车辆与乘客相匹配的技术平台受到狂热追捧的背后，是认为它们可以将汽车出租转变为关键的城市交通基础设施。私家车大部分时间里都处于闲置状态，而网约车也许可以让数百万人免于负担养车的费用，还可以更高效地利用车辆和道路。但是，虽然网约车的市场规模已经扩大，却尚未转亏为盈。为了让业务能维持下去，优步及其同行必须提升每单利润。它们可以提高车资，但低廉的乘车费用一直是它们建立用户群的关键。无论哪个平台最终主导市场，它仍将面临来自其他交通方式的竞争，包括私家车、公共交通，以及出行者自己的双脚。而调高车资将提高其他出行方式的吸引力。

也许网约车公司可以转而削减每单成本。降低司机的佣金是最诱人的做法，优步确实也迫切想要开发出无人驾驶出租车队（其他公司也是如此，包括Waymo和特斯拉）。然而，即便是这些措施也可能难以扭亏为盈。麻省理工学院的阿什利·努内斯（Ashley Nunes）和倡导组织美国未来能源保障机构（Securing America's Future Energy）的克里斯汀·埃尔南德斯（Kristen Hernandez）近期的一项分析表明，自驾车出行的成本约为每英里0.72美元（包括汽车拥有成本，以及燃油、停车等开支）；而要保证最

低收支平衡，无人驾驶出租车的运营商预计需要收取的费用为每英里1.31美元。出租车在出车期间无论有无乘客付费搭车都会累积汽油等成本。此外，无人驾驶汽车将需要人类安全监督员，车资必须要涵盖他们的工资。

在实现盈利之前，网约车公司会很容易失去投资者的耐心。但私家车车主也得到了大量的隐性支持。从污染本地空气从而影响人们健康，到汽车碳排放导致气候变化，车主令他人承受种种环境破坏之害，自己却没有付出任何经济成本。还有道路拥堵的问题。使用稀缺道路空间的权利很有价值。这种权利一旦交予私家车司机，他们就会过度使用可用道路，造成堵塞。这造成了巨大的浪费。咨询公司INRIX估计，仅在美国，2018年因交通拥堵而损失的时间价值就高达870亿美元。

取消对私家车车主的隐性补贴意味着要为道路空间定价，征收随交通流量增加而提高的通行费。这将降低人们驾车出行的意愿，减少汽车使用造成的拥堵和其他社会成本。这样的通行费一般都不受车主欢迎。但政府已经没什么兴趣再修建新的免费道路。而且免费道路对改善交通也没有多大帮助。宾夕法尼亚大学的吉尔斯·杜兰顿（Gilles Duranton）和布朗大学的马修·特纳（Matthew Turner）提出了“道路拥堵的基本法则”：除非道路空间有合理定价，否则新增道路空间会降低驾驶成本，从而吸引更多车辆上路，最终导致道路再次阻塞。

优步乘客也受益于这种车辆补贴，而造成了社会成本。《科学进步》（*Science Advances*）杂志发表的最新研究显示，2010年到2016年间，旧金山街道上的网约车让该市交通阻塞的时间增加了62%。如果污染空气的燃油面临更严苛的税收，或者道路通行费增加，这些额外成本可能会提高网约车的车资。然而，有理由认为，尽管取消补贴会减少驾车出行，但仍将促进网约车业务的增长。拥堵延长了响应约车要求的时间，给乘客带来了不便。从送完一名乘客到接上下一名乘客之间的间隔时间不断延长，提高了出租车的经营成本。企业为客户提供服务的效率越高，它们的成本主张与单独驾车相比就越好。因此，总行程数会下降，但网约车在其中将占据更大的份额。优步和Lyft都出资支持纽约市最近的预算措施以求在曼哈顿部分地区引入拥堵费，这很说明问题。其他交通堵塞的城市很

可能会采取类似的措施。

如果收取拥堵费的政策得到普及，即使没有新资本注入，网约车公司也可能会获得提高车资的空间，从而生存下去。但城市交通会被改变。网约车公司一定程度上是靠引诱乘客放弃公共交通而获得用户。车资上涨会让一些人重新选择公交系统。网约车公司可以通过改善拼车服务来留住用户。拥堵费会减少在多个地方停车带来的延迟。事实上，在一个没有补贴的世界里，各种形式的拼车都会增加。例如，弗吉尼亚州北部的一条高速公路曾经严重拥堵，2017年引入根据拥堵程度变动的通行费以来，有多人乘坐的汽车数量增加了15%。

几十年来，劳动阶级努力奋斗，梦想着能享受私家车内美妙的独立空间，自由通勤。据说撒切尔夫人曾说过：“男人若过了26岁还在搭巴士，可以自认失败者了。”而今，真正的失败可能是大家都死活不愿意解决单独乘车出行的成本问题——无论有没有网约车应用。 ■



Free exchange

Neonatal economics

A dismal scientist offers advice to new parents

FOR NEW parents, it is a terrifying moment. The hospital doors close behind them, leaving them with a new and helpless human being. The baby's survival into adulthood seems impossible. What if it will not eat? What if it is allergic to water? What if an owl carries it off? Probably, few parents wish at that moment for the help of an economist. But "Cribsheet", a new book by Emily Oster of Brown University, shows that in the hectic haze of parenthood an economist's perspective can prove surprisingly clarifying.

Ms Oster's academic work relates to health and health policy. A recent paper, for example, studied how food-purchasing decisions change in response to being diagnosed with diabetes. Five years ago she published a book on pregnancy, drawing on her training as an economist and her own experience (her husband, Jesse Shapiro, with whom she has two children, is also an economist at Brown). "Cribsheet" tackles the next step in the journey from childfree person to parent. Deciding whether to have a child in the first place fairly obviously involves economic calculations, from the impact on the parents' earning potential to the resources that must be set aside to pay for nappies, child care and university. The decisions that come in a torrent after the birth, in contrast, such as whether to breastfeed or how to manage sleeping arrangements, might not seem so amenable to such thinking. But Ms Oster's new book shows that they are.

Parents generally try to maximise the welfare, present and future, of their children (and, secondarily, themselves) subject to constraints of money and time. That requires choices. Economics can help a parent judge these trade-offs. Good choices begin with good information. Before deciding whether

breastfeeding is worth the time, trouble and physical toll, it helps to know the benefits compared with feeding with formula. Parents do as most people do when making a hard call: turn to experts, friends, family and the internet. But different sources provide wildly different answers—and often with an extraordinary intensity of belief. As Ms Oster notes, internet mums frequently write as though ignoring their advice is tantamount to abandoning a child to wolves.

The help she provides begins with sorting through published research and determining what is worth heeding. This involves more than identifying outright disinformation, of the sort published by anti-vaccination groups. The conclusions of serious research also need to be treated with care. Unless studies are well-designed, the results can be influenced by confounding factors. The purported benefits of breastfeeding, such as conferring a higher IQ on the child, can reflect the fact that women who are richer and better educated, and have higher IQs, are more likely to breastfeed. More reliable research attempts to take account of these factors. Whenever possible—and breastfeeding is a case where participants would almost certainly refuse to co-operate—researchers arrange randomised controlled trials, randomly dividing participants into “control” and “treatment” groups, only one of which engages in the behaviour under study, the better to isolate its effects.

Even when a study is well designed, it can require statistical sophistication to understand the size of any effect and the significance of the result. Non-economists may find “Cribsheet” interesting as a guide to understanding research findings, though harried parents may focus more on its concrete guidance. There is plenty of this. Breastfeeding, it turns out, provides short-term health benefits to babies (notably by making diarrhoea less common) and reduces the mother’s risk of developing breast cancer. But there is no hard evidence that breastfed babies enjoy long-term health or cognitive benefits compared with bottlefed ones.

Still, given the potential benefits, why not do it? Economic analyses include not only what is gained by a choice, but what is forgone. For example, putting an infant to sleep beside a parent in bed rather than alone in a cot is associated with a higher risk of sudden infant death. If there are no exacerbating factors (such as a mother who smokes or drinks), that increased risk is tiny: 22 deaths in 100,000, rather than eight. But why risk it? The answer may be that it is worth it. Sleeping side by side can make breastfeeding easier. More importantly, for some parents it is the only way to settle the baby (and hence to get some sleep themselves).

Prolonged sleep deprivation is horrible and makes it harder to be a good parent—or to function. Some mummy bloggers may find it unconscionable that a mother would expose her child to extra risks in order to treat herself to a few hours of sleep. Ms Oster suggests that, if well-informed parents make that choice, then it is reasonable: a welfare-enhancing balancing of benefits and costs.

Economic reasoning can feel bloodless. But the calculations in Ms Oster's book seem more human than "Mummy war" moralising, in their recognition that parental time and energy are finite. She reckons it is helpful to think about work-life balance in bluntly economic terms: "What is the optimal configuration of adult work hours for your household?" In the past, male economists like Gary Becker used such logic to argue that women should "specialise" in homemaking. But Ms Oster points out that the benefits to a household of more income (often a necessity) should not be ignored—and neither should a mother's preferences. Although research suggests that policies allowing a parent to stay at home in an infant's first months do benefit children, staying at home for two years rather than one does not meaningfully alter a child's prospects. Women who need or want to return to work should not be kept from doing so by guilt or others' expectations, she writes.

Parenting can be fraught. “Cribsheet” aims to help parents do better. And in capturing how they struggle when beset by dubious information and emotional pressure from peers, it also holds lessons for economists. Welfare-maximising decisions are hard to make, and sometimes people need a little help. ■



自由交流

新生儿经济学

一位经济学家为新手父母提供建议

对于新手父母来说，这是一个可怕的时刻——医院大门在身后关闭，怀中是一个无助的新生小人。让这个小东西顺利长大成人似乎是不可能的。它不吃东西怎么办？对水过敏怎么办？给猫头鹰抓走了怎么办？可能很少有父母在那一刻会希望得到经济学家的帮助。但布朗大学的艾米莉·奥斯特（Emily Oster）用新著《摇篮数据表》（Cribsheet）表明，在新手父母慌乱无措之时，经济学家的观点可能会出乎意料地为他们拨云见日。

奥斯特的学术研究涉及医疗保健及医疗政策。比如她最近的一篇论文研究了人们在确诊糖尿病后采购食物时的决策发生了怎样的变化。五年前，她出版了一本关于怀孕的书，运用了她作为经济学家的专业知识并结合了自身经历（她的丈夫杰西·夏皮罗[Jesse Shapiro]同为布朗大学的经济学家，两人育有两个孩子）。《摇篮数据表》讨论的则是从没有孩子到为人父母的旅程中的下一个阶段。人们在最初决定是否要孩子时显然要做一番经济上的考量，从对两人收入潜力的影响，到为购买尿不湿、托儿和上大学专门辟出的资金，都需要计算。相比之下，孩子出生后各种事务应接不暇之际，是否母乳喂养或让孩子跟谁睡等决定看似不太需要从经济角度来考虑。但奥斯特的新书表明并非如此。

父母通常会尽量在金钱和时间允许的范围内最大化孩子（其次才是他们自己）现在和未来的福祉。这就需要做出选择。经济学可以帮助父母做出权衡。良好的选择始于可靠的信息。在决定是否值得花时间和精力、忍受身体上的不适采用母乳喂养之前，了解母乳相比配方奶粉的好处能帮助父母们做决定。在做重大决定之前，父母和大多数人一样会求助专家、朋友、家人和互联网。但不同渠道提供的答案截然不同——而且通常都极度自信。正如奥斯特指出的那样，网上的妈妈们分享育儿经时的那种口气，就好像忽视她们的建议无异于把孩子丢到狼群里。

奥斯特给出的第一条建议是查看已发表的研究，确定哪些值得理会。这不仅需要识别彻头彻尾的虚假信息——例如反疫苗接种群体发布的信息，那些严肃的研究得出的结论也要谨慎看待。除非研究设计得很好，否则其结果会受到干扰因素的影响。例如，母乳喂养据称有能让孩子智商更高等好处，然而这可能是因为更富裕、受过更好教育、智商更高的女性更有可能选择母乳喂养。更可靠的研究会尝试将这些因素考虑在内。只要条件允许，研究人员会安排随机对照试验（而母乳喂养是参与者几乎肯定会拒绝合作的研究），将参与者随机分为“对照组”和“实验组”，其中只有一组开展被研究的行为，这样便能更好地隔离其影响。

即使研究设计得很好，也需要精于统计学知识才能理解任何影响的大小和结果的重要性。非经济学家可能会发现《摇篮数据表》为如何理解研究成果提供了有趣的向导，不过忙乱不堪的父母可能会更多地关注其中的具体指导。书中确实有很多这样的指导。事实证明，母乳喂养在短期内对婴儿的健康有益（特别是能够减少腹泻），并能降低母亲罹患乳腺癌的风险。但没有确凿证据表明这种方式与奶粉喂养相比在长期内更有益于婴儿的健康或认知。

尽管如此，既然有潜在好处，为什么不母乳喂养呢？经济分析不仅包括通过一个选择能获得什么，还包括放弃了什么。例如，让婴儿睡在父母一方的身边而不是单独睡在婴儿床中会增加婴儿猝死的风险。如果没有恶化因素（例如母亲吸烟或喝酒），那么婴儿猝死的风险增加得就很少：从十万分之八到十万分之二十二而已。但为什么要冒这个险呢？答案可能是这个风险值得冒。睡在一起可以让母乳喂养更容易。更重要的是，对于一些父母来说，这是能把婴儿哄睡着的唯一方法（这样他们自己也能睡上一会儿）。

长期睡眠不足的后果是可怕的，它也让人们更难成为好父母，甚至连最基本的都难以做到。一些妈咪博主可能会觉得母亲为了让自己能多睡几个小时而让孩子面临额外的风险太过分。奥斯特提出，如果父母做了充分了解之后做出这样的选择就是合理的：在益处和成本之间做出了能提升福祉的平衡。

经济推理可能显得冷酷无情。但奥斯特书中的计算似乎比“妈咪论战”的道德说教更人性化，因为这些计算认识到父母的时间和精力都是有限的。“在你的家庭里，大人们最佳的工作时间安排是怎样的？”奥斯特认为，以这样直截了当的经济术语思考工作与生活的平衡是有好处的。过去，像加里·贝克尔（Gary Becker）这样的男性经济学家就是用这种逻辑来论证女性应该“专门”主内。但奥斯特指出，不应忽视双职工家庭获得更多收入的好处（而且获得更多收入通常还是必要的），而且母亲的选择也不应被忽视。虽然研究表明允许父母一方在婴儿出生后的头几个月里留在家中的政策确实让婴儿受益，但在家照顾孩子两年并不比照顾一年对孩子的未来有实质性的改变。她写道，需要或想要重返职场的女性不应因为内疚或他人的期望而留守家庭。

育儿可能让人倍感焦虑。《摇篮数据表》就是要帮助父母做得更好。本书捕捉了新生父母在被可疑信息困扰以及遭受其他父母带来的情绪压力之时如何百般挣扎，也为经济学家提供了经验教训。福祉最大化的决策不易做，有时候人们需要一些帮助。 ■



Schumpeter

Sleepless in Silicon Valley

Why the techie obsession with sleep technology makes perfect sense

FIRST, CLOSE the blackout blinds in your bedroom. Eat dinner at 4pm, and do not eat or drink anything after 6pm. Put on your blue-light blocking glasses at 8pm. Set your bedroom temperature to 67°F (19.4°C) and your electric blanket to 69.8°F (21°C). At 8.45pm, meditate for five to ten minutes. Switch on your deep-wave sound machine. Put on your Oura sleep-tracking ring. You are now, finally, ready for slumber. This may all sound a bit over the top. But this is the “sleep hygiene” routine described in a recent blog post by Bryan Johnson, who sold his previous company to eBay for \$800m and is now chief executive of Kernel, a startup developing brain-computer interfaces. He admits that his sleep routine has “decimated my social life”, and that his partner sleeps in a different room, but says all this trouble is worth it, because it has boosted his level of “deep sleep” by as much as 157%. He has bought Oura rings for all his employees.

Mr Johnson does not expect other people to copy his routine, but made it public to encourage the sharing of sleep habits and tips. Like many other techies, he regards sleep hygiene as an effective way to maintain mental health, boost cognition and enhance productivity. In its most recent funding round, backers of Oura, the Finnish maker of the high-tech ring, included the co-founders of YouTube and Twitch, along with alumni of Facebook, Skype and Box.com. The ring’s most famous user is Jack Dorsey, the boss of Twitter, whose unusual wellness regime—which also incorporates near-infrared saunas, radiation-blocking Faraday tents, fasting and cryotherapy—prompted the *New York Times* last month to dub him “Gwyneth Paltrow for Silicon Valley”. For tech tycoons, it seems, sleep is the new fitness.

Those who want to monitor and improve their sleep have no shortage of gadgets to choose from. As well as electric blankets and mattress-chillers, sound machines and smart rings, there are also smart pillows, sleep-tracking watches and bracelets, intelligent sleep masks, brain-stimulating headbands, bedside sleep sensors and countless sleep-monitoring apps. The market for sleep technology was worth \$58bn in 2014 and is expected to grow to \$81bn by 2020, according to Persistence, a market-research firm. Big companies in the field include household names such as Apple, Bose, Nokia and Philips. After Mr Dorsey's enthusiastic endorsement, the Oura rings are back-ordered by four to six weeks.

The mania for sleep technology makes perfect sense for the tech industry, combining as it does several existing trends. For a start, it fits with the industry's metrics-driven worldview. Techies obsess about OKRs (objectives and key results), KPIs (key performance indicators) and digital-analytics dashboards showing the performance of specific products and features. Applying similar techniques to sleep and other aspects of their personal lives—an approach known as the “quantified self”—seems a logical step. As those in the startup world like to say, channelling Peter Drucker, a management guru, “what’s measured improves.”

Sleep-tracking also aligns neatly with Silicon Valley’s cult of productivity, and the constant search for “life hacks” that will make entrepreneurs more effective, efficient and successful. This ranges from wearing the same clothes every day, Steve Jobs-style (thus avoiding wasting time deciding what to put on), to fastidious fitness routines and complicated diets. Elaborate sleep regimes slot right in, because they promise clarity of thought and improved cognitive performance. They also let people extend their quantified-self and life-hacking efforts into the one part of the day that was previously untouched: shut-eye. Relentlessly pursuing productivity only while you are awake is for wimps. Sleep-tracking means you can do it round the clock. Oura describes its sensor-packed ring as a “secret weapon

for personal improvement”—another way to get ahead.

Never mind that a study published in 2015, by researchers at Massachusetts General Hospital and Harvard Medical School, found that sleep-tracking devices could not accurately measure sleep, and that claims made about them were long on hype and short on solid evidence. Ignore the fact that another study, published in 2017 by researchers at two medical schools in Chicago, warned of the dangers of “orthosomnia”, defined as a “perfectionistic quest for the ideal sleep in order to optimise daytime function”, as obsessive users of sleep-tech devices self-diagnose sleep disturbances based on dodgy data, or stay awake all night worrying that they are falling behind by not sleeping as efficiently as rivals.

It is hardly surprising that techies are not getting enough sleep, given the industry’s culture of long hours, and the widespread notion that for a true entrepreneur, everything else in life is secondary to succeeding at work. The enthusiasm for sleep-tech also fits a larger pattern of using technology to fix problems that the industry itself has created. Is your smartphone too addictive? Here’s an app to help you monitor and track your usage. Are the streets of your city clogged with Ubers? Try an electric scooter instead. Seen this way, the embrace of sleep-tracking is an indictment of the whole culture: it tackles the symptoms of sleep deprivation, but not the disease.

But resist the temptation to dismiss all this as batty. Sleep-tracking is at exactly the stage that fitness-tracking technology was at a decade ago. Now fitness trackers (including the Apple Watch) are mainstream and nobody bats an eyelid when people share details of their morning runs on Facebook. The same could easily happen with sleep-tech. A series of previous examples—including the use of email, the embrace of online shopping, hailing a car with an app, or renting a room in an unfamiliar city from a complete stranger—are a reminder that the seemingly crazy things that Silicon Valley types do today, everyone else may end up doing in a decade’s

time. In this case, in their sleep. ■



熊彼特

硅谷夜未眠

为什么说科技达人痴迷于睡眠技术完全顺理成章

首先，拉上卧室的遮光窗帘。下午4点吃晚饭，6点以后禁食禁水。晚上8点戴上防蓝光眼镜。将卧室温度设在19.4℃，将电热毯设在21℃。8点45分，冥想5到10分钟。打开深度睡眠声波播放器。戴上Oura睡眠追踪戒指。现在，你终于一切就绪，可以安睡了。这一切听起来可能有些夸张，但却是近期发布的一篇博客文章所描述的“睡眠卫生”程序。作者布赖恩·约翰逊（Bryan Johnson）现在是开发脑机接口技术的创业公司Kernel的CEO，之前以8亿美元将自己的上一家公司卖给了eBay。约翰逊坦言这套入睡程序已经“毁了自己的社交生活”，为此他还与伴侣分房睡觉。但他表示所有这些付出都是值得的，因为这让他的“深度睡眠”水平差不多提高了157%。他给公司所有员工都购置了Oura戒指。

约翰逊将自己的这套做法公之于众，倒不是指望他人仿效，而是为鼓励人们分享自己的睡眠习惯和小贴士。和其他许多科技达人一样，约翰逊认为睡眠卫生是保持心理健康、提升认知和提高效率的有效方法。生产那款高科技戒指的芬兰Oura公司最近一轮融资的投资者包括YouTube和Twitch的联合创始人、Facebook、Skype和Box.com等公司的前员工等。Oura戒指最著名的用户是Twitter的老板杰克·多尔西（Jack Dorsey），他有一套独特的养生方法——除了佩戴Oura戒指，还使用近红外桑拿房、电磁屏蔽帐篷、禁食和冷冻疗法。因此上月他被《纽约时报》戏称为“硅谷的格温妮丝·帕特洛”。看起来，对科技大亨来说，睡眠成了新型健身。

对于那些想要监测和改善自身睡眠的人，可以选择的各式玩意儿不少。除了电热毯、床垫降温器、声音睡眠仪和智能戒指外，还有智能枕头、睡眠追踪手表和手环、智能睡眠面罩、大脑感应头带、床边睡眠传感器，以及数不胜数的睡眠监测应用。市场调研公司Persistence的数据显示，睡眠科技市场在2014年价值580亿美元，到2020年有望增至810亿美元。苹果、

Bose、诺基亚和飞利浦等家喻户晓的大公司都涉足该领域。经过多尔西热情地“代言”，Oura戒指的交货期推迟了4到6周。

对科技行业来说，睡眠科技热的出现完全顺理成章，因为它把目前的几个趋势结合在了一起。首先，它符合科技行业“用标准说话”的世界观。科技达人痴迷于各种OKR（目标与关键成果法）、KPI（关键业绩指标法）和显示特定产品及功能之性能的数字分析仪表盘。将类似方法应用于睡眠以及他们个人生活的其他方面，即所谓的“量化自我”，看起来是合情合理的一大步。就像创业领域的人喜欢借用管理大师彼得·德鲁克（Peter Drucker）的话，“有衡量就有改进”。

睡眠追踪还与硅谷效率至上以及对“生活窍门”的孜孜以求高度一致。他们认为这些诀窍能让企业家更高效、更富成果、更加成功。比如像乔布斯那样每天穿同样的衣服（从而避免在选衣服上浪费时间）、一丝不苟的健身计划，以及复杂的饮食习惯等。精心打造的睡眠保健法与此不谋而合，因为它们声称能让人头脑清晰并提升认知表现。睡眠保健法还让人们量化自我和掌握生活窍门的努力延伸到“睡眠”这一之前未曾触及的时段。只在醒着的时候不懈追求效率不算什么能耐。睡眠追踪让人可以24小时不间断地追求效率。Oura将其装满传感器的戒指描述为“个人提升的秘密武器”，即领先于人的另一种方法。

麻省总医院（Massachusetts General Hospital）和哈佛医学院的研究人员在2015年发表的一项研究结果发现，睡眠追踪设备并不能准确测量睡眠，人们对这些设备做出的论断也偏于夸大而缺乏实证。但我们对此不必介意。同样地，也不必理会另一项由芝加哥两所医学院的研究人员于2017年发表的研究结果。该研究对“完美睡眠强迫症”（即“极度追求理想睡眠以使白天表现最优”）的危害发出了警告，因为痴迷于睡眠技术设备的用户要么根据不可靠的数据自我诊断出了睡眠障碍，要么彻夜不眠，担心自己会因睡眠质量不如对手而落后。

科技行业向来工作时间长，而且人们普遍认为，对于真正的创业者，生活中其他任何事情都比不上事业有成重要。所以科技达人睡眠不足也就不足

为奇了。睡眠科技热也符合一个更大的模式，即利用科技来解决科技行业本身造成的问题。智能手机是不是让你过于沉迷其中？有一个应用可以帮你监控和追踪手机的使用情况。城市的大街小巷挤满了优步的网约车？那就试试电动滑板车吧。从这个角度看，对睡眠追踪的追捧折射出整个行业文化的一个弊端——它在解决睡眠被剥夺的问题时治标不治本。

但也不要急于将这一切贬为发神经。睡眠追踪正处于健康追踪技术十年前所处的阶段。如今，包括Apple Watch在内的健康追踪器已经成为主流，没有人会对别人在Facebook上晒的晨跑记录大惊小怪。同样的情况也很容易发生在睡眠技术上。使用电子邮件、拥抱网上购物、用手机应用叫车，或者从一个素不相识的人那里租下陌生城市里的一个房间……以往一连串的例子提醒人们，硅谷人今天的所作所为看似荒唐，但其他人在十年后可能都会步他们的后尘。而且这次还是闭着眼做的。 ■



Free exchange

Ageing is a drag

But slower growth in older economies is more a choice than an inevitability

FOR THE first time in history, the Earth has more people over the age of 65 than under the age of five. In another two decades the ratio will be two-to-one, according to a recent analysis by Torsten Sløk of Deutsche Bank. The trend has economists worried about everything from soaring pension costs to “secular stagnation”—the chronically weak growth that comes from having too few investment opportunities to absorb available savings. The world’s greying is inevitable. But its negative effects on growth are not. If older societies grow more slowly, that may be because they prefer familiarity to dynamism.

Ageing slows growth in several ways. One is that there are fewer new workers to boost output. Workforces in some 40 countries are already shrinking because of demographic change. As the number of elderly people increases, governments may neglect growth-boosting public investment in education and infrastructure in favour of spending on pensions and health care. People in work, required to support ever more pensioners, must pay higher taxes. But the biggest hit to growth comes from weakening productivity. A study published in 2016, for example, examined economic performance across American states. It found that a rise of 10% in the share of a state’s population that is over 60 cuts the growth rate of output per person by roughly half a percentage point, with two-thirds of that decline due to weaker growth in productivity.

Why are older economies less productive? The answer is not, as one might suppose, that older workers are. Though some capabilities, notably physical ones, deteriorate with age, the overall effect is not dramatic. A study of

Germany's manufacturing sector published in 2016 failed to detect a drop-off in productivity in workers up to the age of 60. Companies can tweak employees' roles as they get older in order to make best use of the advantages of age, such as extensive experience and professional connections.

Furthermore, if weak productivity growth was caused by older workers producing less, pay patterns should reflect that. Wages would tend to rise at the beginning of a career and fall towards its end. But that is not what usually happens. Rather, according to a recent paper by economists at Moody's Analytics, a consultancy, wages are lower for everyone in companies with lots of older workers. It is not older workers' falling productivity that seems to hold back the economy, but their influence on those around them. That influence is potent: the authors reckon that as much as a percentage point of America's recent decline in annual productivity growth could be associated with ageing.

How this influence makes itself felt is unclear. But the authors suggest that companies with more older workers might be less eager to embrace new technologies. That might be because they are reluctant to make investments that would require employees to be retrained, given the shorter period over which they could hope to make a return on that training for those near the end of their careers. Or older bosses might be to blame. Research indicates that younger managers are more likely to adopt new technologies than are older ones. This may seem obvious: older people's greater aversion to new technology is a cliché. And at least anecdotally, greying industries do seem more averse to change.

If the evidence suggested that ageing economies struggled primarily because of slow-growing labour forces and fast-growing pension costs, it would make sense to focus policy efforts on keeping people in work longer—by raising retirement ages, for example. But if, as seems to be the

case, reticence to embrace new technologies is a bigger issue, other goals should take priority—in particular, boosting competition. In America, increasing industrial concentration and persistently high profits are spurring renewed interest in antitrust rules. The benefits of breaking up powerful firms and increasing competition might be even bigger than thought, if conservative old firms are thereby spurred to make better use of newer technologies.

There are other measures that could help. Removing barriers to job-switching, for example by making benefits more portable, could shorten average tenures and help stop companies' cultures becoming ossified. Best of all would be more immigration. An influx of young foreign workers would address nearly all the ways in which population ageing depresses growth. It would not only expand the labour force and create new taxpayers, but would mean more and younger companies, and greater openness to new technologies. And there would be plenty of willing takers in poorer countries with younger populations.

Societies with lots of older workers are also societies with lots of older voters, however. Those voters are, on average, more politically conservative than younger people, and less likely to support increased immigration. People of all ages would gain from policies that boosted growth and productivity. But given the choice between a dynamic but unfamiliar society and a static but familiar one, older countries tend to opt for the second. In hindsight, the demographic boom that coincided with industrialisation in rich countries may have had an underappreciated benefit: it created a big constituency in favour of embracing new technologies and the opportunities they provided.

Technology may at some point overcome the stifling effect of ageing. In a new paper Daron Acemoglu of the Massachusetts Institute of Technology and Pascual Restrepo of Boston University find that when young workers

are sufficiently scarce, manufacturers invest in more automation, and experience faster productivity growth as a result. Robots have yet to make a big impact in the service sector and beyond, but as their capabilities improve and jobs for younger people go begging that may change. The world could use more flexibility and productivity now. But stagnation may end eventually, once the robots are promoted to management. ■



自由交流

变老是拖累

但老龄化经济体增长放缓更多缘于选择，而非必然

地球上65岁以上人口数量历史上首次超过了五岁以下人口。德意志银行的托尔斯滕·斯洛克（Torsten Sløk）近期的一项分析认为，再过20年，两者的比例将达到2:1。这种趋势令经济学家们担心养老金开支飙升及“长期停滞”（吸收可用储蓄的投资机会太少，导致增长长期疲软）等方方面面的问题。世界老龄化不可避免，但它对经济增长的负面影响却不是必然的。老龄化社会如果增长放缓，可能只是因为人们因循守旧，不思进取。

老龄化从几个方面拖慢增长。一是提振产出所需的新增劳动人口减少。由于人口结构的变化，全球约40个国家的劳动力队伍已呈萎缩状态。随着老年人口增加，政府可能会忽视有助于推动经济增长的教育及基础设施方面的公共投资，转而加大养老金和医疗保健方面的支出。领取养老金的人越来越多，劳动人口就必须缴纳更高的税金才能应付这样的支出。但对经济增长打击最大的是生产率疲软。例如，2016年发表的一项研究调查了美国各州的经济增长情况。结果发现，一个州内60岁以上人口占比每上升10%，人均产出增长率就会降低约0.5个百分点，其中三分之二的放缓是因为生产率增长疲软所致。

为何老龄化的经济体生产率更低？答案并不像人们以为的那样是因为老年劳动者的生产率更低。虽然一些能力会随年纪增长而衰退，特别是体力，但整体影响并不显著。2016年发布的有关德国制造业的一项研究发现，年纪高至60岁的工人，其生产率并未随年纪增长而下降。公司可以随着员工年龄的增长调整其岗位，以便他们充分发挥年龄优势，比如丰富的经验和职场人脉。

此外，如果生产率增长疲软是员工年龄增大而产出减少所致，那么这在薪酬模式上应有所体现。工资应该在劳动者职业生涯的前期上升，在后期下

降。但事实往往并非如此。相反，咨询公司穆迪分析（Moody's Analytics）的经济学家最近发表的一篇论文显示，在年长员工较多的公司，所有人的工资都较低。看起来，阻碍经济增长的并非劳动者老龄化令生产率下降，而是他们对周遭劳动者的影响。这种影响是强有力的：论文作者认为，美国近年生产率年增速下降中有一个百分点可能与老龄化有关。

这种影响具体是怎么回事目前尚不明确。但论文作者指出，年长员工较多的公司可能不太愿意接受新技术。这可能是由于它们不愿投资需要员工接受再培训的项目，毕竟给职业生涯接近尾声的员工提供培训，他们能提供回报的时间会比较短。公司老板年纪较大也可能是问题所在。研究表明，年轻的管理者比年老的更可能采用新技术。这似乎显而易见，老年人更抗拒新技术这种说法早已不新鲜。至少从民间经验来看，老年人更多的行业的确显得更厌恶变化。

如果证据表明老龄化经济体发展疲软的主因是劳动力增长缓慢和养老金支出急速上升，那么合理的做法就是把政策制订的重点放在延长人们的工作年限上，例如提高退休年龄。但是，如果更大的问题是人们抗拒采用新技术（现实似乎正是如此），则应优先考虑其他目标，尤其是要促进竞争。在美国，产业高度集中和利润居高不下促使人们重新重视反垄断法规。如果能推动保守的老企业更好地利用新技术，那么分拆强势企业和加大竞争带来的好处可能比想象的更大。

还有其他有助于解决问题的措施。消除转换工作的障碍，例如让劳动者的福利更便于转移，可以缩短平均工作任期，帮助防止企业文化僵化。最好的举措是接收更多移民。年轻外国工人的涌入几乎能从各个方面解决人口老龄化抑制增长的问题。它不仅能壮大劳动力队伍，增加纳税人口，还能造就更多、更年轻的公司，更开放地接纳新技术。在人口较年轻的贫穷国家，愿意响应的大有人在。

然而，拥有大量高龄劳动者的社会也就有着大量老年选民。平均而言，这些选民在政治上比年轻人更保守，更不可能支持增加移民。尽管促进增长

和生产率的政策能令各年龄层的民众受益，但当面前摆出两个选择——一是有活力但陌生的社会，一是停滞但熟悉的社会，老龄化国家往往还是会选择后者。回头来看，富裕国家工业化进程中出现的人口膨胀可能有一个未被充分认识的好处：创造了一个支持利用新技术以及技术带来的机遇的庞大选民群体。

到了某个阶段，技术也许会克服老龄化的窒息效应。麻省理工学院的达伦·阿西莫格鲁（Daron Acemoglu）和波士顿大学的帕斯卡尔·雷斯特雷波（Pascual Restrepo）在一篇新论文中表示，当年轻员工稀缺到一定程度，制造商就会投资于更多自动化设备，从而加快生产率增长。机器人尚未对服务业等领域产生重大影响，但随着机器人能力增强，需要年轻人的岗位又无人可用，情况可能就会改变。当今世界可能仍需要提升灵活性和生产率。但一旦机器人被提升到管理层，停滞可能就会彻底终结。■



North Korea's economy

When the lights go out

Satellite data shed new light on North Korea's opaque economy

VIEWED FROM space at night, North Korea looks like the recently released first image of a black hole: an abyss, ringed by the brilliant glow of South Korea, China and Russia, from which nothing can escape. But the Hermit Kingdom does emit a bit of light, which orbiting satellites detect. And nocturnal luminosity is one of the few reliable sources of information about the country. It implies that North Korea's economy is poorer, more volatile and more vulnerable to weather than formerly thought.

Night lights are a strong proxy for economic activity. A new paper by the IMF finds that they explain 44% of the variation in countries' GDP per person—as close a tie as that between a person's height and hand size. In places where records are poor or manipulated, night lights offer an alternative measure of output. One study found that among countries with similar luminosity, autocracies reported GDP growth 15-30% higher than democracies did.

Nowhere are good economic data rarer than in North Korea. The most detailed numbers come from South Korea's central bank, which derives them from figures on production volumes of various goods. When adjusted for the cost of living in a developing Asian economy, the bank's most recent estimate of North Korea's annual GDP per person is enough to buy goods and services that would cost \$2,500 in America.

The picture painted by night lights, however, is even grimmer. In 2013 a group of scholars compared luminosity and GDP within rural China, obtaining an equation to estimate economic output from light. A

forthcoming paper by World Data Lab, a startup, and a team of researchers applies this formula to North Korea. It yields a standard of living that would cost \$1,400 a year in America, making North Korea one of the world's ten poorest countries.

The data also suggest that the economy has been unusually volatile. In 2013-15 luminosity fell by 40%. That implies a 12% reduction in GDP, including 19% in the capital region, Pyongyang. Since 2016, however, the country has brightened again.

International sanctions are unlikely to have produced this darkening. They were made stricter in 2016-17, just as luminosity rose. A drop in the prices of North Korean exports, like coal, may have played a part.

But the main cause was probably weather. North Korea relies on hydropower, and in 2015 it was parched by a drought. The Bank of Korea also reckons that electricity, gas and water output fell by 13% in 2015.

The economy may not have shrunk as much as the dimming suggests. Recessions caused by power cuts could disproportionately reduce lighting. Many North Koreans own solar panels, which power daytime activity not shown in night lights. And state buildings, whose illumination is a political choice, make up much of the capital's glow. As with physics inside a black hole, no one knows what economic laws apply within North Korea's eerie silhouette.

Nonetheless, a 40% drop in luminosity indicates a serious recession. And this year the government has admitted publicly that heatwaves, floods and drought have caused a dire food shortfall. The regime appears much better prepared to weather trade sanctions than the wrath of nature. ■



朝鲜经济

熄灯之时

卫星数据对朝鲜不透明的经济提供了新的解读

在夜间从太空往下看，朝鲜看起来就像近期发布的首张黑洞照片：一个被韩国、中国和俄罗斯的耀眼光芒环绕的深渊，没有任何东西可从中逃脱。但是轨道卫星还是探测到了这个隐士王国散发出的一些光线。有关朝鲜的可靠信息来源很少，夜间照明显亮度是其中之一。从目前的照明显亮度看，朝鲜的经济比人们之前所想的更贫穷、更不稳定、更容易受天气影响。

夜间灯光数据是经济活动的有力指标。国际货币基金组织的一篇新论文发现，它能解释各国人均GDP44%的差异——和一个人的身高与手掌大小之间的关联程度相近。在数据不完善或受操纵的地方，夜间灯光成了替代性的经济产出指标。一项研究发现，在具有相似亮度的国家中，专制国家公布的GDP增长数字比民主国家公布的高出15%至30%。

没有哪个国家的可靠经济数据比朝鲜更少。最详细的数据来自韩国央行，根据各种商品的产量得出。根据亚洲发展中经济体的生活成本进行调整后，韩国央行得出的最新估计是朝鲜年人均GDP可以在美国购买价值2500美元的商品和服务。

然而，夜间灯光描绘出的图景更加严峻。2013年，一组学者比较了中国农村的夜间亮度和GDP，得出了一个根据亮度估算经济产出的公式。在即将发表的一篇论文中，创业公司世界数据实验室（World Data Lab）和一个研究小组将这一公式应用于朝鲜，得出的结果显示其生活水平在美国相当于每年花费1400美元。照此计算，朝鲜是世界上最贫穷的十个国家之一。

亮度数据还表明朝鲜经济波动异常大。2013至2015年间，夜间亮度下降了40%。这意味着GDP下降了12%，其中首都平壤地区的GDP下降了19%。然而，2016年后，朝鲜的亮度再次提升。

国际制裁不太可能是亮度下降的原因。2016至2017年度光度上升正值制裁力度加大之际。煤炭等朝鲜出口产品价格下跌可能起到了一定作用。

但主要原因可能是天气。朝鲜依赖水电，2015年水电资源却因干旱而枯竭。韩国央行还估计，2015年朝鲜电力、燃气和水的产出下降了13%。

经济缩水程度可能没有照明显度的降幅那么大。电力供应不足造成的经济衰退可能会让照明以更大幅度减少。许多朝鲜人都有太阳能电池板，为日间活动供电，而这在夜间照明数据中没有体现。政府建筑照明是一种政治选择，是首都夜间光亮的主要来源。与黑洞内的物理谜题一样，没人知道在朝鲜幽暗的轮廓之内有什么适用的经济法则。

尽管如此，照明显度下降40%仍然表明经济出现严重衰退。今年朝鲜政府公开承认，热浪、洪水和干旱造成了严重的粮食短缺。看起来朝鲜政权更善于应对贸易制裁，面对暴怒的大自然则力有不逮。 ■



Intelligent machinery

Speaker see. Speaker do

Household electronics are undergoing a sensory makeover

SMART SPEAKERS, like Amazon Echo, Google Home and Apple HomePod, are spreading rapidly, and it is now common to hear people asking such assistants to provide weather forecasts or traffic updates, or to play audiobooks or music from streaming services. But because a smart speaker can act only on what it hears, it has little understanding of objects and people in its vicinity, or what those people might be up to. Having such awareness might improve its performance—and might also let users communicate with these digital servants by deed as well as word. Several groups of researchers are therefore working on ways to extend smart speakers' sensory ranges.

One such effort is led by Chris Harrison and Gierad Laput of Carnegie Mellon University, in Pittsburgh, Pennsylvania. On May 6th, at a conference in Glasgow, Dr Harrison and Mr Laput unveiled their proposal, which they call SurfaceSight, to give smart speakers vision as well as hearing. Their chosen tool is lidar, a system that works, like radar, by bouncing a beam of electromagnetic waves off its surroundings and measuring how quickly those waves return. That information, run through appropriate software, builds up an image of what the beam is pointing at. If, as many radars do, a lidar then revolves, it can sweep the beam around to create a 360° picture of its surroundings.

Dr Harrison and Mr Laput have fitted such a system to an Amazon Echo speaker, permitting it to sense and identify nearby household objects and to recognise hand gestures—and, having been told what those gestures are intended to convey, to respond to them. At the moment, the lidar they use

sweeps a six-millimetre-deep beam around the speaker's base. It is thus able to see only things within that slice of space. This is a restriction on its effectiveness, but a deliberate one. The two researchers are sensitive to suggestions their system might be used to spy on its owner. Although widening its field of view would undoubtedly increase its utility, giving it tunnel vision of this sort helps overcome such suspicions.

Even with this restriction in place, however, the system's machine-learning software can be trained to recognise objects as diverse as saucepans, cereal boxes, screwdrivers, bunches of carrots and smartphones. It can also be trained to respond to this information in useful ways. One experimental app, for example, employs it to recognise utensils and ingredients laid out on a preparation surface and to check everything needed is available to cook a particular dish. Another app recognises the owner's smartphone and connects it automatically, via Bluetooth, to that individual's music collection.

Gesture recognition is similarly useful. When running the music app, a user might swap between tracks by swiping his fingers over the surface the lidar is scanning. The user of a teleconferencing app might similarly advance through a PowerPoint presentation. And, though SurfaceSight's laser beam cannot recognise particular people, it can be trained to sense how many of them are standing beside the surface it sits on—and which way they are facing. This means it could cajole those it deemed not to be paying attention to the aforementioned presentation (that is, those not facing inward) to follow things more avidly. Nor is the technology limited to smart speakers. It can, for example, be employed to control a thermostat.

Dr Harrison and Mr Laput are not alone in making surfaces active. Swan Solutions of Houston, Texas, sells Knocki, an accelerometer which can be fixed to a surface to detect the vibrations made by someone knocking on that surface. Different devices—lamps or a television, say, as well as a smart

speaker—can then be activated by anyone making the appropriate pre-arranged number of knocks.

Other firms, too, are attempting to build devices that are more aware of their surroundings—for example, by boosting their ability to recognise sounds. Audio Analytic, a British maker of sound-recognition technology, has developed and filed a patent on what it calls “brand sonification”. In this, distinctive noises characteristic of the use of a certain product, such as the pop made when removing the lid from a tube of potato crisps or the hiss of opening a can of drink, are recognised by a smart speaker—prompting it, perhaps, to offer discounts on related products.

That is technologically clever. How far Audio Analytic has thought this one through, though, is unclear. Being spied on by a smart speaker sounds bad enough. Being pestered by one might be worse. ■



智能机器

音箱能看又能干

家用电子设备正经历一场感官大变身

Amazon Echo、Google Home和Apple HomePod这类智能音箱的普及程度正在迅速提高。如今经常可以听到人们向这些助手打听天气预报或最新交通路况，或者让它们播放有声书或来自流媒体服务的音乐。但是智能音箱只能根据听到的内容采取行动，因此对附近的物体和人几乎全无了解，也不明白这些人可能想要做什么。如果能让它们拥有这样的觉察力，或许就可以提高其性能，还能让用户除言语外也能通过行为与这些数字仆人沟通。因此，几组研究人员正在探寻扩展智能音箱感知范围的方法。

其中个项目由位于宾夕法尼亚州匹兹堡的卡内基·梅隆大学的克里斯·哈里森（Chris Harrison）和吉亚拉德·拉普特（Gierad Laput）领导。5月6日，他们在格拉斯哥的一次会议上介绍了自己的方案。他们将之命名为SurfaceSight，能让智能音箱既有听觉又有视觉。他们选择的工具是激光雷达。这个系统的工作原理类似雷达，向周围环境射出一束电磁波，并测量其折回的速度。由此得出的信息经由适当的软件处理后，就可为激光束扫过的物体创建一幅图像。如果激光雷达随后如许多种类的雷达那样开始旋转，就可以扫描四周，进而创建出一幅有关周围环境的360°图像。

哈里森和拉普特在一台亚马逊Echo音箱上安装了这样一个系统，让音箱能感知和辨认附近的家用物品，还能识别人的手势。而且，由于它已经被告知这些手势想传达什么意思，这个音箱还可以对手势作出响应。目前他们使用的激光雷达发射出一道直径6毫米的激光束扫描音箱底座的四周，因此音箱只能“看”到这一小片区域内的东西。这限制了它的效用，但却是有意为之——有人指出这样的系统可能会被用来监视音箱的主人，两位研究人员很重视这种意见。这种狭窄的视野有助于打消这样的疑虑，尽管拓展音箱的视野无疑会增强其效用。

然而，即便存在这样的限制，该系统的机器学习软件经训练后还是可以识别出各种各样的物品，如炖锅、麦片盒、螺丝刀、成捆的胡萝卜和智能手机。此外还可以训练它对这种信息作出有用的回应。例如，一个实验性的应用用它来识别散放在厨房流理台上的厨具和食材，确定烹饪某道菜所需的一切是否已备齐。另一款应用能识别主人的智能手机，并通过蓝牙自动连接主人的音乐收藏。

手势识别同样有用。在运行音乐应用程序时，用户可以在激光雷达扫描范围内的一个平面上滑动手指，以此切换曲目。使用远程会议应用的用户或许也可用同样的方法在作报告时翻PPT。而且，尽管SurfaceSight的激光束无法识别别人的身份，但经训练后可以感知有多少人站在它周围，以及这些人面朝哪里。这意味着它可以督促那些在它“看来”没有好好听上述报告的人（也就是没有朝发言人看的人）更加积极认真地参与会议。这项技术也不限于智能音箱。例如，它还可以用于控制恒温器。

想让各种表面成为操作界面的并不只有哈里森和拉普特。位于德克萨斯州休斯顿的Swan Solutions公司出售一款名叫Knocki的加速度计，可以固定在一个表面上，检测表面因敲击而产生的振动。然后，任何人都可以按照预先为智能音箱、电灯或电视机等不同设备设定的敲击次数敲击表面，激活这些设备。

其他公司也在想办法打造更能感知周围环境的设备，例如通过提高这些设备识别声音的能力。英国声音识别技术制造商Audio Analytic已研发并提交了一项名为“品牌可听化”的专利。运用这一技术，智能音箱可识别出某种产品被使用时发出的独特声音特质，例如打开罐装薯片的盖子时发出的一声“砰”，或打开一罐饮料时发出的嘶嘶声——然后它或许就会给相关产品提供折扣。

就技术而言，这很机灵。但Audio Analytic对于使用这项技术已经考虑得多全面还很难说。有个智能音箱监视自己听起来就已经很闹心，还要受它的骚扰可能就更让人厌烦了。 ■



Buttonwood

Sales assistance

Why investors are careful buyers but careless sellers

JACK SCHWAGER was once a moderately successful trader who wondered why he was not an immoderately successful trader. Perhaps if he knew the secrets of trading superstars, such as Paul Tudor Jones or Jim Rogers, he might improve. So he asked them for those secrets. “Market Wizards”, his book of interviews with hedge-fund traders, was published in 1989. A second volume soon followed.

Both books have since been pored over by a generation of hedge-fund wannabes. They are full of great stories and tips covering a range of investing styles. Yet there are common elements. It is striking, for instance, how little emphasis the wizards put on getting into a position—finding the right trade at the right entry price—compared with when to get out of it. That makes sense. Deciding what and when to sell surely matters at least as much as, and perhaps more than, deciding what to buy.

The wizardly injunction to cut your losses and let your winners ride has hardened into hedge-fund doctrine. Even so, it is not widely practised in mainstream investing. Fund managers pay lots of attention to buying decisions. But they are remarkably careless in deciding what to sell.

That is the central finding of “Selling Fast and Buying Slow”, published late last year by a trio of academics—Klakow Akepanidtaworn of the University of Chicago’s Booth School of Business, Alex Imas of Carnegie Mellon University and Lawrence Schmidt of the Massachusetts Institute of Technology—together with Rick Di Mascio of Inalytics, a data firm. They examined the daily turnover of hundreds of portfolios over several years,

tracking more than 2m stock purchases and almost as many sales. Buying decisions, they found, were good: the addition of a stock generally improved a portfolio. But selling decisions were bad—so bad that a fund manager would have been much better off choosing a stock to sell at random.

The disparity between sales and purchases is explained by the attention given to each. Fund managers are careful buyers. Purchases come at the end of a long period of serious thought and research. But they do not give stock sales anything like the same attention. That is especially true when they are stressed because their portfolio has recently done badly. Instead of deliberating, they use a mental shortcut. Stocks that have done either really well or really badly, and so stick in the mind, are far more likely to be sold. The more inclined fund managers are to sell in this way, the worse they perform.

They do not realise that careless selling is harmful, it seems. “Selling is simply a cash-raising exercise for the next buying idea,” one told the paper’s authors. “Buying is an investment decision; selling is something else,” said another. Fund managers sell the stocks that come most readily to mind. Yet they are able to sell wisely, if they pay attention. Sales made when they are focused on information about a stock, for example around the time of an earnings report, are almost as smart as buying decisions, the authors say.

The message is clear. If fund managers took more care over selling, they would be more successful. But the world is not arranged in such a way as to make them take that care. They will be asked often for their best buying ideas, but rarely about stocks they own that are ripe for selling. This lopsided approach to decision-making is not confined to fund management. Businesses often spend an age deciding whom to hire but put off thinking about whom to let go until there is a pressing financial need, by which point the decision is likely to be rushed.

Why do fund managers take their losses on bad stocks too late and their profits on good stocks too early? A body of empirical research, surveyed by Brad Barber and Terrance Odean of the University of California, finds that individual investors show a strong preference for selling winners over losers. They may be impatient to experience the burst of pride that comes from selling a winner. And they hold on to losers for too long in the hope of avoiding feelings of regret.

The type of superstar trader profiled in “Market Wizards” is as likely to sell a currency, commodity or stock short as to buy it. For them, selling is as natural as buying, and requires just as much attention. For his part, Mr Schwager recalls in the book how he lost a lot of money trading soyabeans. He failed to get out of his position when the market moved against him. The decision to buy the beans might not have been a great one. But it was his selling decision that he truly regretted. ■



梧桐

销售助理

为什么投资者买得谨慎、卖得随性？

杰克·施瓦格（Jack Schwager）曾经是一位小有成就的交易员，他想知道自己的为什么没能成为一位非常成功的交易员。要是他知道保罗·都铎·琼斯（Paul Tudor Jones）或吉姆·罗杰斯（Jim Rogers）等超级明星交易员的秘诀，说不定就能更上层楼了。所以他就向他们探求秘诀。1989年，他出版了《金融怪杰》（Market Wizards）一书，记录了他对多位对冲基金交易员的采访。很快他又出版了第二卷。

从那以后，这两本书都被想成为对冲基金交易员的一代人研读过。书中有很多精彩的故事和投资技巧，涉及各种投资风格。不过也有一些通用元素。例如，令人惊讶的是，比起何时退市，金融怪杰们对于以合适的价格买进什么的重视程度竟然如此之低。这是有道理的。决定卖出什么、什么时候卖出无疑和决定买进什么一样重要，甚至可能更加重要。

对赔钱的投资尽快止损，对赚钱的放任自流——这一神奇训谕被反复强调，已经成了对冲基金的信条。尽管如此，它在主流投资领域并没有得到广泛的实践。基金经理们非常关注买进决策，但在决定卖出时却非常随意。

这是去年年底由三位学者和数据分析公司Inalytics的里克·迪·马西奥（Rick Di Mascio）共同发表的论文《快快卖，慢慢买》（Selling Fast and Buying Slow）的主要发现。这三位学者分别是芝加哥大学布斯商学院的克拉科夫·阿克帕尼德塔沃恩（Klakow Akepanidtaworn）、卡内基梅隆大学的亚历克斯·伊马斯（Alex Imas）和麻省理工学院的劳伦斯·施密特（Lawrence Schmidt）。他们研究了过去几年里数百个投资组合的日成交量，追踪了两百多万次股票买进和几乎相同数量的卖出。他们发现，购买决策表现不错：增加一只股票通常会改善投资组合。但卖出的决定太糟糕

了，甚至于基金经理就算随机选择一只股票卖出，情况都会好得多。

卖出和买进之间的差异是因为两者受到的关注度不同。基金经理是谨慎的买家。买进是在经过长时间的认真思考和研究之后才做出的。但他们全然没有给予卖出类似的关注。当他们因为投资组合近期表现不佳而倍感压力时，这一点尤其明显。他们没有深思熟虑，而是走了一条心理捷径。有些股票表现非常好或者非常糟，被基金经理牢记于心，被卖出的可能性也就大得多。基金经理越倾向于以这种方式卖出股票，业绩就越差。

他们似乎没有意识到随意卖出坏处多多。有人告诉论文作者：“卖出只是在为下一个买进的念头筹集资金。”也有人说：“买进是一种投资决策，但卖出是另一回事。”基金经理卖掉的是最容易想起来的股票。不过，他们一旦多加关注，就能明智地卖出。三位作者称，当基金经理们专注于某只股票的信息时，比如在企业发布业绩报告时，他们做的卖出决策几乎和买进一样明智。

这里传递出的信息很明确。如果基金经理在卖出股票时更谨慎，他们会更成功。但是这个世界的运转方式并不能让他们采取这样的谨慎态度。他们经常会被问及最好买进什么，但很少会被问及他们手上哪些股票适合卖出。这种不平衡的决策方式并不限于基金管理。企业往往要花很长一段时间来决定雇用谁，但直到出现紧迫的财务需求时才会考虑让谁走人。而到了那个时候，决定很可能做得很仓促。

为什么基金经理愿意一直忍受坏股票的损失，却要尽早享受好股票的利润？加州大学的布拉德·巴伯（Brad Barber）和特伦斯·奥迪安（Terrance Odean）进行的大量实证研究发现，个人投资者更倾向于卖掉盈利的股票，而非亏损的股票。他们可能迫不及待地想要体验卖掉盈利股票带来的自豪感。他们迟迟不想卖出亏损股票，是希望能不后悔。

对于《金融怪杰》中描述的那类超级明星交易员，卖空一种货币、大宗商品或一只股票的可能性和买进它们是一样多的。卖出和买进一样自然，需要同等的关注度。说到自己，施瓦格在书中回忆道，他在大豆交易上损失

了很多钱。当市场趋势对他不利时，他没能脱手。买进咖啡豆的决定可能不太明智，但他真正后悔的是自己的卖出决策。■



Bartleby

Struggling with style

Modern dress codes are easier for men than for women

SUMMER'S ARRIVAL in the northern hemisphere brings with it a dilemma that plagues every office worker. What does a casual dress code mean in practice? The happy medium between looking like Kim Kardashian or Hagrid the giant is hard to pin down.

Goldman Sachs has just implemented a “flexible dress code” although the executive memo noted gnomically that “casual dress is not appropriate every day”. Besuited corporate clients might not take kindly to investment-banking advice offered by someone wearing a tank top and ripped jeans.

It makes sense that banking would be one of the last bastions to fall to the advance of casual workwear. You want the people who look after your money to appear sober and respectable. For similar reasons, bank headquarters have deliberately been built in a grandiose style to emphasise the institution's financial solidity and historical roots. Depositors might hesitate about handing over their savings to people working under a railway arch.

For men, the move to casual dress seems entirely positive. Few people will mourn the demise of the tie, a functionally useless garment that constricted male necks for a century. The tie's origins date back to the 17th century, when mercenaries hired by Louis XIII of France wore a form of cravat. The modern version of the tie emerged in the 1920s and was popularised by Britain's Edward VIII who, when not flirting with the Nazis, developed the Windsor knot. It became standard office wear for the next six decades. In the 1990s ties started to go out of fashion because technology titans and hedge-

fund managers refused to wear them—and were rich enough to ignore social convention. Once, when Mark Zuckerberg, the founder of Facebook, was to meet a venture capitalist, he turned up wearing his pyjamas.

The jacket, by contrast, is a much more useful garment, replete with pockets to house wallets, spectacle cases and travel passes (or, these days, mobile phones). So the default work garb for men, when meeting clients, is jacket, open-necked shirt and dark trousers (denim excluded).

On days without meetings, men can slob out in T-shirts (though not too garish) and jeans, and no one will think the worse of them. Arriving in shorts or without socks is another matter entirely. But dressing in the morning is quick and easy. Steve Jobs was famous for wearing the same outfit—black polo neck, jeans and trainers—every day.

But what works well for men does not translate as easily to women. Karl Stefanovic, an Australian television presenter, wore the same blue suit every day for a year and no one noticed. By contrast, his female co-presenters received constant remarks on their appearance. Even the Duchess of Cambridge, Kate Middleton, gets snarky comments when she wears the same clothes twice.

Women's workwear seems to have become less formal over time. A survey by Euromonitor found that sales of women's suits fell by 77% in America between 2007 and 2016. But many women worry that they will be judged as unprofessional (unlike their male colleagues) if their clothes are deemed to be too scruffy, or too revealing. It can also be hard choosing clothes that are suitable for both indoors and out. Air-conditioning systems in offices are often designed to suit the male metabolic rate, which can cope with colder temperatures than the female body. The result may be that women have to bring an extra layer to wear in the building.

As for formal meetings, while men have abandoned the tie, many women feel obliged to wear high heels. These give some women a sense of empowerment and femininity (not to mention extra height). But in health terms, heels can seem like the Western equivalent of the ancient Chinese practice of foot-binding: bad for women's feet, ankles and backs and designed to limit their mobility. Britain's Parliament held a debate after a woman was sent home from her job as a receptionist for refusing to wear high heels (it was inconclusive).

Companies understandably want workers who deal with the public to look respectable. Workers shouldn't wear clothes that wouldn't be appropriate if visiting a prudish grandmother or a child's teacher. And yet no one should be expected to turn up at the office as if dressed for a wedding. The most important item to bring to work is a dose of sartorial common sense. ■



巴托比

穿什么？

男性比女性更容易执行现代着装规范

北半球入夏了，给每个上班族带来了难题。“休闲着装规范”到底要怎么操作？要在看上去像金·卡戴珊（Kim Kardashian）和像巨人海格（Hagrid）之间找到一个满意的平衡点，实在太难了。

高盛刚刚实行了“弹性着装规范”，然而其行政备忘录中不无深意地写着“休闲装并不适合每天穿着”。西装革履的企业客户估计不会欣然接受穿着背心和破洞牛仔裤的投行员工给出的建议。

在普及休闲工作装的进程中，银行会是最难攻克的堡垒之一，这合乎情理。你总归希望那些帮你打理钱财的人看上去冷静又得体。出于类似的原因，银行总部总是刻意建得宏伟，以彰显这个机构财务稳健、历史悠久。如果要把存款交给在铁路桥桥洞下工作的人，储户可能就会迟疑。

对于男性来说，转向休闲装似乎只有好处。几乎没人会哀悼领带的消亡。一个世纪以来，这个毫无实用功能的东西一直束缚着男人们的脖子。领带的起源可以追溯到17世纪，当时法国国王路易十三的雇佣兵佩戴着一种领巾。现代领带出现在上世纪20年代，由英国国王爱德华八世推而广之。在和纳粹眉来眼去之余，他推动了温莎结。接下来的60年里，领带成了办公室着装的标配。到了90年代，领带开始过时，因为科技巨头和对冲基金经理拒绝佩戴它，而且他们财力雄厚，可以无视社交习俗。Facebook的创始人马克·扎克伯格某次跟一位风险投资家会面时甚至穿着睡衣。

相比之下，夹克的实用性要强得多。夹克上满是口袋，可以装钱包、眼镜盒和交通卡（或者如今的手机）。所以现在男性在会见客户时，默认的工作服是夹克、开领衬衫和深色裤子（牛仔裤除外）。

在不开会的那些日子，男性可以随便套上件T恤（但别太花哨）和牛仔裤

就出门，没人会瞧不起他们。穿着短裤或者不穿袜子上班就完全是另一回事了。但男人们清早穿衣服真是又快又简单。乔布斯就以每天穿同样的黑色高领衫、牛仔裤和运动鞋闻名。

但在男性身上行之有效的方式并不那么容易移植到女性身上。澳大利亚电视节目主持人卡尔·斯特凡诺维奇（Karl Stefanovic）曾经一整年里每天都穿着同样的蓝色套装，并没有谁注意这件事。但他搭档的女主持们却不断收到对她们穿着的评论。就连凯特王妃也因为两次穿同一件衣服受到尖刻的批评。

随着时间的推移，女性的职场着装似乎变得不那么正式了。欧睿（Euromonitor）的一项调查发现，2007年到2016年，美国女式套装的销量下跌了77%。但许多女性担心，不同于她们的男同事，如果她们的衣服看上去太邋遢或太暴露，人们就会认为她们不专业。选择既适合室内又适合户外的衣服也可能颇麻烦。办公室空调系统的设计通常都适合男性的新陈代谢率——他们比女性的身体更能适应较低的温度。结果可能是女性不得不在室内多穿一层衣服。

在正式会议上，虽然男人们已经不再打领带，许多女员工却仍觉得只能穿高跟鞋。高跟鞋给了一些女性一种赋权感和女性气质（更不用说还增加了身高）。但从健康的角度来看，高跟鞋似乎与中国古代的缠足类似：对女性的足部、踝部和背部有害，并且还是为限制她们的活动能力。在一位公司前台女员工因拒绝穿高跟鞋而遭辞退后，英国议会举行了一场辩论（没有得出什么结论）。

公司希望与公众打交道的员工看起来得体，这可以理解。如果一套衣服不适合穿着去拜访古板拘谨的老祖母或是孩子的老师，那就不该穿去上班。但同时，也不应期待人们上班穿得跟参加婚礼似的。最应该带着上班的“单品”是一套穿衣风格上的常识。■



Freight apps

Moving with the times

Trucking illustrates hurdles to Uber's dreams of dominating world transport

FLORIDA 595 is unappealing, even by truck-stop standards. Odour from a landfill next door permeates the humid air. Planes from a nearby airport buzz overhead. The average American trucker spends two-thirds of working time either in places like this or loadless on the road. So the wheelmen propping up the bar at 595 are giddy about a new breed of smartphone app. For a few years startups like Cargomatic and Convoy have been helping drivers maximise their gainful time behind the wheel by digitising the matching of shipments with lorries. Convoy called itself “Uber for freight”—until 2017, when Uber launched exactly that.

If Uber had presented itself as just a ride-hailing firm, analysts reckon, it would not have fetched an \$82bn valuation when it listed in New York on May 10th. That was predicated on the platform’s potential to disrupt all road transport. Investors are having second thoughts: Uber’s share price fell sharply in its first two days as a public company (before regaining ground), perhaps on the realisation that the firm may struggle to make money anytime soon. Uber Freight is a case in point.

On paper, the market the app could disrupt looks huge. Global spending on road freight reached \$3.8trn in 2017, says Armstrong & Associates, a consultancy. Companies in America spent over \$700bn; freight rates grew by 30% last year owing to a surfeit of cargo and a shortage of drivers.

In practice, only \$72bn of American shipments is managed by brokers; most of the rest travels on company lorries. Digital brokers’ slice is wafer-thin. Zion Market Research predicts that their global turnover will increase from

around \$1bn to \$21bn between 2017 and 2026. Uber would need to dominate this market to rival its \$9bn in revenue from ride-hailing in 2018.

Uber touts freight as its third-most important business after ride-hailing and food delivery. It made up nearly 3% of the firm's revenues in 2018, but bookings grew by almost 450% that year—faster than any other division. Bill Driegert, boss of Uber Freight, thinks that it can grab most of the brokers' \$72bn, not just the digital bit. No rival can match its software or traffic data—both applicable to lorry logistics, Mr Driegert boasts. Brand recognition, he believes, should help win over drivers reluctant to take jobs from apps no one has heard of.

But unlike ride-hailing, which Uber more or less invented, it is a late arrival to freight. Its earlier efforts to disrupt haulage with the purchase of Otto, a startup developing self-driving lorries, came to naught. Grand plans to expand abroad—in March it presented a European app—run up against home-grown incumbents: Timocom of Germany and Teleroute of Belgium in Europe, and Rivigo, a hit Indian app, in Asia.

At home, conventional brokers have shown digital savvy. Goldman Sachs, a bank, estimates that from January to September last year Uber Freight accounted for 30% of haulage-app downloads. That is impressive, but shy of the combined 40% for the three apps from big brokers: C.H. Robinson's Navisphere, J.B. Hunt's Carrier 360 and DAT's Load Board. The boom in road freight provides these companies with cash to plough into apps and algorithms. Landstar, another big broker, claims that a recent software upgrade cut the time needed to process a delivery by nearly a third.

Chris O'Brien, C.H. Robinson's chief salesman, disputes the idea that the startups' data on traffic are better. Lorry routes differ from taxi rides. Brokers can bolt on services—warehousing, last-mile delivery, assistance with

customs or unforeseen problems—onto basic haulage. Here, Uber is miles behind.

The brokers see their main threat coming not from Uber's headquarters in San Francisco but from Seattle, home to Amazon. The e-commerce juggernaut launched an app in 2017 to help lorry drivers deliver merchandise to its warehouses. It is rumoured to be working on its own service. Unlike Uber, it has plenty of experience delivering cargo. It sits on more cash than Uber or the brokers. It may not take long to appear in their rear-view mirrors. ■



货运应用

与时俱进

卡车货运的例子显示，优步主宰全球交通的梦想面临障碍

就算以卡车休息站的标准来衡量，佛罗里达595号也让人喜欢不起来。隔壁垃圾填埋场的气味弥漫在潮湿的空气中。来往附近一个机场的飞机在头顶上方嗡嗡作响。美国的卡车司机通常有三分之二的工作时间要么停在这种地方，要么空车跑在路上。因此，一批新型智能手机应用问世后，一直照顾着595服务区酒吧生意的司机们雀跃不已。近年来，Cargomatic和Convoy等创业公司把匹配货物和卡车的过程数字化，帮助司机们最大限度地减少空车时间。Convoy一直自称是“货运界的优步”，直到2017年优步推出了自己的货运业务。

分析人士认为，如果优步只把自己定位为一家网约车公司，那么5月10日它在纽约上市时的估值不可能达到820亿美元。这一估值的基础是认为该平台有颠覆所有道路运输的潜力。不过投资者正在重新衡量：优步上市后的头两天股价大幅下跌（之后又反弹），或许是人们意识到这家公司可能很难快速盈利。优步货运就是一个例证。

理论上，这款应用可能颠覆的市场看起来非常庞大。咨询公司Armstrong & Associates称，2017年全球公路货运支出达到3.8万亿美元。美国公司的花费超过7000亿美元；由于货物过多而司机短缺，去年运费上涨了30%。

但实际上，只有720亿美元的美国货物由货运代理运输，其余大部分都是由公司自己的车队运送。数字货代所占的份额非常小。Zion Market Research预测，从2017年到2026年，它们的全球营业额将从约10亿美元增至210亿美元。优步只有主导这个市场，才能获得与它去年在网约车市场上90亿美元收入相当的入账。

优步将货运奉为其第三大重要业务，仅次于网约车和送餐服务。2018年这

部分业务占公司总收入的近3%，但它这一年预订量的增速比其他任何部门都快，几乎达到450%。优步货运的老板比尔·德里格特（Bill Driegert）认为公司能拿下720亿美元的货代市场的一大部分，而不仅仅是数字化货代的那一小块。德里格特自豪地表示，在软件和交通数据方面，没有任何竞争对手能和优步抗衡，而这两者都可以应用于卡车物流。他认为，司机们不愿意从闻所未闻的应用中接活，品牌认知度应该有助于优步赢得他们的信任。

但和网约车这一或多或少由优步创造的服务不同，它在货运方面可谓姗姗来迟。优步之前收购了开发无人驾驶卡车的创业公司Otto，想以此颠覆货运业，最后无果而终。后来优步开启了宏伟的海外拓展计划，包括今年3月在欧洲推出一款应用，结果遭到当地企业的阻击：欧洲有德国的Timocom和比利时的Teleroute，亚洲有印度的热门应用Rivigo。

在美国国内，传统货代也已显示出了运用数字化的能力。高盛估计，从去年1月到9月，优步货运占了货运应用下载量的30%。这个业绩很不错，但落后于三家大型货代的应用合计40%的下载比例：C.H. Robinson的Navisphere、J.B. Hunt的Carrier 360和DAT的Load Board。公路货运的繁荣为这些公司提供了大量资金用于开发应用和算法。另一家大型货代Landstar声称，最近一次软件升级后，处理一次货运所需的时间缩短了近三分之一。

C.H. Robinson的销售主管克里斯·奥布莱恩（Chris O'Brien）对创业公司的交通数据更优质的说法提出了质疑。卡车的路线与出租车不同。货代可以在基本的运输之上增加仓储、最后一英里交货、协助办理海关手续或处理无法预见的问题等服务。在这方面，优步远远落后。

这些货代认为，他们面临的主要威胁不是来自优步在旧金山的总部，而是来自亚马逊的总部所在地西雅图。这家电子商务巨头在2017年推出了一款应用，帮助卡车司机将商品送至其仓库。据传亚马逊正在开发自己的货运服务。与优步不同，它有丰富的货运经验。它的资金也比优步或货代更雄厚。可能用不了多久，亚马逊就会出现在这些公司的后视镜里。■



Mountaineering

Not so rare air

Climbers' success rate on Everest is higher than any other Himalayan peak

BEFORE EDMUND HILLARY and Tenzing Norgay set foot on the summit of Mount Everest in 1953, at least 145 other climbers had tried and failed to reach Earth's highest point. In 1924 a British team got within 250 metres of the top, but turned back after two members (who may or may not have reached the peak) vanished.

Scaling Everest was scarcely easier afterwards. Excluding guides, just 9% of people making an attempt reached the summit from 1954-83, while 2% died. As climate change thaws the snow, the remains of many of these victims have emerged—including one of the lost climbers from 1924.

But since the 1990s, the pinnacle of mountaineering has become accessible. In 1994-2003, 24% of Everest climbers got to the top, double the rate in the previous decade. The share doubled again, to 51%, in 2004-13. In the past three complete climbing seasons, 66% have made it. The first summit attempts of 2019 were made last month.

Technology accounts for some of these gains. Oxygen tanks deliver twice as much gas as before, and suffer fewer leaks. Suits and gloves made from high-quality down and double-insulated boots keep climbers warmer. And better weather forecasting has minimised unpleasant surprises.

However, these advances help just as much on other peaks. And summit rates elsewhere have risen much less. Among the 13 Himalayan mountains with available records that were climbed by at least 40 people since 2016, Everest's summit rate was the fourth-lowest before 1994. In the past three

years it has been the highest.

Two factors probably account for this trend. First, Sherpas set up ladders and ropes along the entirety of the two most popular Everest routes, which are used by 98% of climbers. This work is perilous—an avalanche killed 16 Sherpas in 2014—but makes the ascent easier for foreigners.

In addition, the bulk of Everest climbers today hire private firms to bring them up and down alive. In contrast, grizzled daredevils seek harder challenges on other mountains. A few peaks stand out for their difficulty, after adjusting for factors like their height; the season, year and number of guides for each expedition; and how many people have tried to ascend them. Climbers on popular routes benefit from greater infrastructure and know-how.

Take Nuptse, whose snow is especially loose and dangerous. Just 8% of its climbers have succeeded, less than half the 19% predicted by a model we built using the factors above. Its victims include Ueli Steck, a renowned alpinist who fell 1km to his death in 2017. Another siren is the Annapurna massif. For every ten people to reach its three highest summits, three have died trying. The latest perished just early last month. ■



登山

绝顶易见

登顶珠峰的成功率高于攀登喜马拉雅山脉的其他任何山峰

埃德蒙·希拉里（Edmund Hillary）和丹增·诺尔盖（Tenzing Norgay）在1953年踏上珠穆朗玛峰峰顶。在这之前，至少有145名登山者尝试登上这个地球最高点，但都未能成功。1924年，一支英国登山队登至距峰顶不到250米的地方，但在两名队员消失在前方后（未知是否已经登顶），全队掉头下山。

在那之后，攀登珠峰的难度几乎没有降低。1954年至1983年间，除向导之外，尝试登顶的人中只有9%成功，死亡率为2%。随着气候变化，冰雪消融，许多遇难者的遗体重见天日——其中就包括1924年失踪的两名登山者之一。

但自上世纪90年代以来，珠峰已不再遥不可及。1994年至2003年间，24%的登山者成功登顶，是之前十年的两倍。2004年至2013年间，这一比例再次翻番，达到51%。在过去三个完整的登山季中，66%的登山者成功登顶。2019年的首批登顶行动已于上月启动。

技术进步是登顶成功率上升的原因之一。氧气罐容纳的氧气量是以前的两倍，而且更不容易泄漏。高品质羽绒制成的登山服和手套及双层防寒登山靴更利于登山者保暖。更准确的天气预报最大程度减少了令人不快的意外。

然而，这些进步对攀登其他山峰也有同样的帮助，但其他高峰的登顶率上升幅度却小得多。据有效记录显示，自2016年以来，至少有40人攀登过的喜马拉雅山脉高峰有13座，其中珠峰的登顶率在1994年之前是倒数第四，而在过去三年里已升至最高。

造成这一变化趋势的因素可能有两个。首先，夏尔巴人在两条最受欢迎的珠峰路线上全面铺设了梯子和绳索，98%的登山者都选择走这两条路线。铺设工作非常危险——2014年的一次雪崩造成16名夏尔巴人丧生——但外国人的登山过程變得更容易了。

此外，如今大多数珠峰登山者都会雇用私人公司来保证他们安全地上下山。相比之下，追求冒险的登山老手会选择其他山峰挑战自我。在综合考虑高度、每次登山的季节、年份和向导人数，以及试图登顶的人数等因素之后，一些山峰的攀登难度看起来明显高出一筹。选择受欢迎登山路线的登山者能受益于更完善的基础设施和更丰富的经验技术。

以努子峰（Nuptse）为例，那里的雪特别松散，十分危险。只有8%的登山者成功登顶，不到我们基于上述因素构建模型预测出的19%登顶率的一半。在努子峰遇难的登山者包括著名登山家乌里·斯特克（Ueli Steck），他于2017年坠滑一千米丧生。另一个令人着迷的危险目标是安纳普尔纳峰群（Annapurna），尝试登顶它最高的三座山峰的人之中有三成人遇难，最近一次遇难事故就发生在上月初。 ■



Corporate spin-offs

Breaking up is hard to do

At least profitably

CORPORATE FASHIONS come and go, and this season's is industrial break-ups. In America and Europe, once-sprawling conglomerates are being carved up into focused companies that investors hope will fare better on their own. Those banking on quick returns have mostly been disappointed.

Conglomerates thrived in the 1970s, and made a comeback after the merger frenzy of the late 1990s. They are beloved of megalomaniac bosses keen to prove they can run empires peddling anything from train carriages to CT scanners (as Siemens currently does, albeit not, as it announced last month, for much longer). But the argument that diversity lets a firm's healthy arms prop up temporarily frail ones is, once again, losing ground in the rich world.

Private-equity funds have pots of money to buy unwanted divisions. Listing companies—or spinning them off to existing investors—is easier than it once was. Plenty of activist hedge funds are pressing firms to restructure, hoping to cash in when the sum of conglomerates' parts fetches more than the whole (studies show this can be true in the long run).

Gauging the impact of a break-up announcement is hard. Investors price in its likelihood before a company owns up to “exploring strategic options”. Splits often follow bad results that enfeeble the management, which may in turn mean worse news down the line.

Our chart, which takes the first detailed news reports of a spin-off as its starting-point, shows that of recent break-ups, only Honeywell, which filed

listing documents for its car-parts and home-security arms last August, has subsequently outperformed the broader market. United Technologies has kept pace with it. General Electric, Thyssenkrupp, DowDuPont and ABB have not. If their share prices fall any more, they will be ripe for a takeover. ■



企业分拆

分拆不易

至少很难通过分拆获利

企业界的潮流变来变去，这一季的趋势是工业企业分拆。在美国和欧洲，曾经庞大而无序拓展的企业集团正被分拆成业务更聚焦的公司。投资者希望拆分后的公司凭借它们自身会经营得更好。然而那些指望得到快速回报的人大多失望了。

企业集团在上世纪70年代蓬勃发展，到90年代后期合并狂潮掀起后又再次兴盛。自大狂老板们钟爱它们，他们极力想证明自己能运营销售从火车车厢到CT扫描仪等种种产品的企业帝国（西门子目前就是如此，不过上月它宣布不久将做出调整）。但是，认为多元化能让一家公司有活力的部门暂时支撑疲弱的部门的论调再一次在富裕世界中失势。

私募股权基金拥有大量资金，可以买下企业不想再要的部门。让公司上市——或将其分拆给现有投资者——要比以前更容易。许多维权对冲基金都在向企业施压，要求它们开展重组，希望分拆后各业务部门的利润总和会超过原来的企业集团，以此获得回报（研究表明从长远来看这种情况是可能的）。

要衡量分拆消息公布后的影响很难。在公司承认将“探索战略选择”之前，投资者就已经消化了这种可能性。做出分拆的决定往往是在出现让管理层失势的糟糕业绩之后，而这可能意味着还会有更糟的新闻爆出。

我们的图表以有关分拆的第一则详细新闻报道为起点，显示近期分拆的企业中，只有霍尼韦尔在分拆后跑赢了大盘。这家公司在去年8月为其汽车零部件和家居安防部门提交了上市文件。联合技术与大盘持平。通用电气、蒂森克虏伯、陶氏杜邦和ABB都弱于大盘。如果它们的股价继续下跌，就可以出手收购了。 ■



3D printing

Inside the body shop

Using 3D printers to make implants should improve orthopaedic surgery

A ROBOTIC LAWNMOWER keeping the grass neat and tidy outside a modern industrial building in Carrigtwohill, near Cork in Ireland, is a good indication that something whizzy may be going on inside. And so it proves. The airy production hall contains row after row of 3D printers, each the size of a large fridge-freezer. The machines are humming away as they steadily make orthopaedic implants, such as replacement hip and knee joints. Even though several hundred employees' cars are parked outside, the hall is almost deserted. Every so often a team appears, a bit like a Formula One pit crew, to unload a machine, service it and set it running again to make another batch of implants.

It is not unusual in modern, highly automated plants to find the workforce distributed like this, with most of them in the surrounding offices engaged in engineering tasks, logistics, sales and so on, rather than on the factory floor. But this two-year-old factory, owned by Stryker, an American medical-technology company, differs from conventional manufacturing in another way as well. It is an example of how 3D printing, which a decade ago was seen by manufacturers as suitable only for making one-off prototypes, is quickly entering the world of mass production. For commercial reasons, Stryker keeps some of the details secret. But the factory, the largest 3D-printing centre of its type in the world, works around the clock and is said to be capable of producing "hundreds of thousands" of implants a year.

Those made at Carrigtwohill have a feature that is impossible to create with conventional techniques such as casting and machining. Because 3D printing lays down an object layer by layer, complex shapes with intricate

internal structures can be built. Stryker uses this facility to print a special porous surface onto the implants. That surface encourages bone to grow into the implant, which secures it more firmly in place. When combined with the precision of robotic surgical processes the firm has developed, this makes replacements more successful, says Robert Cohen, the company's technology chief.

Replacing worn and damaged body joints with implants is an old idea. The first hip-replacement operation was performed in 1891, in Germany, by Themistocles Glück, using a ball and socket carved from ivory. And Phillip Wiles, a surgeon based in London, carried out the first successful total-hip replacement in 1938, screwing a stainless-steel joint into the patient's bone.

Since then, things have moved on. Cobalt and chromium alloys, along with titanium, are now more commonly employed for implants than steel is. And operating procedures and devices have improved greatly, including the use of hard-wearing ceramic surfaces as bearings. Nevertheless, complications still arise.

One of the commonest is dislocation—with, for instance, the hip ball coming out of the socket because soft tissue has not healed properly. A loosening of the implant over time is also a frequent problem, causing pain and a need for remedial surgery. That, though, should be helped by the implant's porous surface encouraging bone and implant to meld, making such loosening far rarer than it was.

The implants themselves are made by a type of 3D printing called direct-metal laser sintering. The printers are driven by software that takes thousands of digital slices through the design of the object to be manufactured. The process starts by spreading a bed of metal powder onto a special table. A laser then creates the first layer of the object, which can be as thin as a fiftieth of a millimetre, by melting particles of powder in the

correct pattern. When this molten metal has solidified the table is lowered and another layer of powder spread. That second layer is then processed. And so on. Once the object is finished it is removed, cleaned and any final machining carried out. Unused powder is recycled back through the printer.

Stryker is not alone in using 3D printing to make implants. Other companies, including DePuy Synthes, the orthopaedics business of Johnson & Johnson, a giant American health-care group, and LimaCorporate, an Italian firm, also print features intended to enhance bone growth on their implants. Generally, devices such as hip and knee implants can be made in such a wide range of sizes with 3D printing that customised shapes are not required. But some bespoke parts are printed, especially for reconstructive surgery in which patient-specific features are necessary. LimaCorporate, for example, is putting a 3D-printing facility directly into the Hospital for Special Surgery in New York, to produce complex, customised implants.

Doctors were among the first to use 3D printing, employing body scans to produce anatomical models of organs, which can help them plan operations. That and other medical use has grown rapidly. According to a recent report from Wohlers Associates, a consultancy, the medical and dental use of 3D printing was worth more than \$1bn in 2018, 11.5% of the entire market in 3D-printed goods and services.

Much of this work now involves large numbers. Align Technology, an American firm, prints 17m plastic orthodontic aligners, an increasingly popular alternative to orthodontic braces, every year. Millions of metal copings, used to make dental crowns and bridges, are being churned out by 3D printers owned by companies such as Renishaw, a British engineering firm.

Wohlers reckons it is only a matter of time before firms start printing ceramic material directly onto the copings, to make complete replacement

teeth. Researchers are also coming up with new ways to print tiny scaffolds onto which human cells are grown. These structures can be used for drug testing or, potentially, to grow complete organs for transplant (see next article). Making body bits with 3D printers is turning into a big business. ■



3D打印

走进“人体小铺”

用3D打印机制造植入手体可望提升矫形外科手术的效果

在爱尔兰科克郡（Cork）附近的小镇卡里格图厄尔（Carraigtwohill），一座现代化工业建筑外，一台自动割草机把草坪修剪得整齐利落，让人想到大楼内可能有某些高科技玄机。确实如此。宽敞的生产车间里摆放着一排排双门冰箱大小的3D打印机。这些机器嗡嗡作响，源源不断地制造出人工髋关节和膝关节等矫形外科植入手体。尽管大楼外停着数百名员工的汽车，车间内却几乎不见人影。偶尔会有一队人闪现——有点像一级方程式赛车的维修人员。他们关停某台机器，维修它，然后重新开动，继续制造另一批植入手体。

大多数员工在周围的办公室里忙于工程设计、物流、销售等，而非在工厂车间内从事生产，这样的劳动力配置方式在高度自动化的现代化工厂内并不罕见。但美国医疗科技公司史赛克（Stryker）旗下这座建成仅两年的工厂在另一方面也不同于传统制造厂。十年前，制造商普遍认为3D打印仅适用于制作一次性原型，而如今这家工厂则体现了3D打印正在迅速进入大规模生产领域。出于商业考虑，史赛克对部分细节保密。但这家全球同类工厂中最大的3D打印中心全天候运作，据说每年能生产“数十万”件植入手体。

在卡里格图厄尔制造的这些植入手体具有铸造和机械加工等传统工艺无法实现的特性。由于3D打印是逐层印制产品的，因此可以构建具有错综复杂内部结构的复杂形状。史赛克使用这种设备在植入手体上打印特殊的多孔表面。这种表面促使骨骼生长到植入手体当中，帮助植入手体固定在原位。该公司的技术总监罗伯特·科恩（Robert Cohen）表示，配合公司开发的精准机器人手术技术，关节置换会变得更成功。

用植入手体代替老化及受损的身体关节，此想法由来已久。1891年，外科医生第米斯托克利·格鲁克（Themistocles Glück）在德国进行了史上首次髋

关节置换手术，当时植入的是以象牙制成的球窝关节。伦敦的外科医生菲利普·怀尔斯（Phillip Wiles）则在1938年首次成功完成了全髋关节置换手术，将不锈钢关节拧在患者的骨头上。

自此，技术不断发展。相比钢材，现在更常用的植入体材料是钴铬合金和钛。而手术程序及设备也大有改进，包括使用耐磨陶瓷表面作轴承。然而还是会出现并发症。

最常见的问题之一是脱臼。例如，因软组织没有正常愈合，股骨球从股骨球窝中脱位。植入体逐渐松动引发痛楚也是常见问题，需进行修补手术。而通过使用带多孔表面的植入体，能促进骨骼和植入体的融合，松脱的情况将会大大减少。

此类植入体本身是使用名为“直接金属激光烧结”的3D打印技术制成的。打印机由软件驱动，软件把拟制造物体的设计图分解为数千层的数字切片图样。打印过程的第一步是在特制的工作台上平铺一层金属粉末。然后使用激光按照设计图样熔化对应的金属粉末，形成制品的第一层（可薄至五十分之一毫米）。该熔融金属层凝固后，工作台下降，然后铺上另一层金属粉末。再以同理印制第二层。如此类推。打印完成后，制成品会被移走、清洁并完成其他最后加工。未用到的金属粉末会被打印机回收。

史赛克并非唯一使用3D打印技术来制造植入体的公司。美国医疗保健巨头强生的矫形业务部门DePuy Synthes和意大利医疗器械公司LimaCorporate等公司也在打印可促进骨骼在植入体上生长的部件。通常，髋关节和膝关节等植入体可以通过3D打印制造出各种各样的尺寸，而不需要特别定制。但在另一些情况下则需要定制打印，特别是在重建手术中需要根据患者个人特征制造植入体。例如，LimaCorporate正在将一套3D打印设备直接放进纽约的特种外科医院（Hospital for Special Surgery）内，用于制造复杂的定制植入体。

医生是最先运用3D打印技术的群体之一，他们通过人体扫描生成器官的解剖模型，帮助他们规划手术。3D打印在这方面及其他医疗上的应用迅速增

长。根据咨询公司Wohlers Associates最近发布的一则报告，2018年3D打印的医疗和牙科使用价值超过十亿美元，占整个3D打印产品和服务市场的11.5%。

这一领域的很多应用数量庞大。美国的爱齐科技（Align Technology）每年打印1700万个塑料牙齿矫正器，这种替代牙套的产品正日渐受欢迎。英国工程公司雷尼绍（Renishaw）等公司的3D打印机正在生产出数百万件用于制造牙冠和牙桥的金属基底冠。

Wohlers Associates认为，把陶瓷材料直接打印到基底冠上制造整套假牙只是时间问题。研究人员还找到了新方法来打印用于培育人体细胞的微小支架。这些支架可用于药物测试，也可能用来培育用于移植的整个器官。使用3D打印机制造人体部件正在变成一门大生意。■



Goldman Sachs

Tarnished

A new era at Goldman Sachs starts in the shadow of a scandal

NO ONE IS more aware of the value of a brand than Goldman Sachs. The investment bank, founded in 1869, has advised the biggest and best American companies on the value of theirs for the past 150 years. It helped F. W. Woolworth, a pioneering department store, with its initial public offering in 1912. It took Ford and Disney public in the 1950s, helped Amazon buy Whole Foods in 2017 and took Uber public last month. Yet these are troubled times for its own brand, tarnished by association with a fraud-ridden Malaysian state-run fund, 1MDB, and hurt by the bank's failure to adapt after the global financial crisis.

These issues were echoed in its first-quarter results, released on April 15th. Revenues came in below expectations—13% lower than for the first quarter of 2018—largely as a result of lower trading revenues. The share price fell by more than 3% and the earnings call was peppered with analysts asking questions about 1MDB.

The first task for David Solomon, who took over as chief executive last October, is to clean up Goldman's reputation. In 2012 and 2013 it helped 1MDB raise \$6.5bn across three bond offerings, earning \$600m in fees—far above the norm for such work. American and Malaysian authorities have alleged that much of the money raised was stolen in a scheme masterminded by Jho Low, a Malaysian financier. He has denied wrongdoing (and vanished).

Last November America's Department of Justice (DoJ) announced that a former senior partner at Goldman, Tim Leissner, had pleaded guilty to

conspiracy to launder money and to violate foreign bribery laws. And they indicted Mr Low and another former Goldman banker, Roger Ng, who has also denied wrongdoing. Goldman claims that Mr Ng and Mr Leissner, who transferred embezzled funds into his personal bank account, kept the bank in the dark about their actions.

But criminal charges have been filed against the firm in Malaysia. Though Goldman is contesting the case, it is spooking shareholders, who worry about both onerous fines and what it implies about oversight at the bank. Since November its share price has underperformed an index of other bank stocks by 10.3 percentage points, suggesting that the scandal may have wiped as much as \$9.1bn off its value.

It is against these headwinds that Mr Solomon must convince Goldman's investors that it can reinvent itself. Its peers have already digested the fact that Wall Street's traditional model, in which banks advise on huge corporate deals and make bold trades on their own behalf, has become less profitable. According to Michael Spellacy of Accenture, a consultancy, 90% of the economic profit made in the capital-markets industry is now earned on the buy side—that is, by those who manage assets or investments—and just 10% from sell-side investment-banking activities. A decade ago that split was closer to 50-50.

Goldman's slowness in reacting to these structural changes has allowed its competitors to catch up. In 2010 its return on equity (ROE) was 11%, easily beating the 8% average for "bulge-bracket" American investment banks, a group including JPMorgan Chase and Morgan Stanley. But last year that group averaged an ROE of 11.2%, placing Goldman, at 12%, only slightly ahead of the middle of the pack. And investors are becoming concerned about the way it earns its returns. Volatile profits, like those from trading businesses, mergers and acquisitions, are less valuable than steady fee-based income, for example from wealth management.

In 2016 Mr Solomon's predecessor, Lloyd Blankfein, took the first steps towards a new strategy by launching a consumer bank, Marcus. In 2017 Goldman announced a target of increasing yearly revenues by \$5bn by 2020. But the focus on expanding consumer lending, which offers a relatively low return on investment, did not impress shareholders.

They have had a rough ride. Holding shares in the firm since 2010 would have earned investors just 13% (without adjusting for inflation), compared with an average of 71% for its bulge-bracket peers and 152% for the S&P 500. Goldman continues to trade at just 0.9 times its tangible book value, a measure of the money that might be returned to shareholders if it were liquidated. The average ratio of price to tangible book value for a bulge-bracket bank is 1.15.

As far as 1MDB is concerned, the big worry for shareholders is the size and scope of the penalties. A large fine is all but inevitable. It could be based on the \$600m Goldman earned from the bond issuance—or the \$2.7bn American authorities say was stolen from the proceeds. That will be multiplied by anything up to four, depending on the degree to which the firm is found culpable. That Goldman is co-operating with the DoJ will bring the multiplier down; if the DoJ decides the firm's oversight of compliance procedures was inadequate, it will be towards the higher end. Steven Chubak of Wolfe Research, an equity-research firm, thinks the total will be somewhere between \$1bn and \$4bn.

When it comes to the required shift in strategy, however, Goldman's efforts may soon start to bear fruit. Its expansion into consumer businesses is continuing apace. In 2018 it acquired Clarity Money, a personal-finance app. In March Tim Cook, Apple's chief executive, announced that it will launch a credit card with Goldman this summer. When Marcus launched it was as a consumer lender; since then it has added deposit-taking. Though it offers

market-leading interest rates, deposits are still a cheap source of funding. In 2012 just 8% of Goldman's funding came from deposits. Last year that share had risen to 19%. If it can keep replacing wholesale funding with deposits at the pace of the past five years, says Mr Chubak, it will have reduced funding costs by \$500m by 2022.

It is not only on the consumer side that Goldman is rolling out new technology. More than a quarter of its employees are now engineers, says Heather Kennedy Miner, its head of investor relations. The firm has deployed a new platform, called Marquee, for institutional investors. It will expand into corporate cash management in 2020, which will further increase low-cost deposits.

Goldman also seems to be planning an overdue restructuring of its fixed-income, currency and commodities (FICC) business. Revenues earned from FICC have fallen from \$13.6bn in 2010, accounting for more than a third of Goldman's revenues, to \$5.9bn now, or just a sixth. Last October Stephen Scherr, Goldman's newly appointed chief financial officer, announced a review of all its business lines, which will be published early next year. In January the *Wall Street Journal* reported that the commodities business would be scaled back. (Mr Scherr emphasises that Goldman has no plans to shrink its commodities business radically, as some of its competitors, including JPMorgan Chase and Morgan Stanley, did.) In March Mr Solomon announced plans to cut the number of staff in sales and trading by 5% this year.

Its new strategy will mean Goldman is competing on less familiar territory. Consumer deposits and corporate cash management are competitive markets long dominated by JPMorgan Chase and Bank of America. But they are also huge markets. Even a small slice could have a big impact on Goldman's profits, says Mr Scherr. Compared with the incumbents, Goldman is quick at developing and deploying technology; but unlike

digital startups, its innovations are backed by a \$925bn balance-sheet. America's financial-services industry has been slow to adapt to technological change. An old brand with a new direction might be well-placed to disrupt it. ■



高盛集团

黯然失色

在丑闻的阴影下，高盛开启了它的新时代

没人比高盛更清楚一个品牌的价值。这家成立于1869年的投资银行在过去150年里为美国最大、最优秀的公司提供了品牌价值方面的咨询。1912年，它帮助百货业先驱伍尔沃斯（F. W. Woolworth）完成了IPO。上世纪50年代它帮助福特和迪士尼上市，2017年辅助亚马逊收购了全食超市（Whole Foods），上月还推动优步上市。不过它自身的品牌目前却陷于困境。它与欺诈丑闻缠身的马来西亚国家基金一马发展公司（1MDB）有牵连，这令它的声名沾污。此外，这家银行在全球金融危机后未能适应新环境，也折损了它的品牌。

这些问题在4月15日发布的第一季度季报中得到了体现。收入低于预期，比2018年第一季度低13%，主因是交易收入下降；股价下跌逾3%；业绩电话会议上，分析师们纷纷提出有关“一马发展”的问题。

去年10月接任高盛首席执行官的苏德巍（David Solomon）的首个任务就是挽回高盛的声誉。2012年和2013年，高盛通过三次债券发行帮助一马公司融资65亿美元，收取了远高于市场水平的6亿美元债券发行费用。美国和马来西亚当局称筹集的大部分资金因马来西亚金融家刘特佐策划的诡计而遭窃取。刘特佐否认有不当行为（且不知去向）。

去年11月，美国司法部宣布高盛集团前高级合伙人蒂姆·莱斯纳（Tim Leissner）已认罪，承认参与洗钱并违反境外反贿赂法。司法部同时起诉刘特佐和另一位高盛前银行家黄宗华，黄也否认有不当行为。高盛称，莱斯纳将所侵吞资金转移到其私人银行账户，他和黄宗华二人始终把集团蒙在鼓里。

但马来西亚当局已对高盛提起了刑事指控。尽管高盛正就此案进行抗辩，但股东们仍感到恐慌，他们既担心高额罚款，也担心银行暴露出管理上的

疏忽。自去年11月以来，高盛股价的表现较其他银行股的某指数低了10.3个百分点，也就是说这桩丑闻可能让高盛市值蒸发了91亿美元。

面对这一阵又一阵的逆风，苏德巍必须让高盛的投资者相信公司能够重塑自我。它的同行们已经领悟了一个事实：华尔街的传统模式，即银行为大型企业交易提供咨询并代表企业进行大胆交易，已经不像从前那样有利可图了。咨询公司埃森哲的迈克尔·斯佩勒西（Michael Spellacy）称，现在资本市场行业中90%的经济利润由买方赚得，即那些管理资产或投资的机构，而作为卖方的投资银行业务只赚了10%。十年前，两者还几乎各占一半。

高盛对这些结构性变化反应迟缓，结果让竞争对手迎头赶上。2010年，高盛的股本回报率（ROE）为11%，轻松超过了包括摩根大通和摩根士丹利在内的美国大投行8%的平均水平。但去年美国大投行的平均ROE为11.2%，高盛为12%，仅略高于这一集团的中游水平。投资者也开始担心它的盈利模式。不稳定的利润（比如来自交易业务、并购的利润）不如稳定的收费收入（如财富管理）有价值。

2016年，苏德巍的前任劳尔德·贝兰克梵（Lloyd Blankfein）推出了零售银行Marcus，迈出了新战略的第一步。2017年，高盛宣布了到2020年实现年收入增长50亿美元的目标。但消费贷款的投资回报率相对较低，因此高盛对这块业务的关注并没有令股东们眼前一亮。

投资者经历了一段艰难的旅程。如果自2010年以来一直持有高盛的股票，他们的收益率仅为13%（未根据通货膨胀调整），相比之下，同期其他大投行的平均收益率为71%，标准普尔500指数为152%。高盛目前的市值仅为有形帐面价值的0.9倍。市值与有形帐面价值之比是衡量清算后可能返还给股东的资金的一个指标。平均来看，大投行的这一比值为1.15。

至于一马事件，股东们最担心的是处罚的力度和范围。巨额罚款几乎不可避免。处罚的依据可能是高盛从债券发行中赚得的6亿美元，也可能是美国当局所称的所筹集资金中被窃取的27亿美元。根据公司被判定的罪责轻

重，罚款最多可达涉案金额的四倍。高盛正与美国司法部合作，此举将减轻处罚力度；如果美国司法部认定高盛对合规程序监督不严，那就会加大处罚力度。股票研究公司Wolfe Research的史蒂文·楚巴克（Steven Chubak）认为罚款总额将在10亿至40亿美元之间。

不过，说到必要的战略转变，高盛的努力可能很快就会开始结出硕果。它在零售业务上的扩张仍在高速推进。2018年，它收购了个人理财应用Clarity Money。3月，苹果首席执行官库克宣布今年夏天将与高盛联合发行一款信用卡。Marcus成立之初是一家消费贷款机构，后来开始吸收存款。尽管它提供高于市场的利息，但吸收存款仍然是一个便宜的资金来源。2012年，高盛的资金仅有8%来自存款。去年这一比例上升到了19%。楚巴克表示，如果它能持续以过去五年的速度用存款取代批发融资，那么到2022年，它的融资成本将减少5亿美元。

高盛并不只在消费业务方面推出新技术。其投资者关系主管希瑟·肯尼迪·米诺（Heather Kennedy Miner）表示，目前高盛逾四分之一的员工是工程师。公司为机构投资者部署了一个名为Marquee的新平台。到2020年它将涉足企业现金管理领域，这将进一步增加低成本存款。

高盛似乎也在计划对其固定收益、外汇和大宗商品（统称FICC）业务开展迟来的重组。来自FICC的营收在2010年为136亿美元，占高盛营收的三分之一多，目前已降至59亿美元，仅占营收的六分之一。去年10月，高盛新任命的首席财务官斯蒂芬·谢尔（Stephen Scherr）宣布对所有业务部门进行评估，评估结果将于明年初公布。今年1月，《华尔街日报》报道称大宗商品业务将缩减。（谢尔强调，高盛没有计划像摩根大通和摩根士丹利等竞争对手那样大幅收缩大宗商品业务。）3月，苏德巍宣布了今年将在销售和贸易部门裁员5%的计划。

新策略意味着高盛将在一个不那么熟悉的领域参与竞争。消费者存款和企业现金管理是竞争性市场，长期由摩根大通和美国银行主导。但这两个市场规模巨大。谢尔认为，即便能分得一小杯羹也会给高盛的利润带来巨大的影响。与这些领域里的老手相比，高盛在技术开发和部署方面速度较

快；但与数字创业公司不同，它的创新受到规模达9250亿美元的资产负债表的支撑。美国的金融服务业在适应技术变革方面一直行动迟缓，而一个确立了新方向的老品牌可能会具有很好的优势来颠覆它。 ■



Free exchange

The plaza discord

As the trade war heats up, China looks to Japan's past for lessons

HISTORY IS NEVER far from China's mind in its trade dispute with America. A few months ago, when negotiations looked on track, staunch nationalists warned of echoes with the "unequal treaties" that foreign powers had forced upon China in the 19th century. In recent weeks the breakdown in talks has led state propagandists to draw comparisons with the Korean war of the 1950s, a bloody struggle between China and America. But the analogy that haunts Chinese economists does not involve China itself. They fear a replay of the Plaza accord of 1985, when Japan, under American pressure, tried to resolve trade tensions by pushing the yen higher. That calmed the tensions but, most Chinese economists think, at an intolerable price: stagnant Japanese growth for two-plus decades.

The parallels are imperfect. Dependent on America for security, Japan was constrained in its pushback. The Plaza accord also involved Britain, France and West Germany. Jeffrey Frankel of Harvard University has called it "a high-water mark of international policy co-ordination", which is not President Donald Trump's trademark. The substance was different, too. The five countries announced that they wanted the dollar to depreciate and intervened in currency markets to make it happen. Within a year the yen soared by nearly 50% against the dollar. By contrast, currencies are just one part of today's tussle between China and America. Over the past decade China worked to address complaints that the yuan was too low. So there are no calls for appreciation, only demands that China does not weaken it to help its exporters.

Looked at more generally, though, there are similarities. The Plaza accord

is best understood not as a one-off event but as a critical stage in a multi-year dispute, which ranged from agriculture to electronics. America accused Japan of stealing intellectual property and plotting to control future industries. Robert Lighthizer, America's lead negotiator against China today, earned his spurs in these earlier battles. In 1990 the two countries agreed to a "Structural Impediments Initiative", which bears a striking resemblance to the crux of the debate today. America wanted Japan then—and wants China now—to improve its competition laws, open more widely to foreign investors and weaken its giant conglomerates (keiretsu groups in Japan, state-owned firms in China).

The case against the Plaza accord is that it set Japan on a path to doom. To counter the effect of a strong yen, an obvious drag on exports, Japan slashed interest rates and unleashed fiscal stimulus. These moves brought about an economic rebound. But they also generated asset bubbles: stock and land prices tripled within five years. In 1990 these bubbles burst and the economy slumped, never to recover its former mojo. In nominal terms Japanese stocks are still 40% below their peak on the final trading day of 1989. The Plaza accord, in this view, did succeed in defusing tensions between Japan and America, but only because it neutered Japan as a challenger. This has percolated into official thinking in China. As Cui Tiankai, China's ambassador to America, said last year: "Give up the illusion that another Plaza accord could be imposed on China."

The sequence of Japan's woes does seem to make for a damning indictment. But a closer look at each step shows that nothing was preordained. One point, clear in retrospect, is that Japan overcompensated for the slowdown in exports. Within 18 months of the Plaza accord, it had cut benchmark interest rates from 5% to 2.5%. It also announced a big stimulus package—increasing spending and cutting taxes—in May 1987, though by then its recovery was already under way. It did not shift gears and raise rates again until 1989, when its asset bubbles were already a few years old.

As the International Monetary Fund has argued, there were at least two other factors that could have led to a different outcome. Excessive stimulus, by itself, did not guarantee that Japan would suffer an asset bubble. It was that much more dangerous when combined with financial deregulation, which led banks to lend more to property developers and homebuyers. And the bursting of the bubble did not guarantee that Japan would suffer a lost decade, let alone three. A sluggish response by regulators compounded the trouble. Rather than pushing banks to raise capital, they encouraged them to go on lending to zombie firms.

So the simplistic story—that the Plaza accord felled Japan—misses the mark. Rather, China should draw two lessons from Japan’s experience of trade tensions with America. First, it must get its domestic-policy response right. Japan feared that the deal with America would cause its growth to suffer; China fears the same about the absence of a deal. But the bigger dangers for Japan were over-stimulus and flawed regulation. China seems to grasp that. So far it has been cautious about pumping up growth. The real test will come if the trade war continues to escalate.

A second lesson is the danger of resisting America’s demands, just because it is America that is making them. Had Japan acted on some of America’s long-standing gripes, it might have fared better in the 1990s. Domestic competition would have been stronger. A bigger role for foreign investors might have prompted Japanese banks to tackle their festering problems. Similarly, it is China, not America, that would be the biggest beneficiary if it moves more quickly to open its economy to foreign firms.

China might also note a historical curiosity. The talks in 1985 were in New York’s Plaza Hotel, which was bought three years later by a property tycoon named Donald Trump. He paid nearly \$1bn in today’s money. At the time he said he had “knowingly made a deal which was not economic”, because the hotel was a masterpiece, not just a building. Sure enough, in 1992 the

Plaza Hotel entered bankruptcy. That Mr Trump ended up harming himself might be comforting for China. That he went ahead despite knowing the risks should be less so. ■



自由交流

广场纷争

随着贸易战升温，中国想从日本的过去吸取教训

与美国的贸易争端上演后，中国一刻也没有忘记过历史。几个月前谈判看似走上正轨之时，坚定的民族主义者呼吁警惕再出现19世纪外国列强强加给中国的那种“不平等条约”。最近几周谈判破裂，政府宣传人员又将当下的局面与上世纪50年代的朝鲜战争这场中美之间的殊死斗争相比较。但中国的经济学家们脑海中挥之不去的一个类比并不涉及中国本身：他们担心1985年的《广场协议》会再度上演。当时，在美国的压力下，日本试图通过推高日元来解决贸易争端。紧张的局势确实得以平息，但大多数中国经济学家认为日本为此付出了不可忍受的代价：经济增长停滞了20多年。

这一类比并非百分百准确。日本依赖美国保护其安全，对美国的反弹也因而受限。参与签署《广场协议》的还有英国、法国和西德。哈佛大学的杰弗里·弗兰克尔（Jeffrey Frankel）称它代表着“国际政策协作的最高水准”，而这可不是特朗普的特征。两次事件的主旨也不同。那时这五个国家宣称它们要的是美元贬值，并为实现这一目的干预了货币市场。一年之内，日元兑美元汇率飙升近50%。相比之下，货币只是今天中美之间争端的一部分。过去十年里，中国已经在努力应对有关人民币估值过低的抱怨。所以，没有人呼吁人民币升值，只要求中国不要为了帮助其出口商而压低人民币汇率。

然而，如果更笼统地看，两者确实有相似之处。对《广场协议》最恰当的理解是它并非一个一次性事件，而是一场持续多年纷争中的一个关键阶段。这场纷争涉及从农业到电子产品的众多行业。当时美国指责日本窃取知识产权以及密谋控制未来的产业。今天的中美贸易谈判美方首席代表罗伯特·莱特希泽（Robert Lighthizer）在当时的这场较量中收获了名望。1990年，日美两国同意签署《结构性障碍协议》，这与今天中美争端的症结惊人地相似。美国当时希望日本——现在则是希望中国——改善其竞争

法，向外国投资者扩大开放，并削弱其巨型企业集团（在日本是经连会，在中国是国有企业）的影响力。

反对《广场协议》的理由是它使日本走向了厄运。强势日元明显拖累了出口，而为抵消这一影响，日本大幅削减利率并实施财政刺激措施。这些举措带来了经济复苏，但也催生出了资产泡沫：股票和土地价格在五年内上涨了两倍。1990年泡沫破灭，日本经济一落千丈，之后再也没有恢复昔日的魔力。以名义价格计算，目前日本股票的价格仍比1989年最后一个交易日的峰值低40%。按照这种观点，《广场协议》的确成功地缓解了日美间的紧张关系，但只是因为它阉割了作为挑战者的日本。这种看法已渗透进中国的官方思维中。中国驻美大使崔天凯去年就曾说过：“我奉劝那些认为可以将另一个《广场协议》强加给中国……的人放弃幻想。”

日本的一系列悲惨遭遇似乎构成了证据确凿的控诉。但细究其中发生的每一步就会发现，没有什么是注定会发生的。回想起来，有一件事显而易见：面对出口放缓，日本补偿过度了。在《广场协议》签署后的18个月里，它将基准利率从5%下调至2.5%，到1987年5月又宣布了一项大规模刺激计划——增加支出和减税，尽管那时它已经开始复苏。直到1989年资产泡沫已存在几年之后，它才改弦更张，再度加息。

正如国际货币基金组织（IMF）所指出的那样，当时至少有两个其他因素有可能促成不同的结果。过度的刺激措施本身并不一定会令日本遭遇资产泡沫，而当它与放松金融管制（这导致银行向房地产开发商和购房者提供更多贷款）合力出击，危险就大大提高了。接下来，泡沫的破灭并不一定会让日本遭受“失去的十年”，更不用说“失去的三十年”。让惨淡的局面雪上加霜的是监管机构反应迟缓。它们没有敦促银行筹集资本，而是鼓励它们继续向僵尸企业提供贷款。

因此，“《广场协议》击垮了日本”这个过分简单化的讲述未能切中要害。中国倒是应当从日本应对与美国贸易争端的经历中吸取两点教训。首先，必须要让国内政策应对得当。日本当时担心与美国达成的协议会影响自身的经济增长，中国担心的则是未能与美国达成协议会令本国增长受损。但

日本当时面临的更大危险是过度刺激和监管缺陷。中国似乎领会了这一点。到目前为止，它对提振经济增长始终保持谨慎。如果贸易战持续升级，真正的考验就会到来。

第二个教训是不要仅仅因为是美方提出的要求就加以抵制，要小心这样做的危险。如果日本当时对美国长期存在的一些抱怨采取行动，它在上世纪90年代的光景可能会更好，国内竞争水平可能也会更高。如果当时让外国投资者发挥更大的作用，也许就可促使日本银行着手解决它们不断恶化的种种问题。同样，如果中国加快向外国企业开放其经济，那么最大的受益者将会是中国，而非美国。

中国可能还注意到了一则历史趣闻。1985年的谈判是在纽约的广场酒店举行的，三年后这家酒店被一位名叫唐纳德·特朗普的地产大亨买下，售价相当于今天的近10亿美元。当时他表示自己“有意做了一笔无利可图的买卖”，因为这家酒店是一个杰作，而不仅仅是一栋建筑。果不其然，1992年广场酒店破产了。特朗普到头来吃了个大亏，这可能会让中国感到些安慰。但他明知有风险还坚持行动的做派应该就不那么让人宽慰了。■



Technology deals

Acquired taste

Western firms increasingly admire—and covet—Chinese technology

IT IS A charge that American hawks love to level at China: that its companies, through fair means and foul, are after the crown jewels of American technology. Despite years of efforts to manufacture its own computer chips, the Asian giant still spends more on importing them than it does on crude oil. Politicians and companies in the West constantly grumble about Chinese rivals pilfering their intellectual property. So the idea that Chinese firms have some technology gems of their own to offer may seem fanciful.

In fact, Western technology firms increasingly fancy Chinese tech. In some cases, they are buying Chinese rivals outright—with the acquiescence of authorities in Beijing. Those working on such acquisitions date the phenomenon back to 2016. Most deals are small and involve niche industries: makers of the powertrains and sensors for electric vehicles, or agencies managing social-media influencers. But the trend has taken root, even as animosity between the United States and China has escalated. American officials have been treating technology bosses to classified briefings on the dangers of doing business in China.

Those who operate there see things differently. For the first time last year, in an annual poll by the EU Chamber of Commerce in China, a majority of foreign companies (61%) said that domestic firms were as innovative as European ones, or more so. This year four-fifths of them saw opportunities in Chinese sparkiness.

Three main motivations have historically driven Westerners to purchase

Chinese companies. They wanted to gain market share in China, bolster their local distribution networks and get their hands on makers of lower-tech goods. Today, acquiring a Chinese startup can help some foreign firms gain an edge. Takeover targets have their own research teams, patents, clients and, sometimes, lavish state subsidies. For Chinese founders, the interest has been a boon as domestic sources of fundraising have dried up.

In some cases the technology is hard to find elsewhere. In 2017 Faurecia, a French firm that is the world's leading supplier of vehicle interiors, acquired Jiangxi Coagent Electronics, which develops human-machine interfaces. A person with knowledge of the deal says that Faurecia had been looking worldwide for a year before coming to China and spotting Jiangxi Coagent. "Faurecia said, 'Wow,'" he says, and made the Chinese technology the core of its offer.

The enthusiasm extends to artificial intelligence (AI), medical technology, cloud computing and, yes, even chips. Jim McGregor of Tirias Research, an American technology consultancy, discerns "tremendous interest on both sides of the ocean" in semiconductor and software acquisitions. Among the most prominent recently was one last July of DeePhi Tech, a machine-learning startup in Beijing, by Xilinx, an American chipmaker, for an undisclosed amount. DeePhi, which had developed software for Xilinx's chips, was a young business at the time, but had raised close to \$300m within 19 months of its founding. When Xilinx announced the deal, it described DeePhi's capabilities as "industry-leading".

All told, American technology companies have invested \$1bn in Chinese ones since the start of last year, according to Dealogic, a data provider. Chinese tech firms poured nearly four times as much, \$3.8bn, into those in America. But high-profile investments signal the mood. In 2016 Apple put \$1bn into Didi Chuxing, a ride-hailing giant, and Microsoft took a stake in Laiye, an "AI butler" that handles voice commands through an app. Intel

has taken stakes in several startups, including, in 2018, a cloud-services provider and, this year, a firm that builds software for cashierless stores.

In 2018 Alphabet, Google's parent company, paid \$550m for a stake of less than 1% in JD.com, an e-commerce giant. Nvidia, an American maker of AI chips, has invested in WeRide.ai, a Chinese leader in self-driving tech, and TuSimple, an autonomous-lorry startup. Last year Intuitive Surgical, the world's largest surgical robotics company, took a stake in Broncus, a Chinese startup—chiefly, says Nisa Leung of Qiming Venture Partners, an investor in Broncus, for technology to help perform advanced lung surgery. Last month Reuters reported that Facebook was considering minority stakes in Chinese firms.

China has blocked only one foreign acquisition in the past decade—Coca-Cola's \$2.4bn bid for Huiyuan Juice, a drinks giant, in 2009. Last year the “negative list” of areas where investments are restricted shrank from 63 to 48 industries. Chinese regulators surprised many by not reviewing the purchase of DeePhi, despite how strategic its technology could prove—or how easy it is to classify as defence-related and thus untouchable. Without trade tensions and the technological cold war, deals would multiply. That they now might not will delight America's spooks. Its companies, less so. ■



技术交易

慢慢喜欢你

西方公司越来越欣赏且觊觎中国的技术

美国鹰派喜欢向中国提出这么一项指控：中国公司不择手段，想要摘走美国科技皇冠上的宝石。尽管多年来中国一直在努力制造自己的电脑芯片，但这个亚洲巨人在芯片进口上的支出仍高于原油进口。西方的政客和企业不断抱怨中国的竞争对手窃取他们的知识产权。所以，认为中国企业可以提供自己的技术瑰宝的想法或许显得异想天开。

但实际上，西方科技公司对中国的技术越来越感兴趣。有些时候它们还在中国政府的默许下直接收购中国竞争对手。从事此类收购的人士称这种现象可以追溯到2016年。大多数交易的规模较小，涉及行业也比较小众，比如电动汽车传动系统和传感器的制造商，或是管理网红的经纪公司。就在中美两国之间的敌意不断升级之时，这一趋势开始生根发芽。美国官员一直在向科技公司的老板们提供机密简报，告诉他们在中国做生意有何危险。

在中国实际经营生意的人对此有不同的看法。在中国欧盟商会去年进行的一项年度调查中，第一次有多数外国公司（61%）认为中国公司的创新能力与欧洲公司相当，甚至更强。今年有五分之四的外国公司从中国的活力中看到了机遇。

一直以来，西方人收购中国公司主要有三大动机。他们希望扩大在中国的市场份额，增强在当地的分销网络，以及把低技术含量产品的制造商收归旗下。如今，收购一家中国创业公司可以帮助一些外国公司获得优势。收购目标拥有自己的研究团队、专利和客户，有时还享受着慷慨的政府补贴。对于中国公司的创始人来说，随着国内融资渠道的枯竭，外国公司的兴趣已成为一种福音。

而有些时候，某种技术也很难在别处找到。2017年，全球领先的汽车内饰

供应商法国佛吉亚（Faurecia）收购了开发人机界面的江西好帮手电子科技公司。一位知情人士表示，在来到中国发现江西好帮手之前，佛吉亚已经在全世界寻觅了一年。他说，“佛吉亚惊呼——‘哇！’然后把这项中国技术用作了自己的核心产品。

这种热情扩展到了人工智能、医疗技术、云计算，甚至芯片上。美国科技咨询公司Tirias Research的吉姆·麦格雷戈（Jim McGregor）发现，对于半导体和软件方面的收购，“太平洋两岸都兴致勃勃”。近年最引人注目的例子之一是去年7月美国芯片制造商赛灵思（Xilinx）收购了北京的机器学习创业公司深鉴科技，收购金额不详。曾为赛灵思芯片开发软件的深鉴科技当时还是一家年轻的公司，但在创立后的19个月内就融资近3亿美元。赛灵思在宣布这一交易时称，深鉴的能力为“业内领先”。

据数据供应商Dealogic统计，自去年年初以来，美国科技公司向中国公司投资了总计10亿美元。而中国科技公司对美国公司的投资是这个数字的近四倍，达38亿美元。但那些著名企业的投资传达出了热情的情绪。2016年，苹果向网约车巨头滴滴出行投入10亿美元，微软则入股来也——一个通过应用处理语音指令的“AI管家”。英特尔已经收购了几家创业公司的股份，包括在2018年入股一家云服务提供商，以及在今年入股一家为无人收银商店开发软件的公司。

2018年，谷歌的母公司Alphabet斥资5.5亿美元收购了电商巨头京东不到1%的股份。美国AI芯片制造商英伟达投资了中国无人驾驶技术的领军企业文远知行和无人驾驶卡车创业公司图森未来。去年，全球最大的手术机器人公司Intuitive Surgical收购了中国创业公司Broncus的部分股权。Broncus的投资方之一启明创投的梁颖宇表示，这主要是因为该公司的技术能为精密的肺部手术提供支持。上月路透社报道称，Facebook正在考虑持有一些中国公司的少数股权。

过去十年中国仅阻止了一起外资并购——2009年可口可乐拟以24亿美元收购饮料巨头汇源果汁。去年，限制外来投资的“负面清单”从63个行业缩减到48个。令许多人感到意外的是，中国监管机构没有审查收购深鉴科技的

交易，尽管该公司的技术也许具有战略意义，或者很容易被归为国防相关而碰不得。如果没有发生贸易冲突和技术冷战，交易应该会成倍增加。现在看来可能不会如此，这让美方情报人员很满意，但美国公司可就没那么高兴了。 ■



Global markets

Late in the day

The joys and pains of investing in a mature business cycle

IN 14TH-CENTURY Germany a heretical cult grew up around the figure of Frederick II, a dead emperor. Its adherents believed that the apocalypse was close at hand. “In all countries a hard time sets in,” is how a prophecy from the period begins. “Rapine and arson go hand in hand,” it continues. “Everyone is at everyone else’s throat. Everyone harms everyone else in his person and his belongings. There is nobody but has cause to lament.”

This is not the sort of language used in investment-bank research notes and hedge-fund letters, or by pundits on CNBC and Bloomberg News, however troubled the outlook might seem for financial markets. Yet there is a parallel between today’s market chatter and the prophecies of medieval cults. The millenarians believed they were living in the end times or “last days”; and so, in a way, do today’s investors. Much of the talk is of “late-cycle” market conditions—the kind that prevail after a long expansion, when economic slack is largely used up and assets are richly priced.

The late-cycle mindset is a battleground for two impulses. On the one hand, it recognises that these are the good times. The economy is strong, jobs are plentiful, and factories and offices are humming with activity. Animal spirits are higher than they were in the earlier stages of the business cycle. So there is money to be made. And who knows? Perhaps the good times might last a little longer than usual. On the other hand, if it is late in the cycle a recession cannot be far off. Jitters about anything that might bring that day forward—rising interest rates; a prolonged trade war—are understandable.

These warring impulses set the pattern for late-cycle markets. The general tendency is for prices of risky assets (stocks, corporate bonds and so on) to go up—perhaps by a lot. But recurring fears of recession mean this rising trend will be punctuated by sometimes-violent sell-offs.

To understand this push-and-pull dynamic, go back to last year. By September a wave of optimism about the strength of America's economy, buoyed by tax cuts, had taken the S&P 500 index of leading stocks to a fresh peak. Then a host of growth risks suddenly loomed. China's economy was losing momentum. The Federal Reserve was bent on tighter monetary policy. By Christmas Eve the S&P index had fallen by 19.7% from its peak. Credit spreads—the extra yield investors demand as a buffer against default—blew out. Then, just as suddenly, the markets recovered. A succession of policy changes, including tax cuts, convinced investors that China would not let its economy go down. The Federal Reserve changed tack, taking interest-rate increases off the table, at least for this year. The good times were back again.

Yet a feature of late-cycle markets is that recession scares recur. Another is brewing. This one has its origins in the growing breach between America and China over trade. Earlier last month America stepped up its tariffs on Chinese imports. It has now opened a new front in the dispute by requiring American firms wishing to supply Huawei, China's technology champion, to seek licences. Markets are choppier, though more in Asia than America. Investors seem fairly calm. But few yet want to bet against a quick resolution.

This latest leg of the trade dispute started with a tweet from President Donald Trump. It might also be ended by one. So why sell now? But the longer it goes on, the more harm it will do to business confidence in America, China and elsewhere. If a deal is not struck at or before the G20 Summit in Japan on June 28th and 29th, another sell-off seems likely.

The foreign-exchange market may be the place to watch for trouble. The yuan is still a long way from being widely used outside China. But it increasingly reflects, and to some degree sets, the tone for global currency markets. Other major currencies, including the euro, have tended to track its movements up and down against the dollar. A stronger yuan has thus often implied that the dollar is weaker against a range of currencies. At the start of the year the yuan rose against the dollar in line with better news on China's economy. But it has fallen again (see chart) and is now close to the seven-yuan mark, widely seen as a meaningful threshold, not least within China.

That has fuelled speculation that China might use its currency as a weapon in the trade war. Were the yuan to go through seven to the dollar, from this perspective, the gloves would be off. A weaker yuan would mean a stronger dollar—certainly in Asia and probably across the board. Not only would that squeeze American exports, it would also spark a broad sell-off in stocks and in credit. For the dollar is also a thermostat for global risk appetite: it rises with a weak dollar and falls with a strong one. Yet China has so far been “very responsible” in its handling of the yuan, says Steven Englander of Standard Chartered, a bank. Were the yuan to break the seven mark, he reckons, it would be in response to a wave of risk aversion hitting Asia; China would not be the initiator.

If trade peace breaks out, a fresh growth scare will emerge sooner or later. As Willem Buiter of Citigroup notes, each of the world's three biggest economies has a financial frailty: corporate leverage in America, a debt mountain in China and rickety banks in Europe. Even so, he argues in a recent note, it might still take a severe shock to kick off a global recession. If the economy keeps surviving—and it may take a fresh dose of stimulus from China or the Fed to lift spirits—the conviction that the cycle can keep going may take hold. Market “capitulation” usually means a sudden loss of unwarranted optimism. But in the present circumstances capitulation is

“melt-up, not meltdown”, says Eric Lonergan of M&G, a fund-management group.

For now it is hard to see past the trade skirmish and the G20 summit. Today’s late-cyclists might envy the faith of the medieval millenarians. They were hedged. The apocalypse would mark the start of their longed-for salvation. But if it were to be delayed a little, it would be no great loss. ■



全球市场

为时已晚

在商业周期的成熟期投资的苦与乐

在14世纪的德国，围绕死去的皇帝弗雷德里克二世发展出了一个异教徒的邪教组织。其信徒相信世界末日已近在咫尺。“诸国皆入困厄之境。”这个时期的一则预言的开篇这样写道。“烧杀掠夺并起，”预言接着说，“百姓互扼其喉，伤人亦伤财。众生多悲怆。”

不管金融市场的前景有多么糟糕，投资银行的研究报告、对冲基金的致投资者信，或者CNBC和彭博新闻上的专家也不会使用这样的措辞。但是，如今的市场舆论与中世纪邪教的预言之间存在着相似之处。千禧年信徒认为他们生活在终结时代或“世界末日”，而在某种程度上，现在的投资者也有同感。市场舆论大谈“后周期”市场行情——长期经济扩张之后普遍出现的那种状况，此时经济中的闲置产能基本用尽，资产价格高涨。

后周期心态是两种冲动情绪拉锯的战场。一方面，这种心态认可现在是好时候。经济强劲，就业机会多，工厂和写字楼都忙个不停。动物精神比商业周期的早期阶段更高涨，所以有钱可赚。而且说不定好光景能比以往持续得更久一点，谁知道呢？另一方面，如果已经进入周期的后期，那离经济衰退就不会太远了，自然会让人对利率上升、贸易战持续等任何可能提前引发衰退的事件感到紧张。

这两种彼此交战的冲动情绪为后周期市场设定了模式。总体趋势是风险资产（股票、公司债券等）价格上涨——而且可能还上涨很多。但对衰退的忧虑反复浮现，意味着这种上升趋势有时会被猛烈的抛售打断。

为理解这种拉锯的动态，我们来回顾一下去年的情况。去年9月，在减税的推动下，对美国经济实力的一波乐观情绪把覆盖龙头企业股票的标准普尔500指数推向了新高。后来一系列增长风险突然逼近：中国经济开始失去动力，美联储一心想收紧货币政策。到平安夜那天，标普指数已经从峰

值下跌了19.7%。信用利差——投资者为补偿违约风险而需要获得的额外收益——迅速扩大。然后同样在突然之间，市场恢复前态。包括减税在内的一系列政策变化让投资者相信中国不会放任其经济衰退。美联储也改变了策略，至少今年不会加息。好光景又回来了。

然而，后周期市场的一个特征是衰退恐慌会反复出现。另一次恐慌正在酝酿。这一次是由于中美在贸易方面嫌隙日增。上月早些时候，美国提高了对中国进口产品的关税，眼下又在贸易之争中拉开了新阵线，要求想要给中国科技领军企业华为供货的美国公司申请许可证。市场更为震荡，但亚洲市场比美国市场更甚。投资者看起来还算平静。但基本没有人认为贸易争端能迅速化解。

最近这一阶段的贸易争端始于特朗普的一篇推文，也可能以他的另一篇推文结束。那为什么还要着急抛售？但是，贸易战持续越久，就越有损美国、中国和其他地区的商业信心。如果在6月28日和29日举行的日本G20峰会期间或之前不能达成协议，很可能就会出现另一波抛售。

外汇市场可能是需要警惕出现麻烦的领域。人民币在中国境外还远未得到广泛使用。但它越来越能反映全球货币市场的基调，并在某种程度上为其确定基调。包括欧元在内的其他主要货币都会跟踪人民币对美元的波动。因此，人民币升值通常意味着美元对一系列货币疲软。年初，中国经济的好消息传出，人民币兑美元汇率上涨。但后来再次下跌（见图表），现在已临近7元关口，这个关口被广泛认为意义重大，尤其是在中国国内。

这引发人们猜测中国可能会把货币用作贸易战的武器。从这个角度看，如果人民币兑美元“破7”，那就是要动真格的了。人民币贬值意味着美元升值，在亚洲肯定如此，甚至在全球也是一样。这不仅会挤压美国的出口，还会引发股票和信贷的广泛抛售。因为美元同时也是全球风险偏好的调温器：风险偏好会随着美元疲软而上升，随美元走强而下降。然而，迄今为止，中国在处理人民币汇率时“非常负责任”，渣打银行的史蒂文·英格兰德（Steven Englander）表示。他认为如果人民币突破7的关卡，那也是

对亚洲避险情绪的回应；中国并不会主动推动这一趋势。

如果贸易战突然转和，那迟早也会出现新的增长恐慌。正如花旗集团的威廉·布伊特（Willem Buiter）指出的那样，世界三大经济体中的每一个都存在金融软肋：美国的企业杠杆过高，中国负债沉重，欧洲的银行摇摇欲坠。布伊特近期又指出，即便如此，可能还得经过一轮严重冲击，全球经济才会衰退。如果经济继续勉强维持现状——可能还需要中国或美联储采取新的刺激措施来提振市场——认为这一轮周期可以继续延续的信念可能会大行其道。市场“投降式抛售”通常意味着毫无根据的乐观情绪突然消失。但在目前的情况下，投降式抛售是“融涨，而不是崩盘”，基金管理集团M&G的埃里克·洛纳根（Eric Lonergan）说。

目前很难预测在贸易冲突和G20峰会结束之后会是什么情形。今天相信自己处于后周期的人们可能会羡慕中世纪的千禧年主义者对世界末日的信念。他们是有后路的。世界末日标志着他们渴望得到的救赎即将来临。不过，如果世界末日晚来一点，也没有太大的损失。■



Presidential approval

Tinted glasses

The true state of the economy is nearly irrelevant to voters

JAMES CARVILLE, who worked for Bill Clinton's presidential campaign, hung a sign in his Arkansas headquarters in 1992. Designed to keep the candidate on-message, it read: "Change vs. more of the same. The economy, stupid. Don't forget health care." The second injunction has become famous. It is common knowledge that a strong economy helps an incumbent, whereas a weak one is a liability. But this is less true than it used to be.

Between 1952 and 2009, when Barack Obama became president, the popularity of America's leaders was quite strongly influenced by the economy. Excluding the first six months of every president's term (a honeymoon period when ratings tend to be high) a quarter of the variation in monthly presidential approval ratings could be explained by variation in the index of consumer sentiment. Ronald Reagan had an approval rating of 42% when Americans were suffering under high inflation in the summer of 1982. By the time the economy rebounded four years later, his rating had increased by 25 percentage points.

Under Barack Obama the relationship broke down. After the highs of the first few months, his approval rating moved between 40% and the low 50s. Americans felt much the same about him in good times and in bad. President Donald Trump also seems stuck in the polls, despite a booming economy. If the normal relationship between consumer confidence and popularity held, about 60% of Americans would approve of him. The latest Gallup poll suggests that only 42% do.

One explanation is that partisanship now colours Americans' reading of

the economy, as it colours their views on many other things. Polling on behalf of *The Economist* by YouGov shows that Republicans are four times as optimistic as Democrats about the state of the stockmarket, which Mr Trump often cheers on. Liberals complain about high housing costs and low wage growth—never mind that wages are growing more strongly now than towards the end of Mr Obama's term.

Mr Trump's election in 2016 was followed by a rapid switch in attitudes. From the six months before the election to the six months after, YouGov measured a 45 percentage-point increase in the share of Republican-aligned Americans who believed the economy was getting better. Democrats became sharply more pessimistic. So it's not any longer the economy, stupid. It's the partisanship. ■



总统支持率

有色眼镜

选民态度几乎与实际经济状况无关

詹姆斯·卡尔维尔（James Carville）1992年协助克林顿竞选总统时，在阿肯色州的竞选总部挂上了一块牌子，提醒这位候选人不要偏离竞选政纲。牌子上写着：“变革vs.一成不变。经济啊，笨蛋。别忘了医疗。”其中第二句已经成了名言。人人都知道经济强劲对在任者有利，经济疲软就是一种麻烦。不过，现在它没有这么确凿了。

从1952年到奥巴马当选总统的2009年，美国领导人的支持率一直深受经济表现的影响。把历任总统任期的前六个月（这段蜜月期内支持率往往较高）排除在外，总统每月支持率波动的四分之一可通过消费者信心指数的变化来解释。1982年夏季美国遭遇高通胀时，里根的支持率为42%。四年后经济反弹，他的支持率上升了25个百分点。

在奥巴马的任期内，这种关联断裂了。在上任头几个月保持高点后，他的支持率一直徘徊在40%和略超过50%之间。无论经济好坏，美国人对奥巴马的满意度大致不变。尽管当前美国经济繁荣，但特朗普的民调支持率似乎也停滞不前。如果消费者信心和总统满意度保持以往的关联，那么应该有60%左右的美国人支持他。而最新的盖洛普民意调查显示只有42%。

一种解释是，现在美国人对经济状况的解读如同他们对许多其他问题的看法一样，受到党派偏见的影响。本刊委托民调机构YouGov开展的民意调查显示，对于特朗普常常为之打气的股市，美国共和党人的乐观程度是民主党人的四倍。民主党人抱怨现在住房成本高，工资增长慢——尽管目前工资增长实际上比奥巴马任期的末段更加强劲。

特朗普2016年当选后，人们的态度急速转变。根据YouGov的调查结果，从他当选之前的六个月到之后的六个月，共和党支持者中认为经济正在好转的人占比上升了45个百分点。民主党人则变得大为悲观。所以，问题不

再是经济，笨蛋。是党派偏见。 ■



Bartleby

Picking up the Bill

A man who showed that the best managers need to be coaches

AS YOGI BERRA, a legendary Yankees baseball player, coach and master of malapropisms, once said, “baseball is 90% mental and the other half is physical.” Managers might need a better grasp of maths than Berra. But they require a similar focus on instilling the right mentality, not just in themselves but in their team.

That view is held particularly strongly by three Google executives—Eric Schmidt (a former director of *The Economist*), Jonathan Rosenberg and Alan Eagle—who have written a book in praise of their mentor, Bill Campbell. His influence on Silicon Valley was so profound that they have called the book “Trillion Dollar Coach”.

Most outsiders will not have heard of Campbell, who began his career as a college coach of American football. Later, he worked at Apple, heading the marketing campaign for the original Macintosh, and then became chief executive at Intuit, a financial-software company. But his most effective role, until his death in 2016, was in the background, as a board member at Apple (and close friend of Steve Jobs) and as a coach to companies backed by Kleiner Perkins, a venture-capital firm.

Google was one of Kleiner’s investments and when Mr Schmidt was appointed chief executive of the company in 2001, Kleiner’s John Doerr suggested that he recruit Campbell as his coach. Although Mr Schmidt was initially reluctant to accept the need for coaching, he learned to value Campbell’s advice. In 2004 Campbell helped to persuade the Google boss not to quit when his roles as chairman and chief executive were split.

Campbell acted as an unpaid mentor at Google until his death in 2016. He also coached executives at eBay, Facebook and Twitter, among others. In 2000 he advised the Amazon board not to replace Jeff Bezos as chief executive of the e-commerce company.

As a coach, Campbell's role was not to be in charge of particular projects, or to make strategic decisions, but to make other people work better. Although he advised individuals, his focus was on ensuring that teams were able to co-operate properly. His motto was that "your title makes you a manager, your people make you a leader."

While he was happy to dish out praise in group meetings, and was a generous man in his spare time, he was not a soft touch. He simply believed in giving harsh feedback in private, and was usually adept enough to make the recipient grateful for the telling-off.

When he talked to people, he gave them his undivided attention; the discussions were never interrupted and he never checked his smartphone. But coaching had to be a two-way process. Some people were temperamentally incapable of responding properly. To be coachable, Campbell believed, managers need to be honest, humble and willing to learn.

A sign of his unique personality is that he has not been replaced since he died. Instead Google is attempting to incorporate his principles into the way the company is run. All managers should, in part, be coaches. The idea seems to be gaining popularity. In their book, "It's the Manager", Jim Clifton and Jim Harter of Gallup, a polling organisation, include a whole section called "Boss to Coach".

This is linked to the importance of employee engagement. Gallup cites research showing that when managers involve employees in setting their

own work goals, the latter are four times more likely to report feeling engaged. Managers are responsible for 70% of the variance in how engaged employees were.

The primary job of any manager is to help people be more effective in their job. One benefit should be that workers will stay with the company; the main reason they change jobs, according to what they tell Gallup, is for “career growth opportunities”. Workers should get regular feedback from their managers—daily if possible, surveys show. An annual performance review is of little use.

But this approach will only work if it comes from the top down. Middle managers tend to emulate their superiors and to respond to incentives; they will coach underlings if this behaviour is reinforced and rewarded.

Of course, even the best coaches and managers have to give their employees scope to find their own way, and make their own mistakes. As Yogi Berra put it, “I’m not going to buy my kids an encyclopedia. Let them walk to school like I did.” ■



巴托比

重温教练情

他向世人表明，最优秀的管理者也应该是“教练”

扬基棒球队的传奇球员、教练、字词误用大师尤吉·贝拉（Yogi Berra）曾说：“棒球90%在于心理，剩下一半在于身体。”企业主管们可能需要把数学学得比贝拉好些。但他们一样需要着重培养良好的心态，不管是他们自己的，还是他们所带领的团队的。

谷歌的三位高管尤其信奉这种观点。他们是曾任《经济学人》董事的埃里克·施密特（Eric Schmidt），以及乔纳森·罗森伯格（Jonathan Rosenberg）和艾伦·伊格尔（Alan Eagle）。他们合著了一本书来表达对他们的导师比尔·坎贝尔（Bill Campbell）的赞誉之情。坎贝尔对硅谷的影响是如此巨大，他们因而将这本书命名为《万亿美元教练》（Trillion Dollar Coach）。

圈外人大多没听说过坎贝尔。坎贝尔的第一份工作是在大学里担任橄榄球教练。后来他去了苹果公司工作，负责第一代Macintosh电脑的营销，之后又担任财务软件公司Intuit的CEO。但直到2016年去世之前，他最富成效的工作还都是在幕后——他是苹果的董事（也是乔布斯的密友），还是风险投资公司凯鹏华盈（Kleiner Perkins）投资的多家公司的“教练”。

谷歌是凯鹏华盈投资的公司之一。2001年，施密特被任命为谷歌CEO时，凯鹏华盈的约翰·杜尔（John Doerr）建议他聘请坎贝尔担任指导。尽管施密特最初并不认为自己需要指导，但他逐步认识到要重视坎贝尔的建议。2004年，施密特因不能再同时担任谷歌董事长和CEO而想要辞职，后来在坎贝尔的说服下改变了主意。

坎贝尔在谷歌扮演义务导师的角色，直到2016年去世。他还指导过eBay、Facebook和推特等公司的高管。2000年，他曾建议亚马逊的董事会不要另寻他人来取代贝佐斯担任这家电子商务公司的CEO。

作为一名指导，坎贝尔的任务不是负责特定项目，也不是做战略决策，而是让其他人做得更好。尽管他是向个人提供建议，但关注的重点却是确保团队能够通力合作。他的座右铭是：“头衔让你成为管理者，而员工才让你成为领导者。”

虽然他在团体会议上不吝表扬，在工作之外也宽宏大度，但他可不是软柿子。他只是主张“私底下训人”，而且精于此道，也因此总能赢得被训之人的感激。

与人交谈时，他总是全神贯注：讨论时从不打断对方，也从不会看手机。但指导必须是双向的。有些人因性格使然，不会恰当做出回应。坎贝尔认为，要真正接受指导，管理者得是诚实、谦逊并乐于学习的。

自他去世后，还没有人取而代之——他的独特个性由此也可见一斑。而谷歌正在尝试将他的理念纳入公司的运营方式。所有的管理者在某种程度上都应该是指导。这种观念似乎正在流行开来。民意调查机构盖洛普的吉姆·克利夫顿（Jim Clifton）和吉姆·哈特（Jim Harter）合著的《所谓管理者》（It's the Manager）一书中就有一章叫《从老板到指导》（Boss to Coach）。

这种观念与“员工敬业度”的重要性相关联。盖洛普援引的一项研究显示，当管理者让员工参与制订自己的工作目标时，员工表示对工作有参与感的可能性上升到了之前的四倍。员工在参与度上的差异有70%是源于管理者。

每位管理者的首要职责都是帮助员工提升工作成效。这应该会带来的好处之一是员工会留在公司——员工们对盖洛普表示他们跳槽的主因是寻求“职业发展机会”。调查显示，员工应定期获得主管的反馈意见——如有可能，最好每天都有。年度绩效评估无甚用处。

但这种方法只有自上而下实施才能奏效。中层管理者往往会效仿上级并响应激励；如果这种做法得到强化并有所回报，他们就会以此来指导下属。

当然，即便是最好的指导和管理者也必须给予员工探索和犯错的空间。正如尤吉·贝拉所说：“我不会给孩子买百科全书。我会让他们像我小时候那样走路去学校。”■



Free exchange

The bonds that tie

China cannot easily weaponise its holdings of American government debt

AN OLD SAYING: if you owe the bank \$100 it's your problem; if you owe \$100m it's the bank's. The adage is silent on debts like America's to China, of more than \$1.1trn. The IOU looks like a source of leverage for China's leadership—a reason for President Donald Trump to be cautious in waging trade war, lest his counterpart, Xi Jinping, command the People's Bank of China (PBOC) to dump its Treasury bonds and plunge America into a fiscal crisis. An editorial on May 29th in the *People's Daily*, a Communist Party mouthpiece, suggested that China might restrict exports to America of rare earths, which are used in smartphones, electric vehicles and much more. Seen against fresh threats, the \$20bn-worth of long-term bonds China sold in March might seem a shot across the bow. Yet China's bond pile is more blunderbuss than laser-guided missile. It is as likely to miss or blow up as to strike its target.

China's bond-buying began innocently enough. Its leaders, eager to follow the time-tested path to export-led development, favoured an undervalued currency. In the early 2000s, as rapid growth in output and exports put upward pressure on the exchange rate, the PBOC sold yuan and bought dollars, most of which it parked in American Treasuries. Cheap funding looked like a boon to America, at the time awash in red ink because of tax cuts and foreign wars. But as so often with China, something too small to notice quickly became too large to ignore. China's official holdings of American government debt rose from just under \$100bn in 2002 to a peak of nearly \$1.3trn in 2013. It now manages the yuan against a basket of currencies rather than the dollar alone, and no longer buys very many Treasuries. But the reserve hoard remains.

Its value as an economic weapon is dubious, however. The point of a bond dump would be to saturate the market for Treasuries. America's hefty government debt needs continuous rolling over, and its stonking deficits add to the pile at a pace of about \$1trn per year. Investors, for now, keep buying. But China, by selling Treasuries, might ply the market with more bonds than it can easily digest. To keep overfilled investors coming back, America's government might need to offer higher interest rates. A big enough jump in borrowing costs could force it to choose between growth-crushing fiscal austerity and a fiscal crisis.

But Treasuries are not a typical security. In 2011, for example, Standard & Poor's, a ratings agency, cut America's sovereign credit rating, citing its soaring debt and dysfunctional politics. Markets promptly gobbled up more Treasuries than ever; the yield on the ten-year bond soon fell by more than a percentage point. This anti-gravity effect derives from America's hegemonic role in finance. It issues the world's primary reserve currency and its most prized safe asset. The always-healthy appetite for American debt grows in times of economic uncertainty—even when America itself is the cause of the trouble. If Chinese bond sales rattle global markets, the flight to safety might well sop up the new Treasury supply.

Even if markets remained calm, Chinese sales might prove a mere annoyance. An analysis published by the Federal Reserve in 2015 suggested that \$1.5trn in bond purchases would be expected to reduce ten-year Treasury yields by between 40 and 50 basis points. A comparable rise in yields induced by Chinese bond sales would be uncomfortable, but hardly a disaster, especially since the Fed could intervene if rising yields threatened America's economy. The Fed is currently shedding \$15bn-worth of Treasury bonds each month as it unwinds the unconventional stimulus measures used after the financial crisis. Were China to start selling, the Fed could simply resume buying.

Bond yields are only part of the picture. China bought its Treasuries to stop the yuan appreciating too quickly. Were it to sell them and convert the proceeds back into yuan, its currency would rise, hurting its already-beleaguered exporters and delighting Mr Trump. China could instead try to swap its Treasuries for other foreign assets. Alas, no other government-bond market matches America's for size and safety. German bunds are rock-solid, but in short supply thanks to German fiscal surpluses. France, Italy and Japan offer large markets but more risk. All would fume if China turned its cash their way, causing their currencies to appreciate, hurting their exporters and perhaps inducing deflation, which they already struggle against. Their governments might respond by raising tariffs on China, a disastrous outcome for Beijing.

China could use a bit of depreciation to offset American tariffs. Investors know this, and may be selling yuan now to avoid future losses. China's recent Treasury sales probably represent an effort to keep the depreciation orderly, using dollars to buy yuan from bearish investors, rather than the start of a belligerent bond dump. If the pace remains slow, then China could offload more of its American bonds without angering other trading partners—but also without causing America much discomfort, if any. Moreover, as market forces push the yuan down, the value to China of dollar assets is obvious. They provide China with a bit more macroeconomic autonomy in a global economy dominated by the dollar.

America's place at the centre of global finance is unassailable in the short term. Yet neither America nor China appears to understand just why its position is so commanding. China might like to discomfit America by becoming a credible alternative hegemon: if investors could flee American assets in response to bad behaviour, America might behave better. But challenging America would require open markets, transparent financial institutions and the rule of law—all of which is difficult for an authoritarian regime.

America seems just as clueless. A protectionist bully is an unappealing steward of the world economy. In abusing its privilege, it undermines the shared trust that makes Treasuries an asset without equal. This trade war has been built on mistaking strengths for weaknesses—and weaknesses for strengths. ■



自由交流

债券之缚

中国无法轻易将所持美国国债用作武器

美国有一句老话：如果你欠银行100美元，那是你的事，但如果欠了一亿美元，那就是银行的事了。对于像美国从中国借下的1.1万多亿美元这样的债务，这句俗语就不那么灵验了。美国打下的欠条似乎成了中国领导人手中的一张牌——特朗普在打贸易战时为此有所顾忌，担心习近平会命令中国人民银行抛售美债，把美国推入财政危机。共产党喉舌《人民日报》5月29日发表的社论称，中国可能会限制对美出口稀土。稀土材料被广泛用于智能手机、电动汽车等诸多产品。中国在3月抛售了200亿美元的美国长期国债，从新一轮威胁来看，这似乎是对美国发出的一记警告。不过，中国手上这一堆美债的火力更像是老式大口径火枪，而非激光制导导弹，打偏或自爆的几率与命中的几率均等。

中国最初购入债券的动机相当正当。中国的领导人一心要走经过时间考验的出口导向型发展道路，倾向让本国货币保持低估值。到了本世纪初，随着产出和出口的快速增长给汇率带来上行压力，中国人民银行以人民币购入美元，大部分为美国国债。当时美国因减税和国外作战而赤字严重，廉价贷款看起来是美国的福音。但正如在中国常见的，原本微不足道的小事情会很快演变成不容忽视的大事件。中国官方持有的美国国债在2002年还不到1000亿美元，到2013年的最高峰时已达近1.3万亿美元。中国现在参考一篮子货币管理人民币汇率，而非仅看美元走势，而且也不再大量购买美国国债。但它仍留有相当规模的美债。

然而，这些国债作为经济武器的价值很可疑。假如抛售债券，目的就是要使美国国债市场饱和。美国庞大的政府债务需要不断发新债来还旧债。此外，政府的巨大财政赤字又导致每年增加一万亿美元的债务。就目前而言，投资者还在不断购入美债。但如果中国抛售大量美债，可能导致市场难以消化。为吸引已大量持仓的投资者继续购入，美国政府可能就需要提

供更高的利率。借贷成本大幅上升可能会迫使美国采取能遏制增长的财政紧缩政策，否则就会触发财政危机。

但美国国债不是一般的证券。例如在2011年，评级机构标准普尔因美国债务飙升和政治失灵而调低其主权信用评级。市场迅速吞噬了数量之多前所未见的美国国债，十年期美国国债收益率随即下跌超过一个百分点。这种反重力效应源自美国在金融领域的霸权地位。美元是世界主要储备货币，也是最重要的安全资产。市场对美债的胃口向来不小，在经济动荡时期还会增加——即便有时这种动荡是由美国自身造成的。如果中国出售美债对全球市场造成冲击，避险需求可能会充分吸收新增的美债供应。

即便市场保持平静，中国抛售美债可能也只会造成小小的烦扰。美联储在2015年发布的一项分析显示，预计1.5万亿美元的债券购入将使十年期美国国债的收益率降低40至50个基点。中国出售美债导致收益率出现同等幅度的上升会造成不适，但很难有灾难性的后果，尤其是因为如果收益率上升威胁到美国经济，美联储是可以出手干预的。美联储正逐步退出金融危机后采用的非常规刺激措施，目前每月出售150亿美元国债。假如中国开始抛售美债，美联储重新购入便是。

债券收益率只是问题的一部分。中国购入美债是为防止人民币升值过快。如果中国出售美债并将收入换成人民币，人民币就会升值，进一步挫伤本已身陷困境的出口商，为特朗普所乐见。中国或许可以将持有的美国国债转换为其他外国资产。可惜，没有其他政府债券市场能在规模和安全性上匹敌美国。德国国债稳如磐石，但由于该国的财政盈余而供应量不大。法国、意大利和日本国债市场大，但风险也较高。如果中国把资金投向这些国家的国债，导致它们的货币升值、出口商受损，甚至还可能加剧它们本已在艰难对抗的通货紧缩，那么肯定会惹来各方怨怒。这些国家的政府可能会提高对中国的关税作为报复，给北京带来灾难性后果。

中国可以让人民币略微贬值来抵消美国加征关税的影响。投资者明白这一点，可能现在已开始减持人民币以避免将来的损失。中国近期从看跌的投资者手上以美元买入人民币，如此出售美债也许是让人民币有序贬值的一

种手段，而不是挑衅性质的抛售的开端。如果保持慢速推进，中国可以在不激怒其他贸易伙伴同时也不给美国造成太多不适（如果有的话）的情况下减持更多美债。此外，随着市场力量推动人民币贬值，美元资产对中国的价值显而易见。在美元主导的全球经济中，这些资产给中国提供了稍微多一些的宏观经济自主权。

短期内，美国在全球金融的中心地位难以撼动。然而，中美似乎都不明白它之所以获得这般强势地位的原因。中国可能希望成为另一个具公信力的霸主来挫败美国。它可能认为，如果投资者能从美国资产中撤资来回应美国的不良行为，美国可能会修正其做法。但是，挑战美国需要有开放的市场、透明的金融体系和法治，对一个专制政权而言这些都是难题。

而美国似乎同样地无知。一个奉行保护主义的霸道国家不是一个受欢迎的世界经济管家。美国国债成为无可媲美的资产靠的是共同的信任，但美国滥用特权的做法削弱了这份信任。把优势变成缺陷，把弱点错当强项——这就是中美贸易战开打的基础。 ■



American power

Weapons of mass disruption

America is aggressively deploying a new economic arsenal to assert its power. That is counterproductive—and dangerous

WHEN DONALD TRUMP arrived in the Oval Office he promised to restore America's might. His method has turned out to be a wholesale weaponisation of economic tools. The world can now see the awesome force that a superpower can project when it is unconstrained by rules or allies. On May 30th the president threatened crippling tariffs on Mexico after a row over migration. Markets reeled, and a Mexican delegation rushed to Washington to sue for peace. A day later preferential trading rules for India were cancelled. Its usually macho government did not put up a fight and promised to preserve "strong ties". China faces a ratcheting up of tariffs soon, and its tech giant, Huawei, has been severed from its American suppliers. The country's autocratic leaders are enraged, but on June 2nd they insisted they still seek "dialogue and consultation". A tighter embargo on Iran, imposed over European objections, is strangling its economy.

President Trump must view this scene with satisfaction. Nobody takes America for granted any more. Enemies and friends know that it is prepared to unleash an economic arsenal to protect its national interest. America is deploying new tactics—poker-style brinkmanship—and new weapons that exploit its role as the nerve centre of the global economy to block the free flow of goods, data, ideas and money across borders. This pumped-up vision of a 21st-century superpower may be seductive for some. But it could spark a crisis, and it is eroding America's most valuable asset—its legitimacy.

You might think that America's clout comes from its 11 aircraft-carriers,

6,500 nuclear warheads or its anchor role in the IMF. But it is also the central node in the network that underpins globalisation. This mesh of firms, ideas and standards reflects and magnifies American prowess. Though it includes goods traded through supply chains, it is mainly intangible. America controls or hosts over 50% of the world's cross-border bandwidth, venture capital, phone-operating systems, top universities and fund-management assets. Some 88% of currency trades use greenbacks. Across the planet it is normal to use a Visa card, invoice exports in dollars, sleep beside a device with a Qualcomm chip, watch Netflix and work for a firm that BlackRock invests in.

Foreigners accept all this because, on balance, it makes them better off. They may not set the rules of the game, but they get access to American markets and fair treatment alongside American firms. Globalisation and technology have made the network more powerful although America's share of world GDP has fallen, from 38% in 1969 to 24% now. China cannot yet compete, even though its economy is approaching America's in size.

Despite this, Mr Trump and his advisers are convinced that the world order is rigged against America, pointing to its rust-belt and its trade deficit. And rather than mimic the relatively restrained tactics of the last trade conflict, with Japan in the 1980s, they have redefined how economic nationalism works.

First, instead of using tariffs as a tool to extract specific economic concessions, they are being continuously deployed to create a climate of instability with America's trading partners. The objective of the new Mexican tariffs—fewer migrants crossing the Rio Grande—has nothing to do with trade. And they breach the spirit of USMCA, a free-trade deal signed by the White House only six months ago, which will replace NAFTA (Congress has yet to ratify it). Alongside these big fights is a constant barrage of petty activity. Officials have skirmished over foreign washing machines and

Canadian softwood lumber imports.

Second, the scope of activity has been extended beyond physical goods by weaponising America's network. Outright enemies such as Iran and Venezuela face tighter sanctions—last year 1,500 people, firms and vessels were added to the list, a record figure. The rest of the world faces a new regime for tech and finance. An executive order prohibits transactions in semiconductors and software made by foreign adversaries, and a law passed last year known as FIRRMA polices foreign investment into Silicon Valley. If a firm is blacklisted, banks usually refuse to deal with it, cutting it off from the dollar payments system. That is crippling—as two firms, ZTE and Rusal, discovered, briefly, last year.

Such tools used to be reserved for times of war: the legal techniques used for surveillance of the payments system were developed to hunt al-Qaeda. Now a “national emergency” has been declared in tech. Officials have discretion to define what is a threat. Though they often clobber specific firms, such as Huawei, others are running scared. If you run a global company, are you sure your Chinese clients are not about to be blacklisted?

The damage to America's economy so far has been deceptively small. Tariffs cause agony in export hubs such as northern Mexico, but even if Mr Trump imposes all his threatened tariffs, the tax on imports would be worth only about 1% of America's GDP. His poll ratings at home have held up, even as they have slumped abroad. His officials believe the experiment in weaponising America's economic network has only just begun.

In fact, the bill is mounting. America could have built a global coalition to press China to reform its economy, but it has now squandered precious goodwill. Allies looking for new trade deals with America, including post-Brexit Britain, will worry that a presidential tweet could scupper it after it has been signed. Retaliation in kind has begun. China has begun its own

blacklist of foreign firms. And the risk of a clumsy mistake that triggers a financial panic is high. Imagine if America banned the \$1trn of Chinese shares trading in New York, or cut off foreign banks.

In the long run the American-led network is under threat. There are hints of mutiny—of America's 35 European and Asian military allies, only three have so far agreed to ban Huawei. Efforts to build a rival global infrastructure will accelerate. China is creating its own courts to adjudicate commercial disputes with foreigners. Europe is experimenting with building a new payments system to get round the Iran sanctions, which could in time be used elsewhere. China, and eventually India, will be keen to end their dependence on semiconductors from Silicon Valley. Mr Trump is right that America's network gives it vast power. It will take decades, and cost a fortune, to replace it. But if you abuse it, ultimately you will lose it. ■ ■



美国力量

大规模破坏性武器

美国正积极部署全新的经济武器库以宣示其实力。但这会适得其反，且有危险后果

特朗普在入主白宫时承诺要重振美国的威势。如今看来，他的办法是大规模地将经济工具用作武器。现在，全世界都可以见识到一个超级大国在不受规则或盟友的约束时能投射出多么巨大的威力。5月30日，特朗普在有关移民问题的争端未解决后，威胁对墨西哥征收破坏性关税。市场应声震荡，而墨西哥连忙派出代表团赶赴华盛顿求和。一天后，美国宣布终止对印度的优惠贸易待遇。一向态度强硬的印度政府并没有反抗，还承诺与美国继续保持“牢固的关系”。中国面临又一轮关税升级来袭，其科技巨头华为已经被美国供应商“断供”。中国的专制领导层怒火中烧，但在6月2日他们坚称仍在寻求“对话与磋商”。美国还不顾欧洲反对，对伊朗收紧禁运措施，这正在扼杀该国的经济。

这种场面想必令特朗普志得意满。谁也不会再轻视美国了。不论是敌是友，大家现在都知道美国随时会动用经济武器来保护其国家利益。美国正在部署新战术（赌博式的边缘政策）和新武器（利用其作为全球经济中枢的地位来阻止商品、数据、思想和资金的跨境自由流动）。这种打了鸡血般的有关21世纪超级大国的设想对一些人可能充满诱惑力。但它可能引发一场危机，并且正在侵蚀美国最宝贵的资产——它的正当性。

你也许认为美国的影响力来自它的11艘航空母舰、6500枚核弹头，或者它在国际货币基金组织中的主导地位。但同时，在一个支撑起全球化的网络中，它是那个中央节点。这个由企业、思想及标准交织而成的网络体现并放大了美国的实力。尽管其中包含通过供应链交易的商品，但它的大部分是无形的。全球超过50%的跨境带宽、风险投资、电话操作系统、顶尖大学和基金管理资产由美国控制或位于美国境内。大约88%的货币交易使用美元。在全球各地，人们经常性地刷着Visa卡，用美元结算出口，在床头摆放着装有美国高通芯片的电子设备，观看Netflix的节目，在美国贝莱德

集团投资的公司里工作。

外国人接受了这一切，因为总的来说他们能从中获益。他们或许没能制定游戏规则，但得以进入美国市场，并享受和美国公司一样的公平待遇。全球化和技术进步令这一网络愈加强大——虽然美国在全球GDP中所占比例已从1969年的38%下降到如今的24%。即使中国的经济规模正在逼近美国，也仍不是它的对手。

尽管如此，特朗普及其幕僚仍以本国的“铁锈地带”和贸易逆差为例证，深信世界秩序受到了操纵而对美国不公。他们没有像上一次在上世纪80年代与日本发生贸易冲突时那样采取相对克制的策略，而是重新诠释了经济民族主义。

首先，关税并非被用作榨取某些经济上的让步的工具，而是被不断动用以在美国和其贸易伙伴之间制造一种不稳定的气氛。对墨西哥新征关税的目标是减少跨越格兰德河（Rio Grande）入境美国的非法移民，与贸易无关。它们也违背了《美加墨贸易协议》（USMCA）的精神。六个月前白宫才签署了这项自由贸易协议，用以取代《北美自由贸易协定》（国会尚未批准）。除了这些大阵仗，还有连串的小动作。美国官员们已经在外国洗衣机和加拿大软木材的进口上发起了小规模打击。

其次，通过把美国主导的网络用作武器，战事已被扩展到了实体货物以外。像伊朗和委内瑞拉这类彻头彻尾的敌国面临更严厉的制裁——去年有1500个个人、公司和船只被列入黑名单，创历史新高。世界其他地区则面临新的科技和金融管理机制。美国政府的一道行政命令禁止交易外国对手制造的半导体和软件，去年通过的《外国投资风险审查现代化法案》（FIRRMA）则管控外国对硅谷投资。一家公司若被列入黑名单，通常会被银行拒之门外，也就无法再使用美元支付系统。其后果是毁灭性的——去年中兴通讯和俄罗斯铝业公司已经有所领教。

这样的工具以往只会在战争期间使用：用于监控支付系统的法律手段当初是为追击基地组织而设计的。而现在，美国宣布科技业已进入“国家紧急

状态”。官员有权判定什么是威胁。尽管他们常常是猛打特定公司，例如华为，但其他公司也战战兢兢。如果你经营着一家全球性企业，你能确定自己的中国客户不会是下一个被列入黑名单的公司吗？

迄今为止，这些举措对美国经济的破坏看似很小，其实不然。美国加征的关税令墨西哥北部等地的出口枢纽痛苦不已，但即使特朗普威胁加征的关税全部实施，这些税收也仅占美国GDP的1%左右。特朗普在海外民调中声望暴跌，在国内的支持率却依然坚挺。其官认为，美国将其经济网络武器化的实验才刚刚开始。

而事实上，代价正在上升。美国原本可以建立起一个全球联盟来敦促中国改革经济，但它现在却浪费了这宝贵的善意。而那些寻求与美国达成新贸易协议的盟友（包括脱欧后的英国）会担心美国总统只消发一条推文就可以把签好的协议推翻。以牙还牙的反击战已经打响。中国已开始编写自己的外国公司黑名单。由某个鲁莽错误引发一场金融恐慌的风险很高。试想若美国禁止价值一万亿美元的中国公司股票继续在纽约交易，或完全断绝与外国银行的交易，那会怎样。

长远来看，美国主导的这一网络正面临威胁。内讧叛变的迹象已经显现——美国的35个欧亚军事盟友中目前只有三个同意封锁华为。各方将加快建立与美国抗衡的全球化基础设施。中国正在建立自己的法院体系来裁决涉外商业纠纷。欧洲正尝试建立新的支付系统以规避美国对伊制裁，假以时日这一系统可被用于其他地方。中国——最后乃至印度——将竭力摆脱对硅谷半导体的依赖。特朗普认为美国主导的网络赋予其巨大的力量，这没错。要取而代之需要数十年的努力和高昂的花费。但是，如果滥用这一网络，最终必将失去它。 ■



Schumpeter

iPhoney war

Does Apple's boss have a Plan B in China?

LONG BEFORE Tim Cook became Apple's boss, when his job was to wring costs out of the company's supply chain, he learned of a problem with a supplier in China. "This is really bad," he told his staff. "Someone should be in China driving this." Thirty minutes later he saw one of his executives sitting at a table. "Why are you still here?" he asked quietly. The executive stood up, drove directly to San Francisco's airport and bought a ticket to China.

This anecdote, recounted in Walter Isaacson's biography of Steve Jobs, Apple's founder, is one of only a few tales in print that offer an insight into the management style of Mr Cook, who took over from Jobs shortly before he died of cancer in October 2011. It is telling. While Jobs, the irascible creative genius behind Apple's bestselling products, stole the show, Mr Cook, who is both courtly and deeply private, plugged away behind the scenes to cement a relationship crucial to Apple's soaring success: that with China.

In the early days of Apple, Jobs wanted to make his Macintosh computers in America. With his trademark obsessiveness, he built a factory of pure white to produce them (and wore white gloves to check for dust). When Mr Cook joined the company in 1998 he changed all that, deploying his soothing Alabama lilt and a fearsome work ethic (he gets up at 4am) to forge an unrivalled supply chain running through Asia. Today labels on nearly all iDevices read, "Designed by Apple in California. Assembled in China".

Mr Cook's bet on China extended beyond its factories to its consumers.

Sales to the region have risen from next-to-nothing in 2010 to \$52bn last year, or almost a fifth of Apple's revenues. Since Donald Trump's election in 2016, "Tim Apple" (as America's president once called him) has jetted to Washington and Beijing to try to ease rising trade tensions between the two superpowers. Horace Dediu, a technology analyst, says Mr Cook "knows how to navigate the political mind".

Given his reputation as a logistical mastermind, it is worth asking why he has ignored the first rule of supply-chain management: the risk of keeping too many important eggs in one basket. In Mr Cook's case, that basket is China. The trade bust-up is getting uglier. If it leads to an anti-American backlash in China, it could spell trouble for Apple—and for Mr Cook personally.

Mr Cook's lobbying has helped Apple avoid direct hits from Mr Trump's tariffs, already imposed on \$250bn-worth of Chinese imports. But its shares have fallen by almost 12% in the past month. On June 1st China retaliated with tariffs on \$60bn of American goods, including components for Apple devices. Mr Trump has threatened a levy of 25% on \$300bn more of imports if trade talks do not produce a breakthrough. This would cover the iPhone, by far Apple's biggest source of revenue. Morgan Stanley, a bank, estimates that it could add \$160 to the cost of a \$999 iPhone XS. Apple could absorb the cost or pass it on to buyers. Either way, profits would suffer.

A more immediate threat may be a Chinese reprisal for the Trump administration's decision in May, on national-security grounds, to stop American companies from supplying Huawei, China's tech champion (and the biggest seller of smartphones in China), with chips, software and other technology. A Chinese consumer boycott of Apple products could accelerate their shift towards other, cheaper brands. Because of the trade tensions, Citi, a bank, has halved its forecast for iPhone sales in China in the second half of this year, from almost 14.5m to 7.2m units.

Others reckon that Apple could offset Chinese losses by luring customers away from Huawei in other countries—but only if it could continue to churn them out in Chinese factories. Although Apple has tentatively started production of some iPhones in India for local customers, it appears if anything to have increased its China exposure, even as Mr Trump's trade bluster has intensified. According to a review of Apple's top 200 suppliers by the *Nikkei Asian Review*, a Japanese publication, last year those from China (41) exceeded those from America (37) for the first time—though Apple stresses the importance of its American supply chain. China has recently released draft cyber-security regulations that cover threats to national security and supply chains. Andrew Gilholm of Control Risks, a consultancy, says these could be weaponised against big American firms in China if the situation deteriorates.

That would be the nuclear option. It looks unlikely for the time being. The costs for China would be huge; Mr Dediu estimates that Apple contributes about \$24bn a year to China's economy. Some 1.5m Chinese help assemble Apple products. A further 2.5m Chinese software engineers create apps for the iOS operating system. Appetite for punishment may be weak. On May 26th Ren Zhengfei, Huawei's boss, told Bloomberg TV that he would be the first to protest if China hits back against Apple. "Apple is my teacher, it's in the lead," he said. "As a student why go against my teacher? Never."

Mr Ren can always change his mind. So can China. Whereas Huawei claims to have a Plan B to survive its blacklisting by America, and Samsung, a rival smartphone-maker from South Korea, is shifting supply chains from China, Apple appears to have no clear alternative to assembly in China. Few other places possess the expertise to produce the high-end components that Apple needs. The existing network would take years to unscramble.

One fix would be for Apple to develop another indispensable product that no self-respecting affluent Chinese consumer could do without. For all his

success, Mr Cook has not yet managed this. Another would be to develop services that do not need production in China. Apple's much-trailed announcement in March of new video-streaming, payments and other services shows it is trying. They may prove a hit, but would be no substitute for the iPhone. Mr Cook must be hoping that he has not miscalculated the risks to the supply chains he has so intricately engineered. ■



熊彼特

苹果之“战”

苹果的老板在中国有B计划吗?

早在蒂姆·库克成为苹果公司的老板前很久，他曾负责压缩公司的供应链成本，那时他了解到中国一个供应商出了问题。“这太糟了，”他对下属说，“应该有人去中国推推这个事情。”30分钟后，看到手下一名主管还坐在桌子旁，他低声问道：“你怎么还在这儿？”这位主管马上起身，直接开车到旧金山机场，买了一张去中国的机票。

这则轶事出现在沃尔特·艾萨克森（Walter Isaacson）撰写的苹果创始人史蒂夫·乔布斯的传记中。这是少数见诸文字的、能让人一窥库克管理风格的故事之一。它很能说明问题。乔布斯于2011年10月因患癌去世，在这之前不久库克接掌苹果。暴躁易怒的乔布斯是打造出苹果畅销产品的创意天才，在台前风头无两。而库克则彬彬有礼且极为内敛，在幕后不懈努力，巩固了对苹果的飞速成功至关重要的一种关系：与中国的关系。

在苹果创立初期，乔布斯想在美国生产自己的麦金塔电脑。在他标志性的“执念”的驱使下，他建造了一座纯白色的工厂来生产它们（还戴上白手套检查有没有灰尘）。当库克于1998年加入公司时，他改变了这一切。库克讲话带着舒缓的阿拉巴马口音，工作勤勉得可怕（每天早上4点起床）。他打造出了一个无与伦比的贯穿亚洲的供应链。今天几乎所有苹果设备的标签上都写着“由苹果于加州设计，在中国组装”。

库克押宝中国，不仅是看上了那里的工厂，还有那里的消费者。苹果在中国的销售额从2010年的微乎其微增长到去年的520亿美元，占苹果总收入的近五分之一。2016年特朗普当选后，“蒂姆·苹果”（特朗普曾这样叫他）曾飞赴华盛顿和北京，试图缓解两个超级大国之间日益加剧的贸易紧张局势。科技分析师贺拉斯·迪杜（Horace Dediu）表示，库克“知道如何应对政治思维”。

鉴于库克拥有物流规划大师的声名，值得问一问他何以会忽视供应链管理的第一条法则：把太多重要的鸡蛋放在一个篮子里会有危险。对库克而言，这个篮子就是中国。贸易纷争日益激烈，如果在中国引发反美浪潮，可能会给苹果及库克本人带来麻烦。

特朗普已对价值2500亿美元的中国进口商品加征关税，库克的游说帮助苹果避免了直接打击。但公司股价在过去一个月下跌了近12%。6月1日起中国对价值600亿美元的美国商品加征报复性关税，其中包括苹果设备的零部件。特朗普威胁如果贸易谈判无法取得突破，将对另外3000亿美元的中国商品征收25%的关税。iPhone也将受影响，而iPhone绝对是苹果最大的收入来源。摩根士丹利估计，加征关税可能会让售价999美元的iPhone XS的成本增加160美元。苹果可以自己承担这些成本，或将之转嫁给消费者。但无论哪种方式，其利润都会受影响。

而更紧迫、直接的威胁可能缘于华为事件。5月，特朗普政府以国家安全为由，阻止美国公司向这家中国的领军科技企业（同时也是中国最大的智能手机销售商）提供芯片、软件和其他技术。对此中国可能会发起报复。一旦中国消费者开始抵制苹果，他们转向其他更便宜品牌的趋势便会加速。虑及两国贸易紧张，花旗银行将今年下半年中国的iPhone销量预测调低了一半，从近1450万台下调到720万台。

其他观点认为，苹果可以在其他国家吸引走华为的客户，以此抵消在中国市场的损失——但前提是它能继续在中国的工厂生产产品。虽然苹果已在印度尝试为本地客户生产部分iPhone，但这么做似乎却只是增加了源自中国的风险，即使特朗普的贸易威胁已经升级。根据日本的《日经亚洲评论》对苹果前200大供应商的盘点，去年中国供应商（41家）的数量首次超过了美国（37家）——尽管苹果一直在强调其美国供应链的重要性。中国近期发布了网络安全法草案，其中包括对国家安全和供应链的威胁。咨询公司Control Risks的安德鲁·吉尔霍姆（Andrew Gilholm）表示，如果局势恶化，中国可能会以这些法规作为武器来对付在华大型美国公司。

那将是启动“核选项”。就目前来看还不太可能。这么做会让中国付出巨大

的代价：迪杜估计，苹果每年对中国经济的贡献约为240亿美元。约150万中国工人参与组装苹果产品。另有250万名中国软件工程师为iOS操作系统创建应用。中国开展报复的动力可能很弱。5月26日，华为老板任正非在接受彭博电视专访时说，如果中国打击苹果，他会第一个站出来反对。“苹果是我的老师，在前面前进，”他说，“作为一个学生，为什么要反对老师？永远不会的。”

任正非随时都可以改主意。中国也一样。华为声称自己有备选方案，即使被美国列入黑名单也能生存；它在智能手机领域的韩国竞争对手三星正在将供应链转撤出中国。而苹果除了在中国组装产品之外，似乎没有明显的替代方案。没几个地方具备专业能力来生产苹果所需的高端组件。现有供应网络需要多年才能厘清。

一个解决办法就是苹果再研发出一件谁也离不开的产品，让喜欢好东西的中国富人们觉得没它不行。虽然库克功勋卓著，但这方面尚无建树。另一个办法是开发不需要在中国生产的服务。苹果公司在3月公布了此前大量预告的新视频流、支付和其他服务，表明它正在朝这个方向努力。这些服务也许会大获成功，但还不能取代iPhone。库克肯定希望，对于自己精心设计的供应链所面临的风险，他的估计没有错。■



Global technology (1)

Pinch points

The first of two articles about tech supply chains maps their vulnerabilities

JAPAN HAD long since lost its lead in electronics. Or so many thought. When an earthquake and tsunami hit the country in 2011, its continued centrality to the industry quickly became apparent. Copper foils for printed circuit boards, silicon wafers to make chips, resin to package them—for many components Japan was the home of the biggest, sometimes only, supplier. As production ground to a halt, customers scrambled to find alternatives. Many had to limit their output, like carmakers reliant on Renesas Electronics, a leading maker of engine-controlling chips whose wafer-fabrication plant sustained heavy damage.

Natural disasters—whether cataclysmic like the Japanese earthquake or merely destructive like floods or wildfires—regularly test the electronics supply chain. Now a geopolitical shock from President Donald Trump's efforts to isolate China has thrown the industry's structure into sharp relief—and exposed its choke points (see table).

This structure is best thought of as a transcontinental relay race with hidden hurdles, says Willy Shih of Harvard Business School. Modern electronic devices are the most complex things humans produce. Firms at every stage of the process are highly specialised and wield advanced technology. Components are passed from one firm to another, each of which adds a bit of value; some parts cross the ocean several times. Sometimes, where only one or two providers of a particular subsystem exist, the lanes converge. Downstream firms, which may only know their direct suppliers, often have no idea what happens upstream, explains Mr Shih. Until, that is, something goes awry.

The earthquake in Japan revealed that the country produces the bulk of chemicals and other materials to make microchips. The Trump tremor immediately highlighted China's dominant role in electronics assembly. It is home to half the world's capacity, estimates Henry Yeung of the National University of Singapore, which can be ramped up at short notice. When Apple launches a new iPhone, for example, tens of thousands of workers have to be hired within weeks.

In May America's Commerce Department blacklisted Huawei, a Chinese technology titan, and 70 of its affiliates, barring American firms from selling them certain technologies without government approval. This shed light on another bottleneck: chips. Like ZTE, a smaller Chinese firm which in 2017 briefly found itself in a similar situation, Huawei could not survive without chips designed in America.

Although Huawei has its own semiconductor subsidiary, HiSilicon, it still imports most of its chips and spent \$11bn last year on components from America. Qualcomm, a company based in San Diego, makes around half the world's baseband processors, modem chips which manage wireless connections. Intel makes virtually all "server-class" chips used in the world's data centres. Chips based on designs licensed from Arm, a British firm, can be found in almost every advanced smartphone out there. All said they would limit sales to Huawei, lest they fall foul of the American ban.

For their part, Qualcomm, Arm and other chip designers depend on foundries to turn silicon into microprocessors. The largest of these is Taiwan Semiconductor Manufacturing Company (TSMC). It is one of only three firms capable of producing cutting-edge microprocessors. The other two are Intel, which focuses on making chips it designs itself, and Samsung of South Korea. According to insiders, processors which go into an iPhone are all made in a single TSMC facility. And Taiwan, like Japan, is prone to earthquakes. (TSMC says its chip factories are designed to resist major

earthquakes.)

Intel, Samsung and TSMC, in turn, rely on a bevy of specialised equipment suppliers to kit out their factories. One is ASML, a Dutch firm. It is the world's only maker of lithography equipment that uses "extreme ultraviolet" light, which enables the production of transistors small enough for the next generation of advanced chips. ASML has spent decades, and billions of dollars, getting that finicky technology to work. Its 180-tonne machines sell for €120m (\$135m) a pop. Intel, TSMC and Samsung have each bought a handful. SMIC, a Chinese chipmaker, has ordered one. If SMIC or other Chinese firms were barred from buying more, China's ambition to become self-sufficient in advanced chips would come a cropper, says Robert Castellano, an industry analyst.

Then there is software. Three-quarters of the world's smartphones, including many made by Huawei, use Google's Android mobile operating system. The American ban means that, although Huawei retains access to the open-source version of Android, Google has said that it will no longer provide the Chinese firm with proprietary bits, such as the app store and security updates. That will not hurt Huawei in China, where these services are already blocked. But it will in the West, where consumers rely on them every day.

Open-source does not guarantee invulnerability. Some think Mr Trump may want to ban exports of such software to China, as has long been the case for certain encryption programs. Without programs like the Linux operating system or Kubernetes, a tool to manage computing loads, Alibaba could not have become the world's fastest-growing cloud-computing giant.

All these bottlenecks, and America's direct or indirect sway over many of them, makes it tempting for hardliners in Washington to "weaponise interdependence", as Henry Farrell of George Washington University and

Abraham Newman of Georgetown University put it in a recent influential paper. America has threatened to cut off foreign financial institutions from the SWIFT banking network and the dollar clearing system for doing business with countries or entities it does not like. The Huawei ban applies to foreign firms if at least one-quarter of their technology originates in America (hence Arm's decision to stop licensing the Chinese firm).

After the Japanese earthquake, many firms moved to identify risks in their supply chain and sought alternatives, says Bindya Vakil, boss of Resilinc, which maintains a database of links between suppliers and monitors disruptions. But it is hard to will new high-tech companies into existence. And doing so would be costly. So the system remains largely unchanged.

Will the Huawei ban alter it? Many firms will speed up efforts to bypass China—for instance by building factories in places like India or Mexico. (Mr Trump's recent threat to slap tariffs on Mexican imports may give them pause.) Samsung has already moved most of its smartphone production to Vietnam. Retaliation by China may hasten the process. When in 2010 it cut export quotas for rare earths, a set of obscure minerals used in magnets and other electronic components, of which 70% is produced in China, this quickly led to a search for alternative sources and substitute materials. Days after the Huawei ban Xi Jinping, China's president, paid a much-publicised visit to a rare-earths facility.

Whether or not it responds in kind, China will redouble efforts to become technologically independent. Huawei has said it will soon release its own mobile operating system to supplant Android. The government is likely to pump even more money into the country's chip industry.

Optimists argue that interdependence will be disarmed once it has served its purpose in the latest Sino-American trade tussle. But the damage has been done. As Mr Shih says, many companies feel they can no longer rely

on Chinese suppliers. And the Chinese realise that America can use the supply chain to wage economic war. Hawks in Washington and Beijing may dream of two “techno-spheres” of influence. To globalised technology firms, it feels like a nightmare. ■ ■



全球科技（1）

夹点

科技供应链变化之上篇：弱点所在

日本早已失去了它在电子产业里的领先地位。至少很多人曾经这么认为。不过，2011年日本遭遇地震和海啸后，它仍然处于该行业的中心这一点很快清楚显现出来。用在印制电路板中的铜箔、用于制造芯片的硅晶圆，以及用于封装芯片的树脂等许多电子元件最大的供应地都是日本，有时日本还是唯一的供应地。这里的生产停摆后，客户手忙脚乱地寻找替代品。许多企业不得不限制产量，比如依赖瑞萨电子（Renesas Electronics）供货的汽车制造商。这家公司是顶尖的发动机控制芯片制造商，它的晶圆制造厂在这场自然灾害中遭到了严重破坏。

自然灾害经常会给电子产品供应链带来考验，无论是像日本地震那样的巨大灾难，还是只是像洪水或山火那种程度的破坏。而现在，特朗普试图孤立中国，由此带来的地缘政治冲击令电子行业的结构清晰呈现，也暴露了其瓶颈（见表）。

哈佛商学院的史兆威（Willy Shih）说，对这种结构最恰当的理解是将其看作设有隐藏障碍的跨大陆接力赛。现代电子设备是人类生产的最复杂的物件。每个交棒点上的企业都高度专业化，并运用先进的技术。电子元件从一个企业传递给另一个企业，每个企业都给元件增加了一些价值；有些元件甚至要经历数次越洋传递。有时，某个子系统只有一两个供应商，赛道会在这里并道。下游企业可能只了解它们的直接供应商，往往不知道上游的情况，史兆威解释说。直到出了岔子。

日本地震揭示出，大部分用于制造微芯片的化学品和其他材料都是由该国生产的。而特朗普引发的震动则让中国在电子装配领域的主导地位立刻凸显出来。新加坡国立大学的杨伟聪估计，中国在电子装配领域的产能占全世界的一半，并且可以在有需要时迅速提升。例如，当苹果公司推出新款

iPhone时，数周内就需要雇用数万名工人。

上月，美国商务部将中国科技巨头华为及其70家子公司列入黑名单，禁止美国企业未经政府批准向华为出售特定技术。这又揭示了另一个瓶颈所在：芯片。没有美国设计的芯片，华为就无法生存。比华为规模小一些的中兴通讯2017年也曾短暂陷于类似的境地。

虽然华为有自己的半导体子公司海思，但大部分芯片仍依赖进口。它去年花费了110亿美元从美国购买零部件。总部位于圣地亚哥的高通公司生产了约占全球一半的基带处理器，即管理无线连接的调制解调器芯片。全球各地的数据中心所使用的“服务器级”芯片差不多都由英特尔生产。几乎每部先进的智能手机都采用了基于英国公司安谋（Arm）授权的设计所生产的芯片。这些公司都说它们会限制对华为的销售，以免违反美国的禁令。

而对于高通、安谋和其他芯片设计企业，它们又依赖“代工厂”把硅变成微处理器。最大的代工厂是台积电。它是全球仅有的三家能够生产尖端微处理器的公司之一。另外两家是专注制造自己设计的芯片的英特尔，以及韩国的三星。据业内人士称，用于iPhone的处理器都是在台积电的同一家工厂里生产的。而台湾和日本一样，也容易发生地震。（台积电表示其芯片工厂的抗震设计可抵御强震。）

接下来，英特尔、三星和台积电也要依靠一大批专业设备的供应商来为它们的工厂提供装备。其中一家是荷兰公司ASML。它是世界上唯一一家采用“极紫外”线的光刻机制造商，这种光刻机可以生产用于下一代先进芯片的小型晶体管。ASML历经数十年，投入数十亿美元，实现了这项精密技术。它的光刻机重达180吨，售价1.2亿欧元（1.35亿美元）。英特尔、台积电和三星各买了几台。中国的芯片制造商中芯国际订购了一台。行业分析师罗伯特·卡斯特拉诺（Robert Castellano）表示，如果中芯国际或其他中国企业被禁止继续购买，那么中国在先进芯片领域实现自给自足的雄心将被挫败。

然后还有软件的问题。全球四分之三的智能手机——其中有许多由华为制

造——都使用谷歌的安卓手机操作系统。美国的禁令意味着尽管华为仍然可以使用安卓的开源版本，但谷歌已表示将不再向华为提供应用商店和安全更新等专有服务。在中国市场，这些服务本就已被禁用，所以华为不会受影响。但西方市场的消费者每天都依赖这些服务，在那里华为将受到冲击。

开源并不能保证中国企业不受影响。一些人认为特朗普可能想要禁止向中国出口此类开源软件，就像美国长期以来就禁止向中国出口某些加密程序。当初如果没有Linux操作系统等程序或Kubernetes这样的计算负载管理工具，阿里巴巴就无法成为全球发展最快的云计算巨头。

所有这些瓶颈以及美国对其中许多瓶颈直接或间接的影响，让华盛顿的强硬派会很想要“把相互依存用作武器”，乔治华盛顿大学的亨利·法瑞尔（Henry Farrell）和乔治敦大学的亚伯拉罕·纽曼（Abraham Newman）在最近一篇颇具影响力的论文中这样写道。美国已经发出威胁，要把与它不喜欢的国家或实体开展业务的外国金融机构排除出SWIFT银行网络和美元清算系统。华为禁令适用于所用技术至少四分之一源于美国的外国公司（因此安谋决定停止对华为授权）。

日本地震后，许多公司开始识别它们供应链中的风险并寻找替代方案，Resilinc的老板宾迪娅·瓦基勒（Bindiya Vakil）表示。Resilinc维护着一个记录供应商之间关系的数据库，监控供应链中断的情况。但仅有愿望还不足以催生新的高科技公司，而培育这样的公司成本很高。因此供应链体系基本保持不变。

华为禁令会改变现状吗？许多公司将加快它们绕过中国的步伐，例如在印度或墨西哥等地建厂。（特朗普近日对墨西哥进口产品加征关税的威胁可能会让它们暂停脚步。）三星已将其大部分智能手机工厂转移到了越南。中国对美展开报复可能会加速这一进程。2010年，中国削减了稀土的出口配额。稀土是一种用于磁铁和其他电子元件生产的不出名矿物，中国的稀土产量占全球的70%。消息一出，国外厂商很快开始寻找稀土的替代来源和替代材料。华为禁令颁布后几天，中国国家主席习近平视察了一家稀土

企业，受到广泛报道。

无论是否会对美国以牙还牙，中国都将加倍努力实现技术独立。华为已表示将很快发布自己的手机操作系统以取代安卓。中国政府很可能会向本国的芯片产业注入更多资金。

乐观主义者认为，相互依存的关系在最近的中美贸易摩擦中发挥作用之后，就会被解除武装。但损害已经造成。正如史兆威所说，许多企业感到无法再依赖中国供应商了。而中国人则意识到美国可以利用供应链发动经济战。华盛顿和北京的鹰派可能梦想建立两个有影响力的“科技圈”。对于全球化的科技公司来说，这是一场噩梦。 ■



The Economist Film

The next frontier

What will happen when thoughts control machines?



经济学人视频

下一个前沿

若用思想控制机器，会发生什么？



Global technology (2)

The silicon tightrope

Taiwan's computing titans are caught up in the Sino-American tech war

IN THE SHADOW of Taipei 101, the Taiwanese capital's tallest skyscraper, 42,000 people attended Computex, one of the world's biggest electronics trade expos, which concluded on June 1st. They bought, sold and ogled every electronic component imaginable. Neon-pulsating fans. Computer casings in every imaginable shade of beige. Infinite varieties of fibre-optic cables. And, of course, chips. If silicon had a smell, Computex would be oozing it.

The massive exhibition space is in fact a sideshow. The real action takes place high above, in the hotel suites of central Taipei. The world's technology firms book them, then fly in for meetings with the Taiwanese companies that are the beating heart of the global electronics supply chain. Taiwan is, in effect, Computex writ large.

The largest Taiwanese tech companies are contract manufacturers, which make products for other firms rather than sell them directly to consumers. The combined sales of the 19 biggest last year totalled \$394bn. They co-ordinate the fiendish logistics of getting hundreds of parts sourced from Asia and beyond to arrive in the right place at the right time, in order to keep their assembly plants, many located in China, humming. Largan, Pegatron, Quanta and TSMC are not household names. Their customers—Huawei, Apple, Amazon—are. But the global tech value chains atop which these illustrious firms sit would break without their Taiwanese links.

All iPhones and many Huawei devices run on cutting-edge microprocessors made by TSMC. Largan grinds the minuscule lenses and other optical equipment that goes into high-end smartphone cameras. Many lower-end

phones sold by companies under various brands are basically generics produced by Pegatron or Quanta. Hon Hai, better known as Foxconn, is the only company with the capacity to marshal the armies of workers needed to ramp up iPhone production. The vast majority of its stadium-sized factories are in China, but Taiwan is the centre of operations. The label on most Apple devices, “Designed in California. Assembled in China”, is missing a central component: “Made possible by Taiwan”.

By the same token, Taiwan’s silent giants find themselves in the middle of the technology cold war between China and America. TSMC is perhaps Huawei’s most important supplier. For now it says that America’s decision last month, on national security grounds, to prohibit its companies from exporting technology to the Chinese firm does not affect it; TSMC’s meticulous supply-chain management systems show that its exports to Huawei do not contain enough American intellectual property to fall under the ban. Nonetheless it is under pressure, as are its Taiwanese peers. Rumours are swirling that Foxconn has stopped some of its manufacturing for Huawei. (Huawei denies this. Foxconn declined to comment.) China said in late May it was compiling its own list of “unreliable” foreign firms.

Even before these latest salvos, Taiwanese companies were already looking beyond China to locate new assembly plants, prompted by rising Chinese labour costs and President Donald Trump’s earlier tariffs on Chinese imports. But relocating links of the complex supply chain from clusters such as Shenzhen in southern China (800km from Taipei as the crow flies) will increase the costs of shipping and logistics, eating into the Taiwanese firms’ comparatively thin margins. And a wholesale move out of China looks unfeasible, not least because few other places possess the expertise that agglomerations like Shenzhen have built up over the years.

Some Taiwanese firms are quietly seeking a toehold in other countries. Pegatron is planning to invest \$1bn in a new manufacturing facility on the

Indonesian island of Batam, just an hour by ferry from Singapore. Foxconn and Wistron, another Taiwanese firm, each now has an iPhone factory in India.

Keeping a low profile is getting harder for the Taiwanese companies. If you include Hong Kong, China consumes 40% of Taiwanese exports, most of it courtesy of the contract manufacturers. Around 1m Taiwanese, roughly one-tenth of its labour force, work in China. Taiwan's relations with China, which considers the island part of its territory, are ever uneasy—especially when, as now, the Democratic Progressive Party, which insists that Taiwan is an independent country, wields power. Last month John Bolton, Mr Trump's national security adviser, enraged China by breaking with decades of precedent to meet his Taiwanese opposite number. Terry Gou, Foxconn's founder and Taiwan's richest man, is meanwhile seeking the presidential nomination of the biggest opposition party on a China-friendly ticket.

Most of Mr Gou's fellow tech bosses prefer to keep their heads down. Small wonder, for shadows have served them well. From now on they may have to get used to the spotlight. ■ ■



全球科技（2）

如履硅冰

科技供应链下篇：台湾计算业巨头卷入中美科技大战

在台北最高楼101大厦附近，4.2万人参加了于6月1日结束的台北国际电脑展（Computex）——全球最大的电子贸易展览会之一。他们在这里采购、出售、兴致勃勃地观赏你能想象得到的各种电子元件。霓虹闪烁的风扇、各种米色调的电脑机箱、数不清种类的光缆散布在会场。当然还有芯片。如果硅是有气味的，这气味会弥漫展会的各个角落。

这场大型展览实际上只是助兴而已，真正的重头戏在台北市中心的酒店高层套房中上演。全球各地的科技公司提前预订了这些房间，在此会晤在全球电子供应链中居于核心地位的台湾公司。实际上，整个台湾都在上演台北国际电脑展。

台湾最大的科技公司是代工企业，为其他公司制造产品，而不直接对消费者销售。去年，台湾19家最大的科技企业销售额合计达3940亿美元。它们从亚洲及其他地方采购数百种零配件，协调其中高度复杂的物流过程，确保这些零配件在对的时间运达对的地点，让它们的组装厂（许多位于中国大陆）能持续开工。大立光电、和硕、广达和台积电这些企业并非家喻户晓，但它们的客户华为、苹果、亚马逊人尽皆知。然而如果没有和台湾企业的合作，这些大鳄盘踞于顶端的全球科技价值链就将断裂。

所有的iPhone和很多华为设备都采用了台积电制造的尖端微处理器。大立光电打磨高端智能手机摄像头所用的微型镜头和其他光学设备。很多公司以各种品牌销售的大量低端手机基本上都是和硕或广达生产的公模机。鸿海集团（更为人所知的名字是富士康）是唯一一家有能力调集工人大军来提升iPhone产量的公司。其体育场大小的工厂绝大多数位于中国大陆，但运营中心在台湾。大多数苹果设备上都贴有一个标签：“加州设计，中国组装”，它遗漏了一个核心部分：“由台湾实现”。

同样地，默默经营的台湾巨头发现自己卷入了中美技术冷战。台积电可能是华为最重要的供应商。目前台积电表示，上个月美国以国家安全为由禁止美国公司向华为出口技术的禁令没有影响到它，因为台积电细致严谨的供应链管理系统显示，它向华为出口的产品中所含美国知识产权比重未达到禁令限制。尽管如此，台积电与其他台湾同行一样都面临压力。目前盛传富士康已停止为华为生产部分产品。（华为否认有此事，富士康拒绝发表评论。）上月底，中国政府表示正在编制自己的“不可靠”外国企业清单。

在近期这些喧嚣之前，由于中国大陆劳动力成本上升，以及特朗普早前开始对中国进口产品加征关税，台湾企业就已经开始着眼在其他国家建造新的组装厂。但是，将复杂供应链中的环节从深圳（与台北直线距离800公里）这样的产业聚集地移出将增加航运和物流成本，从而侵蚀台湾企业本就相对较薄的利润。整体迁出中国大陆看起来不可行，尤其是因为很少有其他地方拥有深圳这样的产业集群多年积累起来的专业能力。

一些台湾公司正悄悄地在其他国家寻找初步立足点。和硕计划投资10亿美元在印度尼西亚的巴淡岛（Batam）上建一座新工厂，那里到新加坡乘船只要一小时。富士康和另外一家台湾公司纬创集团现在各自在印度设有一家iPhone工厂。

台湾企业要保持低调越来越难。中国大陆加上香港消费了40%的台湾出口产品，其中大部分是由代工企业制造。大约有100万台湾人在中国大陆工作，约占台湾劳动力的十分之一。中国认为台湾是其领土的一部分，台湾与中国大陆的关系从来都不稳定，特别是在像现在这样的民进党执政期——该党坚称台湾是个独立国家。上个月，特朗普的国家安全顾问约翰·博尔顿（John Bolton）打破了几十年的先例，与台湾安全部门的负责人会面，激怒了中国政府。与此同时，富士康的创始人、台湾首富郭台铭正以与大陆友好的政策取向争取最大反对党提名参选台湾领导人。

郭台铭的同行们大多选择继续保持低调。这也难怪，一直以来躲在暗处对他们有益。但从现在开始，他们可能不得不习惯站在聚光灯下。■



Ethics and evolution

The kindness of strangers

Two books explore the evolutionary origins of human morality and societies

CHIMPANZEES AND bonobos are humanity's closest great-ape cousins. They look almost the same as each other, share almost all their (and human) DNA and demonstrate familiar emotions and behaviour. But in an important way, they are opposites. Chimpanzees are routinely violent. Males beat up females to assert sexual dominance, fight each other and kill rivals, friends and even infants. Bonobos, by contrast, enjoy relatively peaceful lives.

Where do humans lie on this spectrum of violence? Are they inherently good or bad, and how does that shape their societies? Two new books offer some answers.

In "The Goodness Paradox", Richard Wrangham, an anthropologist at Harvard, argues that, despite impressions to the contrary, people have evolved into largely docile animals, much like bonobos. But they have maintained the ability to commit acts of planned violence and cruelty, like chimpanzees. They are, at once, much more and much less violent than their primate cousins—the paradox of his title.

Chimpanzees and bonobos have been distinct species for around 900,000 years. Mr Wrangham says part of the reason for their differences is that, on their side of the Congo river, chimpanzees have always had to share their habitats with gorillas; violence and hot-tempered aggression make sense when you have more limited food resources. Across the river, bonobos evolved with abundant fruit and foliage. Natural selection reduced their propensity for reactive aggression (the hot, impulsive type).

These behavioural shifts mirror those of creatures domesticated from their wild cousins, such as dogs or farm animals. Bonobos, it seems, have domesticated themselves in response to their environment. By living in groups, says Mr Wrangham, humans have been domesticated, too.

And domestication set the stage for thriving human societies. A greater capacity for tolerance and co-operation allowed the creation of large, stable settlements and civilisations. In any modern metropolis humans live peacefully in much closer quarters than any other species could without dangerous, possibly fatal consequences. As these societies developed, so did social structures, such as justice and religious ethics, which increasingly keep people from unnecessary aggression and move the moral needle towards good. Mr Wrangham contrasts the trajectory of *Homo sapiens* with the Neanderthals, a human species that became extinct around 35,000 years ago, after living in Europe for half a million years. It was their cognitive inability to work and learn together, he contends, that sealed their doom.

These are controversial ideas, not all of them proven. Given that the fossil record can provide only fragments of clues about how ancient species might have lived, the confidence of Mr Wrangham's claims is bold. Nonetheless, his skilful storytelling—which intertwines his hypotheses regarding primitive humans with rich details from decades of observations of chimpanzees in Tanzania—makes his book both stimulating and compelling.

Successful human societies are the focus of “Blueprint” by Nicholas Christakis, a social scientist at Yale. What sorts of behaviour make societies work, and where do they originate? He begins with shipwrecks.

In 1864 two ships, the *Invercauld* and the *Grafton*, were wrecked on opposite sides of Auckland Island, which lies almost 300 miles (480km) south of

New Zealand. Survivors from both crews were on the island at the same time, but were unaware of each other's presence. Over the year after their stranding, the 19 survivors of the *Invercauld* splintered into groups, often left the weakest to die and even resorted to cannibalism. Only three crew members lived long enough to be rescued. In contrast, all five survivors of the *Grafton* eventually made it off the island. Shipwrecks, writes Mr Christakis, are good natural experiments in society-building: "survivor camps", he says, "provide fascinating data...about how and why social order might vary, and about what arrangements are the most conducive to peace and survival."

The crew of the *Invercauld* were led by a selfish captain who instilled an attitude that every man should look out for himself. The men of the *Grafton*, however, stuck and worked together on everything from repairing boats to sharing their resources equally, even organising a kind of adult-education programme to swap skills. This "social suite" of behaviour, as Mr Christakis puts it, helped them survive.

He argues that this social suite is not just learned from others; it is underpinned by thousands of genes that have evolved to nudge biochemistry and behaviour in such a way that people tend towards a good society. True, there are still appalling wars and horrific murders, but that is not the sum of who humans are. Look at the progress visible all around you, Mr Christakis urges, despite all the well-known episodes of death and destruction.

He ranges across sociology, anthropology, philosophy, genetics and economics, between jungles and laboratories and back again, at what sometimes feels like breakneck speed. But amid the whiplash, Mr Christakis's deep optimism (and considerable evidence) about the arc of human society bending towards good is uplifting. Along the way he delves fascinatingly into human cultures and customs, exploring, for instance,

why monogamy and marriage have become so common (though not universal), and what friendship really means, from an evolutionary perspective.

Mr Wrangham is also an optimist, and even posits a counterintuitive role for certain types of pugnacity in keeping humans on the path towards good. Domesticated as it may be, the species maintains the capacity for a proactive, cold-blooded kind of aggression that may have been instrumental in making societies more socially cohesive. Groups of humans could have worked together to identify and root out the most savage people (usually males) in their midst. Executing the miscreants not only removed an undesirable type of aggressive gene from the pool; it also sent a signal that violence would be punished.

That, in turn, could lead to the emergence of a moral code and demonstrate the benefits of more congenial or generous behaviour. Be good to your neighbours, in other words, lest they gang up and condemn you to death. ■



道德与进化

陌生人的善举

两本书探讨了人类道德和社会的进化起源【《善良的悖论》及《蓝图》书评】

黑猩猩和倭黑猩猩是与人类亲缘关系最近的类人猿。它们看上去几乎一模一样，DNA也极相似（和人类的也是），并且表现出我们熟悉的情感和行为。但在一个很重要的方面，它们却截然不同。黑猩猩一贯暴力。雄性殴打雌性来宣示自己的性支配权，彼此间也相互争斗，还会杀死对手、同伴甚至幼崽。相反，倭黑猩猩则过着相对平和的生活。

那么人类在暴力光谱上处于什么位置？他们是性本善还是性本恶？这又如何塑造了他们的社会？对此，两本新书给出了一些答案。

在《善良的悖论》（The Goodness Paradox）中，哈佛大学的人类学家理查德·兰厄姆（Richard Wrangham）指出，尽管与一般印象相反，但人类已经进化成了大体上温顺的动物，和倭黑猩猩很相似。但人类仍然留存着蓄意施暴的能力，这一点则与黑猩猩相像。与他们的灵长类近亲相比，人类的暴力程度既高得多，又低得多——这就是他的书名中所说的悖论。

早在大约90万年前，黑猩猩和倭黑猩猩就已经是不同的物种了。兰厄姆说，导致两者差异的部分原因是，在黑猩猩生活的刚果河的这一边，他们一直不得不与大猩猩共享栖息地。当食物资源较有限时，暴力和火暴的攻击性便不足为怪了。而在河的另一边，倭黑猩猩在进化过程中有充足的果实和枝叶。自然选择法抑制了它们反应性攻击倾向（即暴躁、冲动的那一类）。

这些行为上的转变与那些从野生近亲驯化而来的狗或家畜等动物的转变类似。倭黑猩猩在顺应环境的过程中似乎完成了自我驯化。兰厄姆指出，人类通过群居生活也得以完成驯化。

而驯化为人类社会的繁荣奠定了基础。容忍度与协作力的提升使得大型且

稳定的定居点和文明社会得以生成。在任何现代都市，相比任何其他物种，人类以近得多的空间距离和平相处而不会产生危险或可能致命的后果。随着这些社会的发展，司法和宗教伦理等社会结构也发展起来，人们由此愈发可以避免不必要的攻击，并使道德的指针指向善的一方。兰厄姆将智人与尼安德特人的发展轨迹加以对比。后者在欧洲生活了50万年，大约在3.5万年前灭绝。兰厄姆认为，正是由于尼安德特人不具备协作和共同学习的认知力，才注定了他们的厄运。

这些观点还有争议，并非所有观点都得到了证实。鉴于化石记录只能提供有关远古物种生存情况的零散线索，兰厄姆自信满满的说法很是大胆。尽管如此，他利用娴熟的叙事技巧，将他关于原始人的种种假设与数十年来在坦桑尼亚观察黑猩猩的大量细节交织在一起，使他这本书读来既趣味盎然，又很有说服力。

兴旺发达的人类社会是耶鲁大学的社会科学家尼古拉斯·克里斯塔基斯（Nicholas Christakis）所著《蓝图》（Blueprint）关注的焦点。社会成功运转有赖于哪些行为？这些行为又是从何而来？他从船舶失事开始说起。

奥克兰岛（Auckland Island）位于新西兰以南约300英里（480公里）处。1864年，两艘名为因弗考德号（Invercauld）和格拉夫顿号（Grafton）的船舶分别在这座岛的两边失事。两艘船的幸存者同时生活在一座岛上，却互不知晓。受困在此的那一年里，因弗考德号的19名幸存者分裂成多个小团体，经常任由虚弱的人死去，甚至还同类相食，只有三名船员活到了获救的时刻。而格拉夫顿号上的五名幸存者最终全部渡过难关，成功离岛。克里斯塔基斯写道，船舶失事是很好的社会构建的自然试验。“这种‘幸存者营地’，”他说，“为社会秩序可能如何演变、为何演变，以及哪些安排最有利于和平与生存……提供了极为有趣的资料。”

领导因弗考德号船员的是一名自私的船长，他向船员们灌输各人照顾好自己的心态。而格拉夫顿号的船员们在每件事上都团结协作，他们一起修船、平分资源，甚至组织类似成人教育的活动来互相学习各种技能。这种

克里斯塔基斯称之为行为上的“社交套件”帮助他们幸存下来。

克里斯塔基斯认为，这种“社交套件”不只是从他人那里习得，还靠成千上万业已进化的基因来支撑，这些基因的进化逐步推动生物化学和人类行为演变，使人类趋向秩序良好的社会。诚然，骇人听闻的战争和恐怖的谋杀仍然存在，但并不代表人类的全部。尽管有广为人知的死亡和破坏事件发生，克里斯塔基斯呼吁人们注意自己周围显而易见的进步。

他在书中跨越社会学、人类学、哲学、遗传学和经济学，在丛林和实验室之间来回穿梭，速度之快有时令人咋舌。但在这种令人头晕目眩的冲击中，他对人类社会向善的发展轨迹所抱持的深切乐观（及其提供的大量证据）令人振奋。在此过程中，他对人类文化和习俗展开了引人入胜的研究，比如从进化的角度探究为何一夫一妻制和婚姻变得如此普遍（尽管有例外），以及友谊的真正含义。

兰厄姆也是个乐天派，他甚至做出了一个与人们的直觉相反的假定：某些类型的好斗行为具有使人类始终向善的作用。尽管人类可能已被驯化，但他们仍保留着一种冷酷无情的主动攻击性，这种攻击性可能会让社会更具凝聚力。人类群体可以齐心协力，找出并铲除他们当中最凶残的人（通常是男性）。处死恶棍不仅从基因库中清除了一种不良的攻击性基因，还传递出暴行必将受惩的信号。

这继而可能催生一种道德准则，并可表明更友善或慷慨的行之益处。换言之，你可要善待周遭之人，以免他们联合起来置你于死地。 ■



Cryptocurrencies

FaceCoin

Facebook's new currency may be based on a blockchain, but it is no Bitcoin

THE EXCITEMENT among crypto-buffs is palpable. Facebook, the world's largest social network, appears to be planning to launch a digital coin early next year. But they should not get their hopes up too high. If the firm does indeed launch what is being dubbed FB Coin, GlobalCoin or Libra, it will be a tame sort of cryptocurrency—more Bitcoin 0.5 than 2.0.

Facebook has declined to comment on the speculation, but is clearly up to something. Last year it put a highly regarded senior executive, David Marcus, in charge of a new team exploring “ways to leverage the power of blockchain technology”, which underlies cryptocurrencies. In April Mark Zuckerberg, Facebook's boss, said at its annual shindig for developers that it “should be as easy to send money to someone as it is to send a photo”. It seems to be talking to potential partners, such as credit-card issuers and merchants, and financial regulators, such as Mark Carney, the governor of the Bank of England.

In America Facebook's Messenger app already allows peer-to-peer transfers, but only in existing currencies and between accounts linked to bank-issued payment cards. But the new blockchain-based money would be a currency on its own.

Reasons abound why Facebook might want to take this step. It has to pull even with other big global apps that already offer easy payment features, such as WeChat in China. A digital coin would work in developing countries, where many people are unbanked and remittances from abroad are large (India is rumoured to be among the first countries where it will

be available). If it is used for commerce, not just peer-to-peer payments, Facebook could take part of the fee that now goes to card-issuers, and charge more for ads, since buying the products touted would be quicker and simpler. It could move into services such as tipping, for which other payment systems are too pricey (at the Facebook do Mr Zuckerberg demonstrated how users could send content-creators some digital change). Data on payments would help make up for what the firm will lose in its planned “pivot to privacy”, which includes steps such as allowing users to communicate on encrypted channels.

But despite the crypto-buzz, the new currency is unlikely to be a close relative of Bitcoin, says Lex Sokolin, a fintech analyst—that is, a decentralised system with no one in charge. Facebook will want to be in control to gather data, simplify administration and avoid the currency being targeted by speculators such as hedge funds. It will be a “stablecoin”, backed by established currencies such as the dollar to avoid the volatility that has bedevilled Bitcoin (which is heading back to over \$9,000 after falling to little more than \$3,000 last year). Regulators, fearing money-laundering or other criminal activity (as happens with Bitcoin), will surely set strict rules, perhaps capping transfers and policing their flow across borders.

Facebook is well-placed to make a go of the venture, according to Ben Thompson of Stratechery, a widely read newsletter on the tech industry. Its services now boast a total of 2.4bn monthly users. It could entice merchants with discounts if they use the new coin to buy ads, and users by paying them in it for viewing those ads—or perhaps, which would be a giant step for Facebook, even for providing data about themselves.

Yet it will not have the field to itself. Similar coins already exist. Signal and Telegram, two messaging apps, are also planning digital cash. Moreover, payment cards are ubiquitous in the rich world, and easy to use online. And then there is the question of whether, for all its reach, a FaceCoin would

really be welcome. Should a firm that has shown a cavalier attitude towards users' data be trusted to deal with their money? ■



加密货币

脸书币

Facebook的新货币可能基于区块链，但它不是比特币

加密技术爱好者的兴奋之情溢于言表：全球最大的社交网络Facebook貌似正在规划于明年初推出一款数字货币。但他们不该期望过高。如果Facebook确实推出了名字可能是FB Coin、GlobalCoin或Libra的加密货币，那也将是比较保守的一种——更像是比特币的0.5降级版而非2.0升级版。

Facebook拒绝评论这一传言，但它显然有所谋划。去年，公司任命备受器重的高管大卫·马库斯（David Marcus）带领一个新团队探索“利用区块链技术的方法”，而区块链正是加密货币的基础。今年4月，老板扎克伯格在公司的年度开发者大会上表示，“汇款应该变得像发送照片那样简单”。Facebook似乎正在与信用卡发卡机构和商家等潜在合作伙伴，以及英国央行行长马克·卡尼（Mark Carney）等金融监管方沟通。

在美国，Facebook的Messenger应用已可实现点对点转账，但只能使用现有货币，而且只能在已关联了银行卡的账户之间进行。但Facebook基于区块链技术的新钱币本身就是一种货币。

Facebook可能会迈出这一步，原因是多方面的。它必须要跟上已经在提供便捷支付功能的其他大型全球应用，比如中国的微信。数字货币应该会对发展中国家适用，那里很多人还没有银行账户，来自国外的汇款又很多。据说印度会是它推出数字货币的首批国家之一。如果实现了商用，而不仅是点对点支付，那么Facebook就可从目前发卡机构收取的费用中分得一杯羹。它还能收取更高的广告费，因为用户将能更快捷地购买这些广告所推荐的产品。Facebook还可以提供小费支付等其他服务，其他支付系统对这类服务的收费过高。（在Facebook的开发者大会上，扎克伯格展示了用户如何用数字零钱给内容创作者打赏。）有关支付的数据将有助于弥补公司

“以隐私为重”的计划将造成的损失，该计划包括允许用户以加密渠道通信等措施。

尽管Facebook这款新货币打着加密技术的旗号，但金融技术分析师莱克斯·索科林（Lex Sokolin）称，它不太可能是比特币的近亲。比特币是一个无人主导的去中心化系统。而Facebook希望能掌控数据收集，简化管理，并避免该货币成为对冲基金等投机者的目标。这将是一款“稳定币”，由美元等传统货币支撑，避免像比特币那样备受波动困扰（比特币在去年跌至3000美元出头，如今又回升至9000美元左右）。监管机构担心新数字货币会像比特币那样引发洗钱或其他犯罪活动，势必会制定严格的规则，或会对转账设置上限，并管制资金跨境流动。

读者众多的科技业简报Stratechery的本·汤普森（Ben Thompson）认为，Facebook拥有很强的优势来做成这件事。目前使用其服务的月度用户达24亿。它可以用折扣吸引商家使用新的数字货币购买广告，用该货币作为奖赏来鼓励用户看广告，或者甚至以此鼓励用户提供自己的数据——这将是Facebook迈出的一大步。

然而，Facebook无法独占这个领域。类似的数字货币已经存在。Signal和Telegram这两款消息应用也在计划推出数字货币。再者，在发达国家，各种银行卡无处不在，在线使用也很方便。而且还有一个问题：尽管Facebook的触角遍及全球，某种FaceCoin是否真的会广受欢迎？人们应该放心让一家对待用户数据漫不经心的公司来处理自己的钱财吗？■



Chinese stocks in America

Far from home

Economic tensions spill into capital markets

AMERICAN INVESTORS wanting a piece of Chinese firms, whether state-owned oil majors or tech stars, need not stray beyond Wall Street. Over the past two decades some 200 Chinese firms have gone public in America, more than from any other foreign country. (Most have their main listing there; a few have a “secondary” one, with a main listing in China.) These firms’ total market value is more than \$1trn. For America’s stock exchanges, that is a great triumph. But trade hawks are starting to describe it as a great liability.

In a letter in April a bipartisan group of politicians led by Marco Rubio, a Republican senator, said American investors faced risks because of exposure to Chinese companies “that pose national-security dangers or are complicit in human-rights abuses”. Steve Bannon, President Donald Trump’s former chief strategist, expanded the focus to all Chinese stocks in America in an interview published on May 22nd in the *South China Morning Post*. “The next move we make is to cut off all the IPOs [initial public offerings], unwind all the pension funds and insurance companies in the US that provide capital to the Chinese Communist Party,” he said.

Those threats might be dismissed as idle, but for the actions of a couple of their targets. On May 24th Semiconductor Manufacturing International Corp (SMIC), China’s largest maker of semiconductors, said it would delist from the New York Stock Exchange. Then on May 28th Bloomberg reported that Alibaba, a New York-listed Chinese e-commerce giant, was considering a second listing in Hong Kong.

There are unglamorous corporate explanations for both moves. SMIC's securities are rarely traded in America (its main listing is in Hong Kong), and Alibaba has long considered selling shares in either Hong Kong or mainland China, partly to broaden its capital base. But it was also easy to discern political motives. The two companies will gain some insulation from America's capital markets and show support for their home side. That message was not lost in China. Several local reports quoted a line by Charles Li, the head of Hong Kong's stock exchange: "Those who travel far always come home some day."

Yet it is premature to proclaim an end to Chinese voyages to the American stockmarket. Indeed, these have so far looked like an exception to the trade war. Just about every facet of the two countries' economic relationship has suffered: trade, investment and even tourism have all declined. But last year more than 20 Chinese companies listed in America, an eight-year high. Another dozen have listed this year.

Chinese firms benefit from deeper liquidity than they can get at home, and more flexible regulations. Profitability requirements have all but blocked Chinese tech firms from mainland exchanges. Last year Hong Kong drew nearer to the American norm by allowing founders to own shares with superior voting rights. But several rising tech stars still opted for Nasdaq, including Pinduoduo, an e-commerce firm, and iQiyi, a video-streaming service. "They view the American market as the gold standard," says Drew Bernstein, the co-head of the China practice at Marcum BP, a firm of accountants.

America has benefited, too. The presence of strong Chinese companies has reinforced its stockmarket's position as the world leader. A series of scams, mostly involving smaller companies, have damaged the reputation of Chinese stocks. But bigger stocks have fared well (Alibaba trades at more than double its IPO price), providing investors with growth and variety.

America's exchanges would be loth to part with them. Shortly after Mr Bannon's interview was published, Bob McCooey, a senior vice-president with Nasdaq, sent out a message to his contacts on WeChat, a Chinese messaging service, which spread quickly among Chinese investors. "Like many of you, I have seen the comments by President Trump's FORMER and discredited adviser Steve Bannon. I do not believe these words to have any truth," he wrote. Nasdaq, he added, still welcomes Chinese companies. It is a message he is likely to find himself repeating. ■



在美上市的中国股票

离家万里

经济紧张局势波及资本市场

美国投资者若想投资中国企业——无论是国有石油巨头还是科技领军企业——不出华尔街就能办到。过去二十年里，约有200家中国企业在美上市，比来自其他任何国家的企业都多。（它们大多数都把美国作为主要上市地；少数是在这里“二次”上市，主上市地在中国。）这些公司的总市值超过1万亿美元。对美国的证券交易所来说，这是个伟大的成就。但贸易鹰派开始将它描述成一个巨大的风险。

以共和党参议员马克·卢比奥（Marco Rubio）为首的一个两党联合团体在4月发表了一封公开信。信中称，美国投资者因所投资的中国企业“对（美国）国家安全构成威胁或成为践踏人权行为的帮凶”而面临风险。5月22日《南华早报》刊登了对特朗普前首席战略顾问史蒂夫·班农（Steve Bannon）的访谈文章，他将目标扩大到所有在美国上市的中国股票。他说：“我们的下一步行动是禁止所有中国企业在美IPO，并且让所有养老基金和保险公司不再向中国共产党提供资金。”

这些威胁原本可能不被人当回事，但几家被列为目标的中国企业有了动作。5月24日，中国最大的半导体制造商中芯国际表示将从纽约证交所退市。5月28日，据彭博报道，在纽约上市的中国电子商务巨头阿里巴巴正考虑在香港二次上市。

两家公司给出的理由都很寻常。中芯国际的证券很少在美国交易（它主要在香港上市），而阿里巴巴老早就在考虑在香港或中国大陆上市，一定程度上是为了扩大其资本金基础。但也很容易看出这些决定背后存在着政治动机。这两家公司与美国资本市场保持一定的距离，并表明对本国的支持。这一信号在中国国内不会被忽略。一些本地媒体在报道中引述了香港交易所总裁李小加的一句话：“远走的人总有一天回家。”

不过，现在就宣称中国企业不会再向美国股市进发还为时过早。实际上，到目前为止，这似乎是一个未受贸易战波及的领域。中美两国经济关系的其他各个方面都受到了冲击：贸易、投资，乃至旅游都出现了下滑。但去年有20多家中国企业在美上市，创八年新高。今年以来又有十几家在美上市。

在美国，中国企业可以享有比在国内更多的流动性及更灵活的监管。对盈利能力的要求几乎阻断了中国科技公司在中国大陆的证交所的上市之路。去年，香港允许企业创始人拥有具有超级投票权的股票，从而向美国的标准靠近了一步。但一些科技新星仍然选择在纳斯达克上市，包括电子商务公司拼多多和视频流媒体服务爱奇艺。“它们将美国市场视为黄金标准。”会计师事务所Marcum LLP的中国业务联席负责人德鲁·伯恩斯坦（Drew Bernstein）表示。

美国也从中受益。强大的中国企业在美上市巩固了美国股票市场在全球的领先地位。主要涉及较小公司的一系列欺诈行为已经损害了中国股票的声誉。但更大的企业的股票表现良好（阿里巴巴的股价是其IPO价格的两倍以上），投资者既收获了回报，也获得了投资多样性。

美国的证交所会很不愿意看到这样的企业撤离。在对班农的采访文章发表后不久，纳斯达克的高级副总裁鲍勃·麦考伊（Bob McCooey）向他微信上的联系人发了一条信息，在中国投资者中迅速传播。“像你们许多人一样，我看到了特朗普前任顾问、被扫地出门的史蒂夫·班农的评论。我认为他的话毫无道理。”他还补充说，纳斯达克仍然欢迎中国企业。这样的意思他可能还会重复表达很多次。 ■



Behavioural biometrics

The way you walk

Your phone uses your gait and sleep patterns, all in the name of security

MOST ONLINE fraud involves identity theft, which is why businesses that operate on the web have a keen interest in distinguishing impersonators from genuine customers. Passwords help. But many can be guessed or are jotted down imprudently. Newer phones, tablets, laptops and desktop computers often have beefed-up security with fingerprint and facial recognition. But these can be spoofed. To overcome these shortcomings, the next level of security is likely to identify people using things which are harder to copy, such as the way they walk.

Many online security services already use a system called device fingerprinting. This employs software to note things like the model type of a gadget employed by a particular user; its hardware configuration; its operating system; the apps which have been downloaded onto it; and other features, including sometimes the Wi-Fi networks it regularly connects through and devices like headsets it plugs into.

The results are sufficient to build a profile of both the device and its user's habits. If something unusual is then spotted—say, a bank detects access to an account from a phone with a different profile from that which a customer usually uses—it can take appropriate measures. For example, additional security questions can be posed.

LexisNexis Risk Solutions, an American analytics firm, has catalogued more than 4bn phones, tablets and other computers in this way for banks and other clients. Roughly 7% of them have been used for shenanigans of some sort. But device fingerprinting is becoming less useful. Apple, Google and

other makers of equipment and operating systems have been steadily restricting the range of attributes that can be observed remotely. The reason for doing this is to limit the amount of personal information that could fall into unauthorised hands. But such restrictions also make it harder to distinguish illegitimate from legitimate users.

That is why a new approach, behavioural biometrics, is gaining ground. It relies on the wealth of measurements made by today's devices. These include data from accelerometers and gyroscopic sensors that reveal how people hold their phones when using them, how they carry them and even the way they walk. Touchscreens, keyboards and mice can be monitored to show the distinctive ways in which someone's fingers and hands move. Sensors can detect whether a phone has been set down on a hard surface such as a table or dropped lightly on a soft one such as a bed. If the hour is appropriate, this action could be used to assume when a user has retired for the night. These traits can then be used to determine whether someone attempting to make a transaction is likely to be the device's habitual user.

Behavioural biometrics make it possible to identify an individual's "unique motion fingerprint", says John Whaley, head of UnifyID, a firm in Silicon Valley that is involved in the field. With the right software, data from a phone's sensors can reveal details as personal as which part of someone's foot strikes the pavement first, and how hard; the length of a walker's stride; the number of strides per minute; and the swing and spring in the walker's hips and step. It can also work out whether the phone in question is in a handbag, a pocket or held in a hand.

Using these variables, UnifyID sorts gaits into about 50,000 distinct types. When coupled with information about a user's finger pressure and speed on the touchscreen, as well as a device's regular places of use—as revealed by its GPS unit—that user's identity can be pretty well determined, Mr Whaley claims. UnifyID began offering behavioural biometrics to its clients (which

include retail banks, online retailers, delivery companies and ride-sharing firms) in 2017. In time, advertisers will pay for the scoop on individuals' lifestyle-revealing movements, reckons Mr Whaley, though his firm has no plans yet to expand in that direction.

Behavioural biometrics can, moreover, go beyond verifying a user's identity. It can also detect circumstances in which it is likely that a fraud is being committed. On a device with a keyboard, for instance, a warning sign is when the typing takes on a staccato style, with a longer-than-usual finger "flight time" between keystrokes. This, according to Aleksander Kijek, head of product at Nethone, a firm in Warsaw that works out behavioural biometrics for companies that sell things online, is an indication that the device has been hijacked and is under the remote control of a computer program rather than a human typist.

On a device with a touchscreen rather than a keyboard, however, the reverse is true. Most people type with their thumbs on touchscreens, so flight times between keystrokes are longer. In this case, therefore, it is short flight times which are a signal of something suspicious going on—for example, that a touchscreen device is actually being operated remotely, using the keyboard of a laptop.

Used wisely, behavioural biometrics could be a boon. As Neil Costigan, the boss of BehavioSec, a behavioural-biometrics firm in San Francisco, observes, the software can toil quietly in the background, continuously authenticating account-holders without badgering them for additional passwords, their mother's maiden name "and all that nonsense". UnifyID and an unnamed car company are even developing a system that unlocks the doors of a vehicle once the gait of the driver, as measured by his phone, is recognised.

Used unwisely, however, the system could become yet another electronic

spy on people's privacy, permitting complete strangers to monitor your every action, from the moment you reach for your phone in the morning, to when you fling it on the floor at night. ■



生物行为特征识别

你走路的样子

你的手机利用了你的步态和睡眠模式，皆以安全之名

大多数在线欺诈都涉及身份盗用，所以在线运营的企业非常希望能将盗用身份者与真正的客户区分开来。密码有一定作用。但很多人的密码可能会被猜到，或被随手记在不安全的地方。较新款的手机、平板电脑、笔记本电脑和台式电脑通常有指纹和面部识别功能来增强安全性。但这些也可以被蒙混过关。为了克服这些缺点，更高一级的安全验证手段很可能会用步态等更难复制的东西来识别身份。

许多网络安全服务已经在使用一种叫作设备指纹识别的系统。该系统运用软件来记录某个用户所用设备的型号、硬件配置、操作系统、已下载应用，以及其他信息，包括设备经常接入的Wi-Fi网络和插入的耳机等。

这些信息足以构建出一个关于设备及其用户习惯的特征概述。一旦发现异常，例如银行检测到登入某账户的手机与客户通常所用手机的特征不同，就可以采取适当的措施，比如提出附加安全问题。

美国分析公司LexisNexis风险解决方案（LexisNexis Risk Solutions）已经以这种方式为银行等客户编制了超过40亿部手机、平板电脑和其他计算设备的特征目录。这些设备中约有7%曾被用于某种形式的欺诈。但设备指纹识别正变得越来越不实用。苹果、谷歌和其他设备及操作系统的制造商不断收紧可被远程观测到的特征范畴。这是为了限制未经授权者可获得的个人信息量，但也使得区分非法与合法用户变得更难了。

在这种情况下，一种新的方法越来越受欢迎。生物行为特征识别技术依赖今天的设备所做的大量测量。这包括由加速度计和陀螺仪等各类感应器生成的数据，揭示出人们使用手机时拿手机的方式、携带手机的方式，甚至是行走的方式。通过监控触屏、键盘和鼠标，可以得知用户的手指和手移动的独特方式。传感器可以检测到手机是放在桌子等硬质表面上还是轻轻

地丢在床之类的柔软表面上。如果是夜晚，则可以通过放手机的动作来估计用户何时就寝。然后就可以利用这些特征数据来判定尝试进行交易的人是否可能是该设备的惯常用户。

位于硅谷的UnifyID就是一家生物行为特征识别技术公司，其负责人约翰·惠利（John Whaley）说，这种技术可以识别出一个人“独有的动态指纹”。通过合适的软件，来自手机传感器的数据可以揭示出非常个性化的细节，比如某人走路时脚的那个部位先着地，力度多大，步幅多长，每分钟走多少步，以及臀部和步子的摇摆和跳跃幅度。还可以确定所识别的手机是放在手提包里、口袋里，还是拿在手上。

利用这些变量，UnifyID将步态分为大约五万种不同类型。惠利声称，再加上用户在触屏上的手指压力和速度方面的信息，以及GPS所显示的设备日常使用地点，就能很好地确定用户身份。2017年，UnifyID开始向其客户（包括零售银行、在线零售商、快递公司和网约车公司）提供生物行为特征识别技术。惠利认为，假以时日，广告商将付费购买揭示个人生活方式的动作数据。不过他的公司目前还没有向这个方向扩展的计划。

生物行为特征识别技术不仅可用于验证用户身份，还可能检测到正在进行中的欺诈行为。例如，在一个带键盘的设备上，如果打字断断续续，每次击键之间的手指“移动时间”比通常长，就是一个警示信号。华沙的公司Nethone为电商企业开发生物行为特征识别技术，其产品负责人亚历山大·基耶克（Aleksander Kijek）说，出现这种情况表明该设备已被劫持，信息输入受计算机程序远程控制，而非由人员手动输入。

在有触屏而没有键盘的设备上，情况正好相反。大多数人用拇指在触屏上打字，因此按键之间的移动时间比在键盘上更长。因此，在这种情况下，移动时间变短则表明有可疑操作正在进行。例如，实际是有人正在用笔记本电脑的键盘远程操控触屏设备。

利用得当，生物行为特征识别技术会是一个福音。正如旧金山从事该技术的公司BehavioSec的老板尼尔·科斯蒂根（Neil Costigan）所说，软件可以

在后台默默工作，持续对帐户持有人做身份验证，而不会不停地要求用户输入额外的密码、妈妈的姓氏和“其他烦人的东西”。UnifyID和一家未披露名字的汽车公司甚至正在开发一种系统，该系统一旦通过手机数据识别出了车主的步态，就会自动为他解锁车门。

但若部署不当，这种系统可能会成为又一类窥探隐私的电子间谍。从早上伸手拿手机那一刻起，到晚上把它扔在一边，你的一举一动都将在陌生人的监视之下。 ■



Climate change

Not-so-cold comfort

China is surprisingly carbon-efficient—but still the world's biggest emitter

WITH ITS four-tiered smog warnings and lethal dumps of toxic waste, China has become Exhibit A for the environmental costs of economic development. Its growing meat consumption and reliance on fossil fuels have also made it a focus for people worried about climate change.

In one sense, China's reputation as the bellows of "hothouse Earth" is overblown. Since 1850 countries with a GDP per head of \$12,000-16,000 in 2019 dollars have produced a population-weighted average of 10.6 tonnes of carbon dioxide-equivalent gases per person per year. In 2016 China's GDP per head was \$14,000, and it emitted just 9.3 tonnes per person.

Moreover, China pollutes far less per person than Western countries did at the same stage of development. When America, France, Britain and Germany had incomes similar to modern China's, they relied on inefficient power stations and cars, and spewed out 16.6 tonnes per person.

The combination of China's huge population and rapid GDP growth has nonetheless made it the world's biggest emitter of carbon. China is predicted to produce 16bn tonnes of greenhouse gases in 2030—four times the entire world's output in 1900.

To prevent the stock of greenhouse gases in the atmosphere from reaching levels likely to cause disastrous warming, China must do better than merely beating the past records of richer countries. Instead, it will need an unprecedented decline in emissions per head—at least to the more carbon-efficient level of similarly rich Latin American economies, and ideally onto the trajectory of poorer Asian giants like India and Indonesia, which rely

less on heavy industry and manufacturing. Those countries, perched at the sweltering latitudes where farmers will be most hurt by climate change, must in turn work out how to reach upper-middle-income status without replicating China's emissions path.

To their credit, Chinese authorities, spurred by public concern about air pollution, have prioritised green policies, such as switching from coal-fired power stations to renewable sources and setting up an emissions-trading system. China's annual rate of emissions growth has fallen from 9.3% in 2002-11 to 0.6% in 2012-16. The waning of its cement-intensive construction boom should slow emissions further. But it will take more than incremental gains to stave off severe warming. ■



气候变化

略感安慰

中国的碳效率之高出人意料，但它仍是全球最大的碳排放国

从四级雾霾预警到成堆的致命毒垃圾，中国已成为了为发展经济而付出环境代价的典型案例。它不断增长的肉类消费量以及对化石燃料的依赖也让它成为关心气候变化的人士的聚焦点。

在某种意义上，称中国为“温室地球”的风箱言过其实了。自1850年以来，人均GDP在1.2万至1.6万美元（按2019年美元计）的国家（经人口加权平均）每人每年产生的温室气体是10.6吨二氧化碳当量。2016年，中国人均GDP为1.4万美元，而人均二氧化碳排放量仅为9.3吨。

此外，中国的人均污染量远低于西方国家当年处于同样发展阶段时的污染水平。美国、法国、英国和德国在国民收入与当今中国差不多的时候依赖的是低能效的发电站和汽车，人均排放量为16.6吨。

尽管如此，庞大的人口和快速增长的GDP还是让中国成为了全球最大的碳排放国。预计到2030年，中国的温室气体排放量将达到160亿吨，是1900年全球总排放量的4倍。

大气中的温室气体存量达到一定程度可能会导致灾难性的气候变暖。为防止这种情况，中国仅仅比富裕国家在过去做得更好还不够。它还需要以前所未有的力度降低人均碳排放量——至少要达到与中国富裕程度相当的一些拉美经济体的碳效率水平，理想的情况是提高到和印度、印尼等相对贫穷的亚洲大国差不多的水平，这些亚洲大国对重工业和制造业的依赖度较低。由于地处酷热难耐的低纬度地区，气候变化对当地农民的危害最大，这些国家必须找到办法，在向中高收入国家的行列攀登时不用走中国碳排放的老路。

值得称道的是，公众对空气污染的关注已经促使中国政府将环保政策放在

了重中之重，比如从燃煤发电站转向使用可再生能源，并建立了碳排放交易体系。中国的碳排放年增长率已从2002至2011年间的9.3%下降到2012至2016年间的0.6%。随着大量使用水泥的建筑热潮的消退，中国的碳排放增速应该会进一步减缓。但是，要避免严重的气候变暖，需要的不仅仅是渐进式的改进。■



Central banks

Think bigger

To equip themselves for the next recession, central banks face a delicate task

IT HAS BEEN a decade since America's latest recession, and it has taken that long for the Federal Reserve to ask itself whether it is ready for the next one. On June 4th officials and scholars gathered in Chicago to debate how monetary policy should work in a world of low interest rates. The benchmark rate is 2.25-2.5%, which gives the Fed little room to cut before hitting zero—and less than half as much as it has needed in past downturns. As if to remind policymakers that rock-bottom rates are here to stay, the ten-year Treasury yield fell below 2.3% late last month. Other central banks, many of which preside over still lower rates and weaker economies, are looking to the Fed for inspiration.

The belated battle-planning, although welcome, is awkwardly timed. Central banking is becoming more politicised. President Donald Trump has called for the Fed to cut rates and tried unsuccessfully to appoint two of his cronies to its board. Left-wingers are increasingly interested in taking charge of monetary policy. In Britain they have suggested, variously, that the Bank of England should cap house-price growth and target productivity—as if the rate of technological change were a monetary phenomenon. Central banks are often eyed as a source of cash for infrastructure investment or for fighting climate change. The European Central Bank's quantitative easing (QE), bond-buying with newly created money, is a source of tension between euro-zone countries, helping make the ECB's leadership race even more political than usual.

Given these pressures, central bankers' caution should hardly be surprising. They surely fear that overhauling their targets and tools could lead to a

free-for-all in which stability and independence give way to populist interference or even economic quackery. But that is not a sufficient reason to hold back. A worse danger is that the world faces a downturn it cannot adequately fight (see United States section). Central banks need to prepare for what is coming, by looking afresh at their targets and their tools, even as they strive to keep their independence.

Unfortunately, the outcome of the review is likely to be just a tweak to the Fed's target or its communications policy and a decision not to change to its tools. The Fed may pledge to redefine its inflation goal, of 2%, so that this applies on average over the economic cycle. Overshoots during booms would make up for shortfalls during busts. The theory is that this might help deal with interest rates stuck near zero, by boosting inflation expectations in a downturn. That would mean real rates were lower, giving the economy a boost.

However that is likely to prove too modest. Start with targets. Inflation has undershot the Fed's target 85% of the time since it was announced in 2012. Financial markets expect these shortfalls to continue for years. Investors may well ignore any new pledges from central bankers to get inflation above the target. And even if they believed the Fed, the cut in real interest rates would be too small to offset a bad bust. In the dark days of 2009 one rule of thumb for monetary policy suggested that nominal interest rates needed to be almost minus 4%.

The tools are equally in need of an overhaul. Most central banks have three unconventional policies to stimulate depressed economies: QE, forward guidance (trying to talk down bond yields) and negative interest rates. Debate rages over the effectiveness of QE—some see it as little more than forward guidance in disguise. Yet forward guidance is not always credible, whether it is disguised or not. And deeply negative interest rates require

reforms to prevent people from hoarding cash or from causing instability at banks, which will struggle to get people to pay them for taking deposits.

If the reforms are inadequate, the result could be a long and ruinous slump. Avoiding that fate is worth the risks. Central banks should thus swap their inflation targets for something better—we favour a target for nominal GDP, a measure that is more closely tied to the fortunes of debtors and investors—and they should search for new sources of monetary ammunition.

Politicians will inevitably play a part in the choice of such innovations—and rightly so, because they set the framework for the technocrats. What is more, the necessary work will take sustained effort, not a single meeting. The bankers should not be cowed by the threat of politicisation. Their work is too urgent and too important for that. ■



央行

着眼更高处

要准备好应对下一场衰退，各国央行面对一项需要小心拿捏的任务

距美国最近一次经济衰退已过了十年，而美联储也花了同样长的时间自问是否已为下一次衰退做好了准备。6月4日，官员和学者们齐聚芝加哥，讨论货币政策该如何在一个低利率的世界中发挥作用。目前的基准利率在2.25%到2.5%之间，距零利率之近令美联储没有多少降息的空间。而且，这样的数字还不到过去的经济衰退期它所需的利率水平的一半。上月末，十年期国债收益率跌至2.3%以下，似乎在提醒政策制定者低利率的情形还将继续。而其他国家央行治下的利率甚至还要低，经济也更疲软，它们正在向美联储寻求灵感。

迟来的战斗计划虽值得欢迎，发生的时间却比较尴尬。央行的角色正变得越来越政治化。特朗普呼吁美联储降息，还试图任命自己的两个亲信加入美联储董事会未果。左翼人士对掌控货币政策的兴趣日渐增长。在英国，他们以各种各样的方式建议英格兰银行限制房价上涨并紧盯生产率——就好像技术变革的速度是一种货币现象似的。央行常被视为基础设施投资或对抗气候变化的资金来源。欧洲央行的量化宽松政策（QE，即通过加印新钞来购买债券）是欧元区国家之间关系紧张的一个源头，令欧洲央行的领袖职位之争变得愈发政治化。

鉴于这些压力，央行官员的谨慎并不叫人意外。他们无疑担心大举修订自己的目标和工具会导致一种所有人都可以参与进来的大混战，原本的稳定和独立让位于民粹主义的干涉甚至经济上的骗人把戏。但这并不是不作为的充分理由。更糟糕的危险是世界正面临一场衰退却无法正确抗击它。各国央行在努力保持自身独立的同时，还需重新审视自己的目标和工具，为即将到来的局面做好准备。

遗憾的是，审视的结果可能只是美联储微调了自己的目标或沟通政策，而

做出不改变其工具的决定。美联储可能会承诺重新定义其2%的通胀目标，以便它在整个经济周期内都普遍适用。在繁荣时期超出目标应会弥补在萧条期间未达到目标。理论上看，这会在经济低迷时提高通胀预期，这也许有助于应对在零附近徘徊的低利率。这将意味着实际利率会下降，从而推动经济增长。

然而，到头来这可能还是太小打小闹了。先来看目标。自2012年美联储宣布2%的目标以来，通胀率在85%的时间都低于这一目标。金融市场预计这种状况还将持续多年。投资者很可能会忽视央行官员声称要使通胀高于目标的任何承诺。而即使他们相信美联储，实际利率下调的幅度也会太小，无法抵消严重经济衰退的影响。根据货币政策的一个经验法则，在2009年的灰暗日子里，当时的名义利率几乎需要降到负4%。

央行的工具同样需要全面的改革。大多数央行都有三项非常规政策可用于刺激不景气的经济：量化宽松、前瞻指引（试图压低债券收益率）和负利率。围绕量化宽松有效性的争论十分激烈，有些人认为它只不过是披着伪装的前瞻指引。然而，不管是否伪装，前瞻指引并不总是可信。而实施严重的负利率则需要改革来防止人们囤积现金或造成银行不稳定，因为银行将很难让人们为了把钱存在银行而付钱给银行。

如果改革不充分，结果可能就是毁灭性的长期经济滑坡。为了避免这种命运，冒险是值得的。因此，各国央行应该用更好的选择来替换其通胀目标。我们主张采用名义GDP作为目标，这一指标与债务人和投资者的际遇联系得更紧密。此外他们还应寻找新的货币政策弹药的来源。

政客们不可避免地将参与到这类创新的选择中，而且他们理当如此，因为他们为技术官僚设定框架。更重要的是，这项必须的工作需要不断为之努力，而不是仅靠一次会议就能一蹴而就。央行官员们不应被政治化的威胁吓倒，因为他们的工作太紧迫也太重要了。 ■



Inequality

The listening cure

A Wall Street trader's photographic journey to neglected parts of America

EIGHT YEARS ago Chris Arnade, a physicist turned Wall Street trader, ventured up to Hunts Point, a rough and isolated section of the South Bronx, armed with curiosity and a camera. A habitual walker, Mr Arnade had begun to feel a sort of moral restlessness in the wake of the financial crisis. In his view, his industry was responsible for—yet largely insulated from—the effects of the recession.

He realised that he knew far too little about the many Americans who were much poorer than his social circle. So, in the Bronx, he began talking to people and photographing them. What he encountered “wasn’t what I was told I would find—it was welcoming, warm and beautiful, not empty, dangerous and ugly.” Thus began a 150,000-mile, multi-year journey through unthriving America—urban and rural, black and white, from Lewiston, Maine, to Bakersfield, California, with many waypoints in between—that Mr Arnade has woven into “Dignity”, his deeply empathetic book. A few of the pictures he took on his travels appear here.

“Dignity” is “about” inequality in much the same way that James Agee’s “Let Us Now Praise Famous Men”—a seminal study of tenant farmers in Alabama, illustrated with stark photographs by Walker Evans—was “about” the Great Depression. Both works illuminate the reality of political and economic forces that might seem familiar in outline, by showing their effects on ordinary people.

Mr Arnade offers a handy framework for thinking about inequality. People like him are “akin to the kids who sat in the front row”—strivers eager to

learn and achieve. Front-row people believe in science, data and progress. They cluster in big cities, often leaving their home towns behind, both for the sake of opportunity or because they felt judged, out of place and hemmed in. They are careerists, often liberal in politics but afflicted by immense blind spots. “We had compassion for those left behind,” Mr Arnade confesses, “but thought that our job was to provide them an opportunity (no matter how small) to get where we were.” That, he discovers, was a patronising mistake: “It didn’t occur to us that what we valued...wasn’t what everyone else wanted.”

Back-row people did less well at school—because they disliked it, or were obliged to leave to earn money, or were distracted by personal problems. Affinity, family or lack of alternatives kept them more bound to place than the nomadic denizens of the front row. As a woman in Cairo, Illinois, tells Mr Arnade: “When you don’t have anything else all you got is your home.” A generation or two ago, many such people could have stayed put in comfort. Factories provided plentiful jobs at decent wages in small and medium-sized towns across America. The pay might not have made anybody rich, yet it provided a middle-class life for people who had a sound work ethic but no college education.

More important, jobs conferred dignity. This, argues Mr Arnade, is what (deliberately or not) the front row routinely denies the back row, and what he seeks in some measure to restore. On that score, his book succeeds. Mr Arnade went to a lot of places that his peers have little cause to visit. He talked to a lot of people who are often ignored, and has rendered them visible.

Some of the characters he evokes are haunting: the prostitute who left home after finding her mother unconscious in the company of strangers; the

shrewd and diligent drug-dealer in Selma, Alabama; the welcoming wife of a storefront-preacher; the retired factory workers catching up over morning coffee at a McDonald's on Milwaukee's north side. Mr Arnade spends a good deal of time in McDonald's restaurants across America, which often become de facto community centres.

His photographs—of addicts and street scenes, invalids and sports events—are uncaptioned, which lends them an everyman air. But they are intimate and unflinching. He quotes people at length, letting them define themselves on their own terms. “Everyone wants to feel like a valued member of something larger than themselves,” he writes. In his telling, back-row Americans find this sense of belonging in places “that [do not] demand credentials”, whether it be church, family or people who share their drug habit.

The portrayal of front-row Americans is much less nuanced. It may be true that America’s elite move more often and value education as a path to advancement. But it does not follow that all of them define “success as all about how much you can learn and then earn”, or put “owning more stuff” above everything else. It is true that racism persists in America, but for a middle-aged man raised in the small-town South, as Mr Arnade was, to say that race relations today are “just the same ol’ thing, dressed up differently” is both facile and inaccurate.

Still, these caricatures may let his front-row readers know how it feels to be stereotyped. To Mr Arnade’s credit, he shies away from prescriptions beyond observing that “we all need to listen to each other more”. Self-deprecatingly, he calls that “wishy-washy”, but it is not; for adults caught in the maelstrom of jobs and relatives and daily life, listening is hard. “Attention is the beginning of devotion,” wrote Mary Oliver, an American poet. Mr Arnade is scarcely the only commentator to worry that Americans have grown less attentive to each other. But in listening himself, and reminding his

compatriots to do so more, he sets out a path to greater devotion. ■



不平等

聆听疗法

一名华尔街交易员在美国被忽视角落的摄影之旅【《尊严：在美国“后排”寻求尊重》书评】

八年前，物理学家出身的华尔街交易员克里斯·阿纳德（Chris Arnade）带着满心好奇和一部相机，来到纽约南布朗士（South Bronx）混乱偏僻的亨茨点（Hunts Point）一带“探险”。这位徒步爱好者在金融危机过后开始感到某种良心不安。在他看来，自己所在的行业要为经济衰退负责，但这个行业本身却没有受到衰退多少影响。

他意识到，他对于比他的社交圈子穷得多的众多美国人知之甚少。因此，在布朗士，他开始和人们攀谈，给他们拍照。他说自己遇到的“并不像别人告诉我的那样。那里其实热情、温暖又美丽，并不空洞、危险而丑陋”。就这样，他开始了长达15万英里、历时数年的穿越美国落后地域之旅。从缅因州的刘易斯顿（Lewiston）到加利福尼亚的贝克斯菲尔德

（Bakersfield），他走过城市和农村，黑人区和白人区，一路在许多地方停留。他将这段旅程写进了《尊严》（Dignity）一书——一部深具同理心的作品。本文中的几幅图片就是他在旅行中拍摄的照片。

《尊严》描绘不平等的方式与詹姆斯·阿吉（James Agee）所著《现在，让我们赞美伟大的人》（Let Us Now Praise Famous Men）描绘大萧条的方式如出一辙。后者是对阿拉巴马州的佃农所做的一项开创性的研究，辅以沃克·埃文斯（Walker Evans）质朴写实的摄影作品。两部作品都通过展示那些大体上似曾相识的政治和经济力量对普通人的影响，阐明了这些力量的现实状况。

阿纳德为思考不平等问题提供了一个有用的框架。像他这样的人“就像坐在教室前排的孩子”，是渴望学到东西、获得成功的奋斗者。“前排”的人相信科学、数据和进步。他们聚集在大城市，通常是背井离乡——要么是为了寻找机会，要么是因为在小地方感到被评判、格格不入、被束缚。他

们是事业上的野心家，在政治上常常是自由派，却又受到大量盲点的限制。“我们同情那些被落下的人，”阿纳德坦言，“但又觉得我们的工作是为他们提供一个机会（无论多么小），让他们能赶上我们一些。”他发现，这犯了一种自以为高人一等的错误：“我们没有意识到，我们珍视的东西……并不是每个人都想要的。”

“后排”学生在学校的表现不太好，因为他们不喜欢学校，或者被迫退学去挣钱，或者因个人问题而分散了注意力。与四处迁移的“前排”人相比，类同、家庭或是别无他途让他们更容易被束缚在某个地方。伊利诺斯州开罗市（Cairo）的一位女士告诉阿纳德：“当你一无所有时，你能有的只是你的家。”若是在三五十年前，许多这样的人应该能安稳地生活。那时，在美国的中小城镇，工厂提供了大量工作岗位，工资也不错。收入水平可能不会让每个人都富裕，但给那些有良好职业道德但没有受过大学教育的人提供了中产阶级的生活。

更重要的是，工作赋予了他们尊严。阿纳德认为，尊严正是“前排”（有意或无意地）常常拒绝给予“后排”的，也是他寻求在某种程度上重塑的东西。在这一点上，他的书成功了。阿纳德去了很多他那样的人没有什么理由要前往的地方。他与许多经常被忽视的人交谈，并且让他们被人们“看见”。

他描绘的一些人物形象令人难以忘怀：一名妓女发现母亲在几个陌生人旁边不省人事后离开了家；阿拉巴马州塞尔玛市（Selma）一位精明而苦干的毒贩；一个在商店门口布道的人的热情的妻子；在密尔沃基（Milwaukee）城北的一家麦当劳里，退休工人们早晨聚在一起喝咖啡。阿纳德花了很多时间探访美国各地的麦当劳餐厅，那里往往是事实上的社区中心。

他拍摄的照片——有瘾君子和街景、病残者和体育比赛——没有配文字说明，这更让照片中的场景显得寻常。但他们亲密无间，毫不畏惧。他详尽地引用人们的话，让他们用自己的方式定义自己。“每个人都想在自身之

外成为有价值的成员。”他写道。在他的叙述中，“后排”的美国人发现这种归属感存在于“那些（不需要）资质证书的地方”，无论是教堂、家庭还是瘾君子之中。

对“前排”美国人的描述则远没有那么细致入微。诚然，美国的精英阶层可能更频繁地迁移，并将教育视为上升的通道。但这并不意味着他们所有人就都把成功定义为“你能学到多少东西，然后赚多少钱”，或是把“拥有更多东西”放在第一位。种族主义在美国确实依然存在，但对于像阿纳德这样一个在南方小镇长大的中年男人来说，把如今的种族关系说成是“新瓶装旧酒”，是轻率且不准确的。

不过，这些夸大了某些部分的速写可能会让他的“前排”读者一尝被脸谱化的感受。值得称道的是，在提出“我们都需要更多地倾听彼此”之外，阿纳德并没有急于开出什么药方。他自嘲地说自己的结论很空泛。实则不然。对于陷入工作、亲戚和日常生活的漩涡中的成年人来说，倾听是困难的。美国诗人玛丽·奥利弗（Mary Oliver）曾写道：“专注是奉献的开始。”阿纳德并不是唯一一个担心美国人越来越互不关心的评论家。但是，通过倾听自己内心的声音，并提醒他的同胞们更多地这样做，他开辟了一条通往做出更多奉献的道路。 ■



The Economist Film

Clothes of the future

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经济学人视频

未来的服装

机器学习技术能够从不断增长的大量数据中迅速发现各种模式，如今它已成为预测时尚的关键要素



Anheuser-Busch InBev

Bud far from Stella

The world's mightiest beermaker needs a fresh way to grow

SNOOTY ALE connoisseurs mock Budweiser's usurped title of "King of Beers". No one, however, quibbles that Bud's purveyor, Anheuser-Busch InBev (ABI), reigns over global brewing. The all-conquering firm now sells almost three Olympic-sized swimming pools of beer an hour—more than its three nearest rivals combined. Yet even as profits have frothed, weariness has descended upon the head that wears the crown. ABI's prospects, once as golden as its Corona lager, have assumed the cloudier quality of a Belgian *witbier*.

ABI, which is nominally based in the Flemish city of Leuven but run out of New York, is not just much bigger than its rivals, selling one in four beers worldwide. It also generates around half the industry's global profits. Its gross operating margins were 40% in 2018, more than double the average for other listed brewers—and stellar by the standards of firms that peddle any kind of consumer goods. It has devoted managers, nearly all recruited out of university. The looming presence of ABI's boss, Carlos Brito, in the company's corridors, can feel almost eerie. Employees' fealty to "Brito", as the methodical Brazilian is universally known, is reminiscent of General Electric under Jack Welch.

Investors' similar devotion to the company as a whole is increasingly being tested. The first set of worries is specific to ABI.

Its agglutinated name points to a firm whose trajectory has been set by financiers, not brewers. At its core is a trio of Brazilian investors best-known for later starting 3G Capital, a private-equity fund which has snapped up

other food firms such as Burger King and Kraft Heinz. They used Brahma, a Brazilian beer firm they acquired in 1989, as a platform to buy up rivals the world over: Interbrew, a Belgian brewer which makes Stella Artois, in 2004; Anheuser-Busch, the American owner of Budweiser, in 2008; and SABMiller, its biggest remaining rival, in 2016. Mr Brito is their main lieutenant. He has led ABI since 2005 atop a Brazilian-heavy management team with a lust for trimming fat from flabby conquests.

The successful two-pronged strategy of serial acquisitions and cost-cutting appears to be nearing its limits, however. Having consolidated the fragmented beer industry—four of the ten biggest brewers in 1990 are part of its empire—no large rivals remain to be taken over without goading competition authorities. As for cost-cutting, by the end of the year ABI will have wrung out the last of the \$3.2bn of annual savings it expected from SAB.

At the same time, cost controls espoused by ABI and its 3G-run cousins—starting with every manager having to justify every dollar of spending anew each year—have come under scrutiny. Kraft Heinz's shares tumbled in February after it wrote down the value of its assets by \$15bn. Many took it to be a tacit admission that its cost-cutting had done the business harm. The announcement by Kraft Heinz on May 6th that it would have to restate nearly three years of results, after an internal probe unearthed “misconduct” in its procurement procedures, though not directly linked to “zero-based budgeting” or 3G’s other distinctive management techniques, nevertheless cast a shadow over them.

Mr Brito is adamant that problems at Kraft Heinz are not ABI’s concern. His own cost-curbing philosophy—to redirect spending from wasteful things to wiser ones like marketing, he says, not strip expenses willy-nilly—does seem less draconian than Kraft Heinz’s. “We are not a 3G company,” he insists. Investors are not so sure. ABI’s own share price dipped briefly in February in the wake of Kraft Heinz’s impairment. ABI’s erstwhile top

marketeer has been parachuted in to fix the food giant.

Either way, ABI needs a new growth strategy, having squeezed its historic one dry. Expanding its small non-beer offering—buying Coca-Cola, for example, or Diageo, which mainly sells spirits—once seemed like the obvious thing to do. But a daring takeover seems unlikely. The £79bn (\$98bn) bid for SABMiller three years ago landed ABI with net debt of over \$100bn, nearly five times last year's earnings before interest, tax, depreciation and amortisation. Repayment has been slow, not least because ABI has borrowed largely in dollars and euros but earns most of its money in the fragile currencies of volatile emerging markets like Brazil and South Africa.

Worries about debt caused its shares to tumble by 38% in 2018, a third straight year of decline. The share price has recovered half of last year's losses, though it still looks cheap relative to expected earnings compared with its two closest rivals, Heineken and Carlsberg—ABI's superior margins notwithstanding. It is also still down by a third since the SAB deal, even as the shares of smaller rivals have risen smartly.

In a humbling turn, ABI's board (which the Brazilian investors control alongside a group of Belgian heirs) halved its dividend in October to pay down debt. On May 7th it confirmed rumours that it is exploring listing a minority stake in its Asian operation, estimated to be worth perhaps a quarter of the group's \$172bn market value.

No wonder Mr Brito says reducing debt is his priority. More specifically, analysts reckon, he wants to make it more manageable by boosting profits. Now that Kraft Heinz's woes make some investors take a leery view of ABI's fat margins, lest they too are down to indiscriminate cost-slashing, the focus has turned to increasing earnings by growing revenues from beer.

Beermaking is not what it used to be, however. Brewers are seeing demand for their tipple dry up. In America, ABI's biggest single market by revenue, beer is losing "share of throat", in industry jargon, to wine and spirits, just as people are drinking less booze. The only rival of any size whose shares have underperformed ABI's is predominantly American Molson Coors. Youngsters across the rich world are spending less time in the pub and more at the gym (or smoking cannabis, another alternative to beer). Nearly a quarter of young Brits are teetotal.

Consumption is rising in poor countries, where 57% of ABI's revenues now come from, in part thanks to SAB. But even there growth has slowed. Beer sales used to closely track the global economy, notes Ed Mundy at Jefferies, a brokerage. In future he expects them to grow a third as fast as GDP—or a paltry 1% a year.

Such trends explain why ABI shipped barely 0.3% more pints in 2018 than the previous year. Exclude acquisitions and ABI has not increased beer volumes in over a decade. Sales growth, of 4.7% a year since 2008, is largely thanks to what Mr Brito calls "revenue management initiatives"—or, in plain English, selling ABI's existing beers at higher prices.

Mr Brito wants to emulate the spirits-and-wine trade, where consumers pay vastly higher prices for top brands than for mainstream ones. For example, ABI owns lots of labels which are nothing special at home but marketed as posh overseas: Budweiser, America's bog-standard lager, sells for a premium in China; Stella, which Europeans quaff at football games, is served with three-course dinners across the pond. Around the world, dozens of craft breweries that ooze local charm and anti-capitalist mystique—think Camden Town Brewery or Goose Island—are, in fact, owned by ABI. But growth in craft-beer consumption, too, looks flat; people will only pay so much for ultra-hoppy ales.

Analysts fret that ABI's margins in emerging markets may come under attack next. Competition there used to be as weak as a Bud Light. Brewers did not unduly tread on rivals' historic patches. No longer. "The competitive intensity has gone up a notch in recent years," says Trevor Stirling of Sanford C. Bernstein, a research group. Countries that used to be beer monopolies, or at worst comfortable duopolies, are being besieged by outsiders. Heineken is making a big push into Brazil and Colombia, which would once have been considered an act of *lèse-majesté* against ABI. In November Heineken sealed a joint venture with China Resources, that country's biggest brewer. The listing of ABI's Asian business, if it happens, may help it retaliate by acquiring its way to a bigger market share in places where it is weak.

Mr Brito insists growth is still there if you know where to look for it. Non-alcoholic beers have got tastier thanks to improved recipes and are also growing quickly; Mr Brito theatrically cracked one open at ABI's annual shareholder meeting in April. Once considered the preserve of young men, beer is increasingly marketed to women and older folk. First-quarter results reported on May 7th suggest Mr Brito could be on to something. Revenue grew by a respectable 5.9% year on year.

Sceptics question whether a corporate culture built around Excel wizards can be retooled into one where marketers eek out incremental market-share gains, quarter after quarter. Mr Brito may yet prove the doubters wrong. He betrays no hint of abdicating. But if he has learned anything, it is that reigning over the brewing world is more work than seizing the crown. ■



百威英博

威力尚小

全球最大的啤酒公司需要新的增长方式

傲慢的艾尔啤酒的鉴赏家们嘲笑百威篡夺了“啤酒之王”的称号。不过，对于出品百威的百威英博（ABI）统治了全球啤酒业这一点，没有人会持异议。如今，这家所向披靡的公司每小时卖出的啤酒几乎可以装满三个奥运标准泳池，比最接近它的三个对手加起来的销量还多。然而，即便利润好得冒泡，王冠之下的百威英博已现疲态。这家公司的前景曾像它的科罗娜淡啤那样金光闪烁，如今却变得像比利时白啤酒一样朦胧浑浊。

百威英博的总部名义上是在比利时弗莱芒区的鲁汶，但实际运营地是纽约。它不仅规模比竞争对手大得多——占全球啤酒销量的四分之一，还把该行业约一半的全球利润收归囊中。它在2018年的运营毛利是40%，是其他上市啤酒公司平均水平的两倍多。以任何消费品公司的标准考量，它的效益都是一流的。其管理人员忠心耿耿，基本都是一出大学校门就进了公司。老板薄睿拓（Carlos Brito）在公司走廊内若隐若现的身影甚至让人感到一丝诡异。员工们对这位做事一板一眼的巴西人忠贞不二，让人想起杰克·韦尔奇（Jack Welch）领导下的通用电气。

但投资者对整个百威英博的忠诚度却日益受到考验。首先是对公司本身的担忧。

百威英博这个拼接而成的名字表明这家公司的发展轨迹是由金融家而非酿酒商设定的。其核心是三位巴西投资者，他们因后来创办了私募股权基金3G资本（3G Capital）而闻名，该基金已收购了汉堡王和卡夫亨氏等其他食品公司。他们以1989年买下的巴西啤酒公司布哈马（Brahma）作为平台，在全球各地收购竞争对手：2004年收购了生产时代啤酒（Stella Artois）的比利时啤酒公司英特布鲁（Interbrew）；2008年收购了百威啤酒的美国母公司安海斯-布希（Anheuser-Busch）；2016年收购了当时剩

余的最大对手南非米勒（SABMiller）。薄睿拓是这三位投资人的主要副手。他自2005年起领导百威英博，成为一个主要由巴西人组成的管理层的主脑，一心要精简收购来的臃肿公司。

然而，这种连串收购和削减成本双管齐下的成功策略似乎已走到了极限。百威英博整合了原本分散的啤酒行业（1990年十大啤酒制造商中现有四家在其帝国版图内），已很难再收购大型竞争对手而不会惊动垄断监管机构。至于削减成本，百威英博让南非米勒每年减省32亿美元，到今年年底这些压缩就将全部完成。

与此同时，百威英博及其他由3G资本运营的公司所推崇的成本控制手段（每位管理人员每年都要解释每一美元的支出）开始受到质疑。今年2月，卡夫亨氏在减记150亿美元的资产价值后股价遭遇重挫。许多人认为这等于该公司默认削减成本对其自身造成了伤害。卡夫亨氏于5月6日宣布，因为内部调查发现采购程序中存在“不当行为”，公司将不得不重新发布近三年的业绩，尽管这与“零基预算”或3G资本的其他独特管理手法并没有直接关系，却仍给它们蒙上了阴影。

薄睿拓坚称百威英博不担心卡夫亨氏那样的问题。他自己的成本控制理念（砍掉不必要的开支，投向营销等更明智的方面，而不是不问青红皂白地削减支出）看起来确实不像卡夫亨氏的做法那么严苛。“我们不是3G资本旗下的公司。”他坚称。投资者却不那么确信。卡夫亨氏受挫后，百威英博的股价在2月也一度下跌。原百威英博的高层营销人员被空降到这家食品巨头去挽救局面。

无论如何，百威英博都需要新的增长策略，因为旧的那一套的效力已经乏善可陈。放在以前，扩大旗下规模不大的非啤酒类业务似乎是显而易见的选择，比如收购可口可乐或主要销售烈酒的帝亚吉欧（Diageo）。但现在不太可能再有这样大胆的收购。三年前，百威英博以790亿英镑（980亿美元）收购了南非米勒，令集团背上了超过1000亿美元的净负债，几乎是去年其税息折旧摊销前利润的五倍。还债的进展缓慢，尤其是因为百威英博主要以美元和欧元借债，而收入则主要是巴西和南非等波动较大的新兴市

场的脆弱货币。

对债务的忧虑导致百威英博的股价连续三年下滑，在2018年下跌了38%。目前其股价已挽回去年一半的跌势，但对比紧随其后的两个竞争对手喜力和嘉士伯，它的股价相对预期收益而言仍显得较低——尽管它的利润更高。自收购南非米勒以来，百威英博的股价下跌了三分之一，而同期规模较小的竞争对手股价上扬了不少。

百威英博的董事会（由上述巴西投资者与多位比利时继承人执掌）为偿还债务，去年10月谦恭地转变态度，把股息减半。5月7日，集团证实传闻，表示正考虑将其亚洲业务的少数股权上市，估计占集团1720亿美元市值的约四分之一。

难怪薄睿拓说减债是他的首要任务。分析师认为，更具体来说，薄睿拓是希望提高利润来让债务变得更可控。现在卡夫亨氏的困境让一些投资者对百威英博的高利润持审慎态度，担心它也会走上肆意削减成本的道路，于是他把重点转向了通过增加啤酒营收来提高利润。

然而，啤酒酿造业的日子已不比从前。厂商们正眼看着对啤酒的需求日渐枯竭。在美国（百威英博收入最高的单一市场），人们喝酒变少了，而啤酒正在把市场份额（行话叫做“喉咙占比”）让给葡萄酒和烈酒。唯一稍具规模的对手是美国的莫尔森库尔斯（Molson Coors），它的股价表现还不如百威英博。富裕国家的年轻人泡酒吧的时间变少了，花在健身房的时间在增多（或者去吸食大麻——啤酒的另一替代品）。近四分之一的英国年轻人滴酒不沾。

贫穷国家的酒类消费则在上升，百威英博如今57%的营收来自这些地区，部分要归功于南非米勒。但即便在这些地区，增长也已放缓。券商杰富瑞（Jefferies）的埃德·蒙迪（Ed Mundy）指出，啤酒销售过去往往与全球经济走势密切同步，而他预计未来啤酒销售的增速将只有GDP增速的三分之一，即每年仅增长1%。

这些趋势解释了为什么百威英博2018年的啤酒销量仅比上一年增加了0.3%。不算上被收购公司的话，百威英博的啤酒销量在过去十多年里并无增长。自2008年以来每年4.7%的销售额增长在很大程度上要归功于薄睿拓所谓的“收入管理策略”——简单来说就是以更高的价格销售同样这些啤酒。

在烈酒和葡萄酒市场，消费者愿意为顶级品牌支付远高于主流品牌的价格，薄睿拓有意仿效这种情形。比如说，百威英博的许多啤酒品牌在本国平平无奇，到了海外却被定位成高级货：百威在美国是最平常不过的拉格啤酒，在中国却成了高端啤酒；欧洲人看球赛时大口畅饮的时代啤酒在大西洋彼岸成了三道菜晚餐的高级配酒。在世界各地，几十家散发着本地特色和反资本主义神秘色彩的精酿啤酒厂实际上都在百威英博旗下，如卡姆登镇（Camden Town Brewery）或鹅岛（Goose Island）。但精酿啤酒的消费增长同样平淡；对于酒花味超重的艾尔啤酒，人们愿意付出的高价是有限的。

分析师担心接下来百威英博在新兴市场的利润将遭到打击。在那些地方，以往竞争有如“百威淡啤”般不带劲，酿酒商不会过分侵犯对手的固有地盘。但此景不再。“竞争激烈程度近年来升级了。”研究公司盛博的特雷弗·斯特林（Trevor Stirling）说。啤酒市场曾被独家垄断或最是安枕无忧的双头垄断的国家现在都深受外敌困扰。喜力正大力进军巴西和哥伦比亚，这在以前会被看做是对百威英博的“僭越”。去年11月，喜力与中国最大的啤酒生产商华润啤酒成立了合资公司。百威英博如果能如愿上市亚洲业务，也许可以帮助集团还以颜色，在势力薄弱的地区通过不断并购获取更大的市场份额。

薄睿拓始终认为增长机会是有的，只要找准方向。通过改进配方，无酒精啤酒的口味变得更好了，销售也在迅速增长；4月，在公司年度股东大会上，薄睿拓就表演打开了一瓶无酒精啤酒。以往，啤酒被认为是年轻男士的专属饮品，现在则愈发向女性和较年长者的市场拓展。5月7日公布的第一季度业绩显示，集团收入同比大增5.9%，表明薄睿拓可能真找对了方向。

怀疑者则质疑，这种围绕“Excel表格”构建的企业文化能否重整，让营销人员得以发挥，使市场占有率一季又一季地增长。薄睿拓还未能打消这样的质疑。他没有显示出任何要退位的迹象。但有件事情他已心知肚明——统领啤酒酿造的世界比夺取这顶王冠更费功夫。 ■



Living in outer space

Back to the future

Jeff Bezos's ambition to colonise space is straight from the 1970s

IT WAS MORE interesting than another quarterly business update. On May 9th Jeff Bezos, the boss of Amazon, had his coming-out party as a space cadet. Mr Bezos, who is the world's richest man, has long been interested in using his fortune to advance the cause of space flight. His private rocketry firm, Blue Origin, was founded in 2000. But he has been less of a publicity seeker than Elon Musk, the founder of SpaceX and the world's best-known enthusiast for outer space.

No longer. During an hour-long presentation, Mr Bezos introduced Blue Origin's prototype lunar lander, a machine that could be ready, he said, to meet America's ambitions to return to the Moon by 2024. More striking were his plans for the farther future. Mr Musk wants humans to colonise Mars as an insurance policy should anything happen to Earth. Mr Bezos has no interest in Mars, or indeed any other planet in the solar system, all of which (except Earth) are pretty inhospitable places. Instead, he thinks humans should build their new space-going homes from scratch.

The idea is not new. Mr Bezos studied at Princeton, and one of his professors was Gerard O'Neill, a physicist. In 1976 O'Neill published "The High Frontier", a bestselling book in which he sketched out the basic engineering principles of how such space habitats might work. It was exactly those sorts of habitat that Mr Bezos advocated as the way humans would live in the future.

O'Neill's book offered three shapes: a cylinder, a pair of cylinders or a torus. All are hollow, with the living surface built on the inside. All rotate, with the

centrifugal force felt at the walls standing in for gravity. Sunlight provides both energy—through solar panels—and illumination, thanks to a system of mirrors and windows. And all are on a heroic scale. The biggest are tens of kilometres long and have enough living room for millions of people.

For that reason, they would have to be built by a species that had already mastered space travel, using resources harvested from the asteroid belt (like Mr Musk, Mr Bezos hopes to drive down the cost of space flight as a first step). They would be strange places to live. The land would curve visibly up the sides of the structure. The superstructure of the habitat would arch across the “sky”. And rotation is not a perfect substitute for gravity, so moving objects would behave oddly, particularly if the habitat were small. But, said Mr Bezos, they also offer several advantages. Climates could be engineered (“Maui on its best day, all year long”). The best bits of Earth could be replicated elsewhere (one of his illustrations, shown above, depicted a space-going version of Florence).

Their biggest advantage, though, is the sheer amount of living space they would create. Mr Bezos’s ultimate justification for pursuing such megaprojects is his worry about the mismatch between the exponential process of population growth and the finiteness of Earth’s resources. He gave the example of energy demand, which, he says, has historically grown by around 3% a year. He argues that if this were to continue, Earth would, in a couple of centuries, need to be covered completely by solar panels. With the resources of the solar system at its command, however, and thousands of habitats scattered through space, the human population could comfortably grow to a trillion or more.

Perhaps. It is notable that Mr Bezos’s justifications come from the same era as his proposed solutions. It is a mathematical truism that exponential growth will eventually overwhelm any fixed, finite quantity. Such

arguments were most famously applied to natural resources in “The Limits to Growth”, published by the Club of Rome in 1972. Not so much a bold new future, then, but a blast from the past. ■



外太空生活

回到未来

杰夫·贝佐斯的太空殖民壮志直接承袭自上世纪70年代

这可比发布又一季的财报有意思。5月9日，亚马逊的老板杰夫·贝佐斯作为太空探索界的新人首次正式“亮相”。这位世界首富早就有志于用自己的财富推动航天事业。他的私人火箭公司蓝色起源（Blue Origin）成立于2000年。但他没有SpaceX的创始人、也是最出名的外太空爱好者伊隆·马斯克那么好出风头。

现在不是了。在一个小时的演讲中，贝佐斯介绍了蓝色起源研发的月球登陆器原型机。他说这台机器将准备就绪，实现美国在2024年重返月球的雄心。更惊人的是他对更遥远未来的计划。马斯克希望人类殖民火星，作为地球发生灾难后的退路。贝佐斯对火星或太阳系中的任何其他行星都没兴趣。既然所有那些行星（地球除外）基本都不适宜人类居住，他认为人类应该从零开始建造新的太空家园。

他的构想并不新鲜。他曾在普林斯顿大学求学，他的一位教授是物理学家杰拉德·奥尼尔（Gerard O'Neill）。1976年，奥尼尔出版了畅销书《太空殖民地》（The High Frontier），概述了这类太空栖息地将可能如何运作的基本工程原理。贝佐斯倡导的人类未来的生活方式和奥尼尔描绘的那类栖息地一模一样。

奥尼尔在书中给出了三种形状的栖息地：圆柱体、一对圆柱体，或一个圆环体。它们都是中空的，生活区建在内部。不管哪种形状都要旋转，通过离心力在内壁模拟重力。阳光通过太阳能电池板提供能源，并通过镜子和窗户系统提供照明。所有栖息地都规模巨大。最大的长数十公里，可容纳数百万人。

这样的太空栖息地必须由已经掌握太空旅行的物种利用从小行星带收集的

资源来建造（和马斯克一样，贝佐斯希望首先降低太空飞行的成本）。在这样的栖息地生活将是完全陌生的体验。地面将沿栖息地两侧明显弯曲，栖息地的上部结构将横架在“天空”上。旋转的离心力无法完美替代重力，因此物体移动的情形会很奇怪，特别是如果栖息地很小的话。但贝佐斯说，这些栖息地也有其优点。这里可以人工调节气候（“全年都能有毛伊岛上最好的天气”）。地球上最好的地方可以在其他地方重现（贝佐斯的一幅示意图描绘了太空版的佛罗伦萨，见上图）。

但这些栖息地最大的优势是它们能创造出巨大的生活空间。贝佐斯追求这些大型项目的最根本理由是担心地球有限的资源无法支撑指数级的人口增长。他以能源需求为例，指出能源需求以每年约3%的速度增长。他认为，如果以这样的速度继续下去，几个世纪后地球就需要完全被太阳能电池板覆盖才够。但是，如果人类掌握了太阳系的资源，有了散布在太空中成千上万的栖息地，人口可以增长到万亿甚至更多都没问题。

或许是吧。值得注意的是，贝佐斯所说的原因与他提出的解决方案源自相同的时代。指数增长最终将超过任何固定的、有限的量值，这是数学上的老生常谈。1972年智库罗马俱乐部（Club of Rome）发表的报告《增长的极限》（The Limits to Growth）用它来论述自然资源的限制，震动世界。所以太空栖息地算不上多大胆的新未来，只是旧事重提。■



Economic geography

Flyover country v coastal elite

The gap between rich and poor Chinese regions is widening again

MOTIVATIONAL SLOGANS do not get much blunter than the one hanging over the sewing machines in Li Zhiguo's factory: "Work hard here to make money, don't be disliked by your family". He proudly holds up one of his products, a red chiffon dress with ruffled sleeves. Dozens more are wrapped up, awaiting shipment.

It is a scene that, on the surface, should please Chinese leaders. Mr Li's factory is in Baiguan, a poor town in the central province of Hunan. The government has long wanted to spur growth deep inside the country, in part by getting low-end industries to leave the prosperous coast and move to places like Baiguan. The money, managers and machines in Mr Li's factory are almost all transplants from the coast. "There's advantages to being here. It's easier to find workers," he says.

But scratch a little deeper, and problems appear. Mr Li aims to have enough orders to keep a hundred workers busy. But business is so slack that he has only hired half that many. When Baiguan launched its industrial park three years ago, the government billed it as a new home for China's textile industry. Today, the zone is pockmarked with vacant buildings. Workers may be paid less than on the coast, but they are more expensive than their counterparts in Cambodia and Bangladesh. The roof over the park's sales office has partly collapsed. Managers complain of power cuts.

The difficulties of building a textile industry in Hunan are part of a much bigger challenge: closing the gap between inland China and its coast. When China opened its economy in the 1980s, its seaboard reaped the biggest

gains. Other regions grew more slowly. Eventually the government began focusing on the poorer areas. Two decades ago this month, it launched a “develop the west” plan, followed in 2004 by a similar scheme for its central provinces. These projects involved large investments in roads, railways, schools and hospitals, plus incentives for businesses and workers to move to the interior.

In the official telling, these efforts have been a triumph. That is partly true. Since the early 2000s growth in the interior has soared. But a shift is now under way. Growth is still strong in the interior. Yet the coastal region, particularly its southern half, is now outpacing much of the rest of China. It is a phenomenon familiar in other countries: the richest areas are pulling further ahead of the poorer ones. It is one that makes the Communist Party, having prided itself so much on its efforts to reduce inequality, deeply anxious.

China’s south coastal region comprises Shanghai and five provinces from Jiangsu to Hainan (see map). It is home to the mainland’s four busiest ports, including Shanghai and the tech hub of Shenzhen. The region is China’s wealthiest, with a GDP per person of nearly 100,000 yuan (\$15,000). When the government began pouring money into the interior, the south coast initially lost ground. From 2003 to 2013 its share of national GDP fell from 36% to 33%. But since then its relative fortunes have revived. Its share rebounded to nearly 35% in 2018, the highest in more than a decade.

The region that has fared the worst is the north-east, burdened by a legacy of state ownership. The north coast, centred around Beijing, has also stumbled, in part because of policies to limit pollution. The western and central regions have done better. Several cities there, such as Chengdu and Wuhan, are thriving. But on the whole the west and centre have stopped gaining on the south coast. In nominal terms, China’s economic slowdown

of the past decade has been twice as sharp inland as it has been along the coastal strip.

The underlying picture is even more worrying. Fiscal deficits (the gap between government revenues and expenditures) have remained low on the south coast, rising from 2% in 2000 to 3.9% today. In western and central China, deficits have expanded rapidly, from an average of 5.5% to 15.5% (see chart). Land sales and transfers from the central government have kept local governments afloat, but will diminish as growth slows.

The change in regional fortunes is partly the result of investment flows. In 2000 the construction of things such as roads, railways and factories accounted for roughly a third of GDP in all regions. By 2015, as a result of the government's drive to boost the interior, the ratio had risen to 43% in the south coast, but to 68% in the west and to 60% in the centre (see chart). With investment now tailing off inland, their growth is also beginning to falter.

The slowdown in investment will be easier to stomach for places that have spent money well. The central city of Wuhan should benefit. It has been a focal point of China's efforts to cultivate its semiconductor industry. But cities that have got it wrong will suffer. Chongqing, in the west, worked to attract car and computer manufacturers. As sales of both have weakened, so has Chongqing's economy. It went from being one of China's zippiest cities, growing by 17% in 2010, to one of its slowest, growing by 6% last year. "Everyone says we got hit by a financial crisis," says Liao Li, a saleswoman in a small home-decoration shop there. It is not that bad, but Chongqing's decline has been sudden.

Plenty of industries on the south coast have also run into trouble, from shipbuilding in Jiangsu to garment-making in Guangdong. But the region's economy is more diversified, and so more resilient. It is strong in modern

services, from software design to wealth management. And it is still an industrial powerhouse. Many of its manufacturers have spent heavily on automation. Its smaller firms have also adapted. Scholars estimate that 77% of China's "Taobao villages"—ones deriving much of their sales from e-commerce platforms such as the eponymous one—are based on the south coast.

As China's economy matures, the south coast's advantages are likely to grow. The region is well-suited to knowledge-based industries. It generates half of all patent applications nationwide. Since 2015 worker productivity has increased by 7.4% annually on the south coast, more than any other part of China, according to Moody's Analytics, a consultancy. It is also a magnet for foreign firms: 87.5% of foreign direct investment flowed to coastal China in 2017, official figures show. Many foreign managers say the business climate in the south is better. "Guangdong is like a spa," says a European executive who recently launched a big project there, having previously endured frustrations in the interior.

One incentive that is often touted for producing goods in China's interior is lower wages. But the region's workers usually earn more than those in South-East Asian countries: twice as much as in poorer ones such as Vietnam and a tenth more than in wealthier ones such as Thailand. The trade war with America strengthens the headwinds. Firms that might have moved inland from the coast are instead looking abroad. Industrial activity has been declining more rapidly as a share of the interior's economy than of the south coast's. In western China, for example, it has fallen from 51% of GDP in 2011 to 41% last year.

China's leaders will not give up. In recent speeches President Xi Jinping has declared that reducing the economic gap between regions remains a crucial goal. Local officials are still trying to pursue it. Nearly an hour's drive from Baiguan's would-be textile centre, the city of Zhuzhou has created

“Power Valley”, which local officials hope will become a manufacturing base for the railway, car and plane industries. It is a well-manicured zone with crisp factory buildings, a slogan (“beautiful intelligence town”) and a big government office dedicated to making it work.

But nearly four years on from its opening, Power Valley is clearly low on fuel. A clerk at the reception says it has 80% occupancy. Yet just outside her door, there is half a block of abandoned offices. Down the road, one of the bigger occupied buildings belongs to a car-design company. Its manager sheepishly admits that he obtained a five-year lease rent-free. Ten employees are spread across four floors. “We are racing to catch up with the coast,” he says. The race already seems lost. ■



经济地理学

飞掠之地 vs 沿海重镇

中国地区间的贫富差距正再次拉大

李志国（音译）工厂的缝纫车间里挂着一条再直白不过的励志标语：“努力多挣钱，不被家人嫌。”他自豪地举起一件厂里生产的带皱褶袖的红色雪纺连衣裙。还有更多这样的连衣裙已经打包好，等待装运。

这场景乍一看应该能讨中国领导人的欢心。李志国工厂所在的白关是中部省份湖南的一个贫困城镇。长期以来中国政府一直想要刺激内陆腹地的经济增长，其中一个办法就是将低端产业从繁荣的沿海地区迁往白关这样的地方。李志国工厂的资金、管理人员和机器几乎都是从沿海地区迁过来的。“到这里来有很多优势。更容易招到工人。”李志国说。

但如果再深究一点儿，问题就显现出来了。李志国的目标是拿到足够的订单，能让百来名工人有事做。但生意很不景气，他只雇了大概50名工人。三年前白关工业园开园时，政府将它宣传为中国纺织业的新基地。如今园区内空置厂房比比皆是。这里的用工成本可能低于沿海地区，但却高于柬埔寨和孟加拉国。园区招商处的屋顶有些地方已经塌陷了。管理人员抱怨经常断电。

在湖南打造纺织基地的困局是一个巨大挑战的一部分：缩小内陆与沿海之间的差距。上世纪80年代中国开放经济之初，沿海地区是最大的受益者。其他地区经济增长较慢。最终，政府开始关注更贫困的地区。20年前的这个月中国启动了“西部大开发”计划，随后在2004年又启动了一项与之类似的“中部崛起”计划。这些计划包括大举投资建设公路、铁路、学校和医院等，以及鼓励企业和员工内迁的激励政策。

按照官方说法，这些努力卓有成效。这在一定程度上是真的。自本世纪初以来，内陆地区经济增长迅猛。但现在出现了转折。内陆经济增长目前仍然强劲，但沿海地区——特别是南部沿海——目前的发展速度超过了中国

大部分其他地区。最富裕地区与更贫困地区的差距进一步拉大。这种现象在其他国家也很常见，但却让共产党深感忧虑，因为它一直为自己在减少不平等上的努力倍感自豪。

中国大陆南部沿海地区包括上海市以及从江苏到海南的五个省（见地图）。这里集聚了大陆最繁忙的四个港口，包括上海和科技中心深圳。人均GDP接近10万元，是中国大陆最富裕的地区。当政府开始向内陆地区大规模注资时，南部沿海的优势一度有所回落。从2003年到2013年，该地区占全国GDP的比重从36%降至33%。但自2013年之后，该地区的相对优势又重新增长。2018年，其占全国GDP的比重回升至近35%，创十多年来的新高。

情况最糟糕的是背负着国有制经济后遗症的东北地区。以北京为中心的北部沿海地区也步履蹒跚，部分是受污染控制政策的影响。中西部地区的情况更好些，成都和武汉等几个城市都在蓬勃发展。但总的说来，中西部追赶南部沿海地区的脚步已经停滞不前。按名义价值计算，过去十年中国内陆经济增长放缓的严重程度是沿海地区的两倍。

一幅暗藏的图景更令人担忧。南部沿海地区的财政赤字（政府收入和支出的差额）一直维持在低水平，从2000年占GDP的2%上升到目前的3.9%。而中西部地区的赤字率增长迅速，从平均5.5%增长到了15.5%（见图表）。地方政府靠卖地和中央的财政转移支付维持，但随着经济增长放缓，这些资金来源都将减少。

地区财富的变化一定程度上是投资流动的结果。2000年，公路、铁路和工厂等项目的建设约占所有地区GDP的三分之一。到2015年，这一比例在南部沿海地区上升到43%，而由于政府大力发展内陆地区，在西部和中部地区则分别上升至68%和60%（见图表）。随着如今向内陆的投资逐渐减少，这些地区的经济增长也开始减弱。

那些合理使用了资金的地方将能更好地承受投资放缓的影响。中部城市武

汉应该是个受益者。它一直是中国着力发展半导体产业的一个聚焦点。但是那些走错了方向的城市就要吃苦头了。西部城市重庆曾致力于吸引汽车厂商和计算机制造商。而随着这两个产业的销售下跌，重庆的经济也下滑了。2010年重庆的经济增速达17%，是中国经济最活跃的城市之一，去年仅为6%，在发展最缓慢的城市之列。“大家都说我们遭遇了一场金融危机。”当地一间小家装店的售货员廖丽（音译）说。情况还没有那么糟糕，但重庆的衰落是突如其来的。

从江苏的造船业到广东的制衣业，南部沿海地区的许多行业也遇到了麻烦。但由于该地区的经济更多样化，也就更容易恢复元气。从软件设计到理财，这里的各种现代服务业发展强劲，而且依然是工业重地。许多制造商在自动化上投入了巨资。小企业也与时俱进。学者们估计，中国77%的“淘宝村”都位于南部沿海地区。“淘宝村”是指商品销售大部分依靠淘宝网等电子商务平台的村落。

随着中国经济日趋成熟，南部沿海地区的劣势很可能还会增强。该地区很适合发展知识型产业。全国一半的专利申请都出自这里。根据咨询公司穆迪分析的数据，自2015年以来，南部沿海地区的劳动生产率每年增长7.4%，超过中国所有其他地区。这里也是外企落户的热土。官方数据显示，2017年，87.5%的外国直接投资流向了沿海地区。许多外国主管表示，南方的营商环境更好。“广东就像个水疗所。”一位欧洲高管表示。不久前他刚在广东启动了一个大型项目，而此前他在内陆地区屡次受挫。

中国内陆地区常用“人工成本低”来招徕制造业。但该地区的工资水平通常高于东南亚国家——差不多是越南等相对贫穷国家的两倍，比泰国等相对富裕国家高出十分之一。中美贸易战更是让内陆地区雪上加霜。原本可能从沿海迁往内陆的公司转而将目光瞄向了海外。相比南部沿海地区，内陆地区的工业在经济中的占比下降得更快。例如，在中国西部，工业占GDP的比重从2011年的51%降至去年的41%。

但中国领导人不会放弃。国家主席习近平在最近的讲话中多次宣称，缩小地区间的经济差距仍然是重要目标。地方官员仍在努力实现这一目标。距

离白关这一计划中的纺织中心大约一小时车程的株洲市已经建成了“动力谷”，当地官员希望这里成为轨道交通、汽车和飞机等产业的制造基地。在这个精心打造的区域里，有着崭新的厂房、书写着“美丽的智慧之城”的标语和一个专门管理动力谷的大型政府机构。

然而开园已近四年的动力谷却明显动力不足。接待处的一名工作人员表示动力谷目前的入驻率为80%。然而，在她办公室门外就有半个街区的空置办公楼。顺着这条路往前，一座较大的建筑物有一家汽车设计公司入驻。公司经理不好意思地承认，他获得了为期五年的免租金租约。公司的十名员工分散在四个楼层。“我们正在努力追赶沿海地区。”他说。这场赛跑看起来已经输掉了。 ■



Bartleby

For the future, look to the past

Workers may need new ways of organising themselves

THE DEBATE about the future of work tends to divide commentators into two camps. The optimistic case is that technology may cause temporary disruption but will ultimately result in economic growth and thus more jobs. Combine harvesters reduced the need for agricultural labourers and personal computers eliminated the typing pool, but the displaced workers found other jobs in the end.

The pessimists argue that new technology, even if it does not cause mass unemployment, will create a “digital divide”. The future will resemble a high-tech Downton Abbey, with the skilled elite lording it over the rest. Unskilled workers will be delivering pizzas to, and cleaning the bathrooms of, the likes of Elon Musk and Tim Cook.

A new report* from the consultants at McKinsey veers towards the optimistic camp. It predicts that men and women will be roughly equally affected by automation over the next decade, with 21% of working males and 20% of females losing their jobs by 2030. In the developed world, McKinsey estimates that men will tend to lose machine-operating jobs and women will lose clerical and service roles. But new jobs will be created, if not necessarily for the same people. Women will find work in the expanding health-care industry and men in the professional, scientific and technical fields (a higher proportion of men than women have science degrees).

Not all of these jobs will be well paid, especially for women, says McKinsey—just as, according to left-wing critics, the jobs boom of recent years has been in low-paid work (though data suggest that high-paying ones

also rose fast). On the bright side, discouraged workers have rejoined the labour market as the economy has boomed and technology has made it easier for employers to find workers (and vice versa).

How much of this low-paid work is the result of the gig economy? Not much so far; it represents about only 1% of American employment. But in their book, “Ghost Work”, Mary Gray and Siddharth Suri forecast that what they call “on-demand work” will reach 60% of the global workforce by 2055. They define this category to include those who work for temporary staffing agencies, have short-term contracts or who accept work from employers through websites or apps.

All this makes it sound as if the future of jobs will look like the past. Before the days of the factory and the office, many workers were part of a “putting-out system”, in which merchants hired them to undertake specific tasks, such as spinning or weaving, for which they were paid a piece rate. The attraction to employers is that such work is cheap. The authors quote one marketing executive as saying that “We can save up to 40% by not paying benefits or allocating office space.” Furthermore, in two of the main markets where on-demand workers toil, America and India, they have little access to the legal protections associated with formal employment. A digital Downton Abbey, in other words.

However, the new forms of employment have a plus side. Many workers in emerging markets relish the opportunity to work at home and at times of their choosing. They are only expecting to supplement their family’s other sources of income. On some platforms, workers are identified by a sequence of letters and numbers, meaning that they are free from discrimination on the grounds of age, religion or sex.

Workers may also look to the past to find a way to organise themselves. Some have set up online forums which share information on the most

reliable employers. Ms Gray and Mr Suri suggest that these could be expanded to create the equivalent of medieval guilds which could enable workers to learn new skills. Such guilds could also act as a repository for employees' work records. At the moment, it is as hard—or harder—to transfer your work rating from one online platform to another as it is to wrest your user data from Facebook. Lack of interoperability means workers have to start each contract from scratch.

Responsible employers could pledge only to use workers from guilds and to apply minimum standards on issues such as prompt payment. They will benefit from more reliable and skilful employees. That way, if the workers of the world unite, everyone may gain.

* “The future of women at work: Transitions in the age of automation” ■



巴托比

历史预言

工人们可能需要新的自我组织方式

在辩论工作的未来时，往往会展现出两派。乐观派的看法是，技术可能会造成暂时的颠覆，但最终会带来经济增长，进而创造更多就业机会。联合收割机的诞生减少了对农业劳动力的需求，个人计算机取代了打字间，但失业的劳动者最终都找到了其他工作。

悲观派认为，新技术即使不会导致大规模失业，也会劈开一道“数字鸿沟”。未来将像一个高科技的唐顿庄园，掌握技术的精英阶层高高在上主宰世界。非技术劳动者将为伊隆·马斯克和蒂姆·库克这样的人送外卖比萨，清洁浴室。

麦肯锡咨询公司的新报告*更倾向于乐观派的观点。报告预测，未来十年，自动化对男性和女性的影响差不多。到2030年，21%的男性劳动力和20%的女性劳动力将失去工作。麦肯锡估计，在发达国家，受影响的主要还是男性机器操作人员和女性文书及服务业人员。但是，新的就业机会也将被创造出来，尽管不一定适合那些失业人士。女性将进入不断扩大的医疗保健行业，男性则将在专业、科学和技术领域中找到工作（男性拥有理科学位的比例高于女性）。

麦肯锡表示，并非所有新的就业机会都会报酬丰厚，尤其对女性而言。正如左翼评论人士所说，近年来的就业增长一直集中在低薪工作岗位（尽管数据显示高薪职位也在快速增加）。从好的方面来看，随着经济蓬勃发展，一度失业的劳动者得以再次进入劳动力市场，而科技的发展让雇主更容易招到员工（反之亦然）。

低薪岗位的增加有多少是零工经济催生的？到目前为止并不多——零工经济仅占美国就业人数的1%左右。但玛丽·格雷（Mary Gray）和西达尔特·苏利（Siddharth Suri）在《幽灵工作》（Ghost Work）一书中预测，到2055

年，从事他们所说的“按需工作”的人将达到全球劳动力的60%。根据他们的定义，这些劳动者包括为临时工职介所工作^{*}、签订短期劳务合同，或通过网站或应用接单工作的人。

这么说来，工作的未来似乎会很像它的过往。在劳动者集中在工厂和写字楼之前，很多人都是在“包出制”下工作，商人雇用劳动者承担纺纱或编织等特定工作，按件计酬。这种方式对雇主的吸引力在于劳动力成本低。作者在书中引述了一位营销高管的话：“我们不用承担福利支出或配备办公空间，能节省高达40%的成本。”此外，在美国和印度这两个主要的按需就业市场，这类辛苦劳动的就业者几乎无法获得正式员工享有的法律保护。换言之，这是一个数字唐顿庄园。

但是这种新型就业方式有一个优势。新兴市场的许多劳动者都很享受可以自由安排时间在家工作的机会。他们只是希望通过这种方式来为其他家庭收入来源提供补充。某些网络平台只用一串字母和数字编号来标识工人，这让他们可以免受年龄、宗教或性别歧视。

工人们也可以以史为鉴，找到自我组织的方法。有些人建立了在线论坛，分享最可靠雇主的信息。格雷和苏利建议，可以扩展此类操作，创立相当于中世纪行会的机构，让工人们学习新的技能。这些行会也可以存储劳动者的工作记录。目前，你若想把自己的工作评级记录从一个在线平台转移到另一个平台，就和从Facebook提取自己的使用数据一样难，甚至还更难。由于缺乏互联互通，劳动者的每份合同都必须从零开始创建。

负责任的雇主可能会承诺仅雇用行会工人，并在迅速结款等问题上贯彻最低标准。他们将因更可靠、技术更娴熟的员工受益。如此，如果全世界的工人联合起来，人人都可能获益。

* 《职业女性的未来：自动化时代的转型》 ■



Policing social media

Guardians of the galaxy

Content moderators are the unacknowledged legislators of the online world

THEY ARE paid to spend their days watching filth: beheadings and chemical-weapons attacks, racist insults and neo-Nazi cartoons, teenagers encouraging each other to starve, people having sex with animals or with ex-lovers against whom they want revenge. When batches of images leap onto their screens, they must instantly sort them into categories, such as violence, hate speech and “dare” videos, in which people offer to do whatever a stranger asks. If the material violates the platform’s explicit policies (nudity, sensationalistic gore), they take it down. If it contains suicide threats or evidence of a crime, they alert law-enforcement authorities. If it is a borderline case (violence with possible journalistic content, say), they mark it for review. Some earn \$15 an hour, some a piece-work rate of a few cents per item, sorting anywhere from 400 to 2,000 a day.

With soldierly bravado, they insist the job does not upset them. “I handle stress pretty well,” says one of the social-media content moderators interviewed by Sarah Roberts in “Behind the Screen”—before admitting to gaining weight and developing a drink problem. They avoid discussing their work with friends or family, but it intrudes anyway. War-zone footage, child sex-abuse and threats of self-harm are especially hard to repress. “My girlfriend and I were fooling around on the couch or something and she made a joke about a horse,” says another moderator. “And I’d seen horse porn earlier in the day and I just shut down.”

Those who work directly for the big American internet platforms may boast about it to their friends, but they are mainly on short-term contracts with little kudos or chance of promotion. At a huge Silicon Valley firm that Ms

Roberts calls MegaTech, the content moderators were barred from using the climbing wall. Even further down the hierarchy are third-party contractors in India and the Philippines, who handle material for corporate websites, dating sites and online retailers, as well as for the big platforms. Whether in San Francisco or Manila, their task is fundamentally the same. These are the rubbish-pickers of the internet; to most of the world, they are all but invisible.

An estimated 150,000 people work in content moderation worldwide. Ms Roberts's book is one of just a few about them. Much of her research was conducted early this decade; for recent developments, she is obliged to refer to articles by journalists such as Adrian Chen of *Wired*. But in some ways little has changed. A short documentary Mr Chen made in 2017 about moderators in India suggests the job was largely the same as it was in California in 2012.

One reason content moderation is hard to investigate is that social-media companies prefer not to talk about it. The platforms have never been comfortable with their role as gatekeepers. Like much of Silicon Valley, their culture reflects the libertarian optimism of the internet's pioneers, which Ms Roberts terms "an origin myth of unfettered possibility for democratic free expression". Early cyberspace utopians thought censorship would soon be obsolete: the internet would treat it as a broken node and route around it. (The Great Firewall of China had not yet been erected.) Until recently, strategists at giant social-media firms seemed to imagine they were still running the sorts of self-policing communities which existed on text-only messaging boards in the 1990s, and which survive today on forums like 4chan and Reddit.

The platforms also have less rarefied reasons to keep content moderation out of the public eye. America's law on online content, the Communications Decency Act of 1996, lets internet companies restrict it as they see fit, and

holds them largely immune from liability for third-party material on their websites. A fear that legislators might deem the firms' methods biased or inadequate—and decide to regulate them—makes executives circumspect in both what they do and how they talk about it. The big platforms and their contractors routinely require moderators to sign non-disclosure agreements.

Since the American presidential election of 2016 and the Brexit referendum, controversies over fake news, hate speech and online harassment have forced internet companies to bring content moderation into the light—up to a point. Facebook says it now has 30,000 people working on safety and security worldwide, of whom half are moderators (many of them employed by outside contractors). Twitter has beefed up its moderation staff; it now boasts about the number of accounts it suspends, sometimes millions per month. A new German law requires internet sites to delete material that breaks hate-speech laws within 24 hours of a complaint. Earlier this month YouTube began taking down thousands of channels that violated policies against racism, sexism and religious bigotry. It has also been criticised for algorithms (now amended) that routed family videos to viewers who expressed an interest in child porn.

These efforts have exposed the platforms to just the sort of criticisms they are least comfortable with. Alt-right YouTubers whose channels are taken down because of racism complain they are being censored by the liberal establishment. Some history channels were initially knocked out too, because they displayed racist material in order to critique it (they have since largely been restored). Still, when targets of suspensions complain, they are usually met by a boilerplate statement that their content violated company policies, with no explanation of what those policies are or exactly what the violation was.

As Ms Roberts shows, the opacity is ingrained. Social-media sites have often

been reluctant to tell malefactors precisely what they did wrong. Beside the political risks, they fear that would let provocateurs flirt with the edges of prohibitions, and furnish endless fodder for challenges to their decisions. A report in February by the Verge, a news site, found that a Facebook subcontractor's training regime required moderators to learn a decision-tree of rules, then justify which one led to a take-down. Even so, individual instances often involve subjective judgments, which are almost never explained to users.

For years, tech activists have called for more transparency about these boundaries. But some say that simply revealing the rules is insufficient, because formal criteria can never capture the irreducible moral and political decisions moderators make. Ms Roberts's subjects already faced such dilemmas in 2011, when MegaTech decided that gruesome images from the Arab spring constituted news (and so could stay), but equally grim ones from gang conflicts in Central America had to go.

Others think the focus on what may be published misses the bigger question of which posts get amplified—by being shared, liked or “ratioed” (the current term for a wave of negative comments). Early this month Carlos Maza, a reporter for Vox.com, pilloried YouTube for refusing to take down videos by Steven Crowder, a conservative YouTuber who had mocked him using homophobic slurs. As well as complaining about the slurs themselves, Mr Maza said he had been subjected to online harassment by some of Mr Crowder's many followers. This raises the difficult question of whether platforms should impose stricter rules on influential personalities.

A different approach was suggested last year by Tarleton Gillespie, a consultant, in his book “Custodians of the Internet”. Part of the problem, he says, is that both users and companies have got it wrong: content moderation is not a peripheral inconvenience, but “in many ways, *the* commodity that platforms offer”. Increasingly, these sites are where people

conduct their lives, and the task of keeping them within acceptable bounds of discourse, and excluding the unconscionable, may be the most important thing the firms do. It is too demanding for harried box-tickers.

Facebook has recently raised moderators' pay; YouTube has limited their exposure to disturbing videos to four hours a day. But in general, as Ms Roberts chronicles, moderators are treated as low-skilled labour. She is particularly good at depicting how the strange international network of content moderation mirrors the class divides of other globalised industries. Just as it dumps some of its nastiest refuse in poor countries, the West leaves it to them to sort much of the internet's yuckiest trash. ■



监管社交媒体

银河护卫队

内容审查员是网络世界里默默无名的立法者【《屏幕背后》书评】

他们受聘终日观看污秽内容：斩首、化学武器攻击、种族主义侮辱、新纳粹漫画、少年互相怂恿绝食、兽交，或为报复而发布的与前任的性爱视频。当影像批量涌现于屏幕，他们必须立即将其分门别类：暴力、仇恨言论、“大冒险”视频（按陌生人要求做大胆举动），等等。如果发现内容违反平台明文规定的政策（裸露、耸人听闻的血腥场面），他们会立即将其删除；若发现包含自杀威胁或犯罪证据，他们会通知执法机构。遇到不好确定是哪一类的情况（比如可能带有新闻资讯的暴力内容），他们会作标记以待复核。他们当中有人时薪15美元，有人按件计酬（每条内容几美分），每天可审核400到2000条不等。

就像逞强的士兵那样，他们坚称这份工作不会困扰他们。“我抗压能力挺强的。”一位社交媒体内容审查员在接受《屏幕背后》（Behind the Screen）的作者莎拉·罗伯茨（Sarah Roberts）采访时说，但之后他承认出现长胖和酗酒的问题。在家人朋友面前，他们对自己的工作避而不谈，但生活还是会受到干扰。交战、儿童性虐、威胁自残等影像尤其挥之不去。“我和女朋友在沙发之类的地方调情，她开玩笑说起‘马’的段子，”另一位受访的审查员说，“我一下子没了性趣，因为这天我刚好看过人马性交。”

直接受雇于美国大型互联网平台的内容审查员也许会在朋友面前吹嘘，但实际上他们大多签的是短期合同，没什么地位或晋升机会可言。在硅谷一家罗伯茨称之为“特大技术”（MegaTech）的巨头企业里，内容审查员被禁止使用公司的员工健身攀岩墙。处于更底层的是印度和菲律宾的第三方承包商，它们为企业网站、交友网站、在线零售商及大型平台审查内容。无论是在旧金山还是在马尼拉，这类工作基本相同。他们是互联网的垃圾工，而对于世界大多数人来说，他们几乎是完全隐身的。

全球范围内估计有15万人从事网络内容审查。关于这些人的著述不多，罗伯茨的这本书是其中之一。她的大部分调查是在2010到2015年期间进行的，对于近期的新发展，她不得不参考《连线》杂志（Wired）的艾德里安·陈（Adrian Chen）等记者的文章。但从某些方面看，情况基本没有变化。2017年艾德里安·陈制作的一部纪录短片显示，如今在印度的那些网络审查员的工作与2012年在美国加州的大致相同。

内容审查是个不易探究的领域，一个原因是社交媒体公司不愿谈论它。一直以来这些平台都不大愿意接受“看门人”的角色。与硅谷大多数企业一样，这些平台的文化反映了互联网开拓者的自由派乐观主义——罗伯茨称之为“不受约束的民主自由表达的起源神话”。早期的网络乌托邦主义者认为审查很快会过时，互联网会视之为坏掉的节点并绕道而行。那时中国的防火墙也还没有竖立起来。直到最近，大型社交媒体公司的战略规划者似乎都还以为自己管理的仍是上世纪90年代纯文字论坛上那种自我监督的社区（存在至今的包括4chan和Reddit等论坛）。

这些平台对外界保密其内容审查还有一些不那么高雅的理由。美国关于网络内容的法律，即1996年出台的《通信规范法》（Communications Decency Act），允许互联网公司自行酌情审查，且很大程度上免除了他们对自家网站上第三方内容所负的责任。由于担心立法者认为平台的审查方法存在偏颇或不足而插手监管，高管们在开展内容审查和谈及这件事时都态度谨慎。大型平台及其承包商一般会要求内容审查员签署保密协议。

自2016年美国总统大选和英国脱欧公投以来，围绕假新闻、仇恨言论和网络骚扰的争议迫使互联网公司提高了内容管理的透明度——在一定程度上如此。Facebook表示目前公司在全球有三万人从事安全保障工作，其中一半是内容审查员（许多是由外部承包商雇用）。推特壮大了内容审查队伍，现在它自诩查封的账户数量之多——有时每月多达几百万个。德国的一项新法律要求网站在收到投诉后的24小时内删除违反仇恨言论法律的内容。本月稍早时，YouTube开始清除成千上万个违反平台政策而涉及种族主义、性别歧视和宗教偏见的频道。YouTube的算法曾把家庭视频推送给表达出对儿童色情内容感兴趣的观众，在遭到批评后已经修改了算法。

这些努力恰恰给平台招来了它们最不愿意听到的那种批评。YouTube上的另类右派播主们因种族歧视言论被关停了频道，于是他们抱怨受到了自由派权势集团的审查。一些历史题材频道为批判种族主义而展现相关资料，一开始也被清理了，后来基本得以恢复。尽管如此，被平台叫停的播主在申诉后通常会收到一份照本宣科的声明，说他们的内容违反了公司政策，但并不解释具体是什么政策或哪里违规了。

正如罗伯茨所说，这种不透明是根深蒂固的操作方式。长久以来，社交媒体网站通常都不愿意告诉违规者他们犯了什么错。除政治风险之外，他们还担心清晰的说明会导致挑事者在违禁边缘试探，为挑战平台的决策提供无尽的素材。新闻网站Verge今年2月发布的一份报告发现，Facebook分包商的培训要求内容审查员学习平台的规则决策树，这样他们能自我辩护是哪一环导致了删帖决定。即便如此，具体个案往往涉及主观判断，这方面几乎是从来不对用户解释的。

多年来，科技业维权人士一直呼吁提高这些界限的透明度。但有些人说，仅仅揭示条规是不够的，因为规范式的标准永远无法囊括内容审查员做出的不可化简的道德和政治决策。罗伯茨的受访者在2011年时就曾面对这样的困境，当时“特大技术”公司决定，有关“阿拉伯之春”的血腥影像是新闻资料，因此可以保留，但同样骇人的中美洲黑帮冲突影像则必须删除。

其他人认为，把关注点放在允许发布哪些内容上，实际是忽略了更大的问题——哪些帖子因为转发、点赞或恶评而被放大了影响。本月初，Vox.com的记者卡洛斯·马扎（Carlos Maza）抨击YouTube拒绝删除保守派播主史蒂文·克劳德（Steven Crowder，曾以恐同言论嘲笑马扎）的视频。除了指责歧视言论本身，马扎还说克劳德的众多粉丝中的一些人在网上骚扰自己。这暴露了又一个难题，即平台是否应对“大V们”施行更严格的规定。

去年，咨询顾问塔尔顿·吉莱斯皮（Tarleton Gillespie）在《互联网托管人》（Custodians of the Internet）一书中提出了另一种看法。他认为，部分问题在于用户和公司都搞错了，实际上内容审查并不是什么不重要的麻

烦事务，而是“从很多方面来说都是平台提供的商品”。这些社交网站愈发成为人们生活的重地，将他们约束在可接受的话语界限内，排除无节制、不道德的行为，可能是这些公司最重要的任务。而对疲于机械性工作的审查员而言，这项任务太过艰巨了。

Facebook最近提高了内容审查员的工资；YouTube把他们审查黄暴视频的工作时间限制为每天四小时。但总体而言，正如罗伯茨所记录的，内容审查员被当作低技能劳力对待。她尤其出色地描绘了一个奇特的内容审查全球工作网络如何呼应了在其他全球化行业中存在的阶级鸿沟。西方国家把自己最肮脏的垃圾倾泄到贫穷国家，同样地，它们把互联网上最恶心的垃圾也留给了这些穷国来收拾。 ■



The life of German tycoons

The reticent rich

Inside the secretive world of Germany's business barons

IF THEY think their ranking on rich lists is too low, American tycoons fume. German ones kick up a fuss when theirs looks suspiciously high, explains Heinz Dürr. When a magazine called him a billionaire a few years ago, Mr Dürr rang the editor to remonstrate. The reporters had double-counted his ownership of Homag, a maker of wood-processing machines that Dürr, his family's mechanical-engineering firm, bought in 2014. Plutocrats have reached the top of politics in America and Italy, while in Asia the super-rich often display their wealth in ostentatious style. Germany's magnates love to shun the limelight.

The country is hardly short of super-rich people. It has the most of any country after America and China. In February *Forbes*, a magazine which tracks such things, counted 114 German dollar billionaires, more than double the number in Britain (see chart). This equates to one for every 727,000 Germans, not a world away from America's tally of one for every 539,000 (though it has 607 in total). The German Institute for Economic Research, a think-tank, estimates that the combined assets of the richest 45 Germans are roughly the same as those of the entire poorer half of the country.

That such figures are a surprise to many is testament to the persistence of attitudes outlined by Mr Dürr. German business barons have guarded their privacy more jealously than those from elsewhere. Almost everyone knows what Jeff Bezos, the boss of Amazon, looks like. Most French people will recognise Bernard Arnault, the luxury-goods magnate who is France's richest man. Neither the German nor English Wikipedia page for Dieter

Schwarz, who controls Lidl and Kaufland, two supermarket chains, shows his photograph. And good luck with finding a snap of the Albrechts, owners of Aldi, a discount grocer, or the Reimanns, a super-rich clan that controls JAB, a privately held conglomerate that owns Krispy Kreme, Panera Bread and a host of other consumer-goods brands.

“We do not want to get noticed,” says Nicola Leibinger-Kammüller, boss of Trumpf, one of the world’s biggest makers of machine tools, which her father, Berthold Leibinger, bought from its heirless founder, Christian Trumpf. A devout Lutheran, Ms Leibinger-Kammüller, her father and her two siblings worked out a family code of conduct that members of the third generation sign when they turn 16. It covers succession and the sale of shares in the firm, but also guidelines for religious tolerance, modesty and respect for others.

A third of German entrepreneurial families have similar rules, according to a study by the WHU Otto Beisheim School of Management and PwC, a consultancy. The constitution of the Reimanns enshrines secrecy, reportedly obliging family members to sign a charter at the age of 18 whereby they pledge to stay away from day-to-day workings of the family business, shun social media, avoid being photographed in public and turn down interviews.

Several factors account for this anonymity. One is the nature of the tycoons’ businesses. In America many vast fortunes have been made in finance or technology. Many rich Germans owe their success to staid businesses where progress happens not through headline-grabbing disruptive leaps but unremarkable incremental tinkering. Over half the riches of the country’s billionaires comes from dull endeavours such as retailing, manufacturing and construction. The ten wealthiest German families make cars (BMW and Volkswagen), brakes (Knorr-Bremse) and car parts (Schaeffler), or run supermarkets (Mr Schwarz and the Albrechts). Many of Germany’s “hidden

champions”, which lead the world in niche endeavours like mechanical engineering, are tucked away in the countryside.

Culture, too, plays a part. Dirk Rossmann, the founder of an eponymous chain of pharmacies, says that fellow rich Germans are shy because they worry about making fools of themselves, not least in light of a national disposition towards *Sozialneid* (envy of those better off), and fear for their safety—especially in the wake of the tragic kidnap and murder in 2002 of Jakob von Metzler, an 11-year-old boy from a banking dynasty.

As in other countries, many German journalists are left-leaning and display instinctive hostility towards plutocrats. In March *Stern*, a weekly magazine, published a cover story about the “Shamelessly rich”, illustrated with a gold spoon and arguing that Germany’s wealthiest 5% try to protect themselves against a redistributive welfare state by lobbying for lower taxes and hiding their wealth offshore. In May *Die Zeit*, a news weekly, published a series of articles about “the responsibility of the rich”, and backed a wealth tax and higher inheritance taxes. “A billionaire cannot win in the German media,” says Tobias Prestel of Prestel & Partner, who organises conferences for the family offices of the super-wealthy.

Chequered history is another reason to keep heads down. Most German billionaires are not self-made but scions of industrial dynasties. Their forebears were neither particularly private nor parochial. All that changed after the second world war, during which some had prospered under the Third Reich.

A few years ago the Reimanns, whose fortune dates back to a chemicals business founded in 1823 by Johann Adam Benckiser (hence JAB), asked Paul Erker, a historian at Munich University, to look into the family’s behaviour under the Nazi regime. Mr Erker discovered that the then patriarch, Albert, and his son were early and ardent supporters of Adolf Hitler. They permitted

the brutal abuse of forced labourers in their business and their own home.

Werner Bahlsen, the current head of the Bahlsen biscuit empire, said the family will hire a well-known historian to examine their Nazi past after Verena, his 26-year-old daughter, recently blurted in response to a question about Bahlsen's exploitation of forced workers that they were treated well. (Ms Bahlsen has since apologised for her "thoughtless" remark.)

The Quandts (BMW), Krupps (steel), Porsches and others have grappled with similarly tainted legacies. In 2000, 4,760 German companies including Siemens, Daimler, Deutsche Bank and Volkswagen, created a foundation that, along with the German state, raised more than €5bn (\$4.8bn) for survivors of Nazi atrocities and slave labour. The Reimanns chipped in €5m at the time. After the first results of Mr Erker's study became public, the family announced it would donate an extra €10m to charity (though did not specify which).

Unsavoury pasts and secrecy may partly explain why Germans dislike the rich. In a survey last year by the Allensbach Institute, commissioned for a study by Rainer Zittelmann, a historian, the foremost qualities associated with the rich were selfishness (62%), materialism (56%), recklessness (50%), greed (49%) and arrogance (43%). Only 2% admitted that it was "very important", and 20% that it was "important", for them to become rich. Ipsos MORI asked similar questions of Americans and found that 39% of young respondents, who tend to be more critical of wealth than older ones, said it was important or very important for them to become rich.

Germans are also likelier than Americans to blame the world's ills on the wealthy, according Mr Zittelmann. One in two Germans thinks that they caused the financial crisis or humanitarian disasters, compared with one in four Americans. Surveys also show that Germans are likelier than Americans, Britons or French to experience *Schadenfreude* when wealthy

businessfolk lose their shirts in risky deals.

Such attitudes explain why German business barons have kept a low profile. Mr Rossmann lives an unassuming life by any measure. He does not own a smartphone or a fancy watch, has lived with his wife in the same relatively modest house for 35 years and buys a new Mercedes car every eight years. If he or others like him exert influence, it is typically close to home, often in an obscure small town. Ms Leibinger-Kammüller's generosity to her local parish led a leftist paper to christen her "the Madonna from Swabia" in an admiring profile last year. Families like hers may also maintain close relations with local politicians, who in turn make their voices heard in Berlin.

They have learned to keep those voices low. In 2006 the *Stiftung Familienunternehmen*, a foundation for family firms, lobbied so hard and loudly for lower inheritance taxes that its efforts backfired and the entire reform collapsed. A decade later their main national lobbies—the BDI (association of German industry), the BDA (association of German employers) and the foundation itself—put the case more subtly and managed to get easier rules that let heirs avoid paying inheritance tax provided they keep their business running for at least seven years and protect jobs and wages.

As the German rich mingle with plutocrats elsewhere and their companies have globalised, they are starting to become a little less diffident. This is not always to their advantage. Before Ms Bahlsen's tone-deaf comments about forced labour, she reacted to a proposal of a youth chief of the Social Democrats to collectivise big firms by saying, "I'm a capitalist. I own a quarter of Bahlsen, that's great. I want to buy a sailing yacht and stuff like that." But Mr Rossmann, who does not shy away from the press, thinks that Germany's rich should be more active in politics, which lacks a spirit of enterprise. Few have so far tried and none has succeeded.

Mr Dürr has raised his profile, too. After building his family's firm into a global leader and listing it on the stock exchange, he moved to the public sector as boss of Deutsche Bahn, the state-owned railways, which he merged with eastern Germany's Reichsbahn and in 1994 transformed into a privately run joint-stock company. Like Mr Rossmann, Mr Dürr does not hide from the public eye. He even briefly considered running for political office, though ultimately demurred. Old habits die hard. ■



德国大亨的生活

沉默的富人

一探德国商业巨头的隐秘世界

如果美国大亨认为自己在富豪榜上的排名过低了，会大为光火。如果德国大亨看到自己的排名高得不对劲，会抱怨连连——海因茨·杜尔（Heinz Dürr）说。几年前，一本杂志把他称作亿万富翁，他专门打电话给编辑抗议。记者重复计算了杜尔在木材加工机械公司豪迈（Homag）的股份——他的家族企业、机械工程公司杜尔（Dürr）在2014年收购了这家公司。在美国和意大利，巨富们已跻身政界高层；在亚洲，超级富翁常以铺张的排场炫富；在德国，巨头们却喜欢保持低调。

德国可不缺超级富豪。它的富豪人数排名全球第三，仅次于美国和中国。今年2月，据编制富豪排行榜的《福布斯》杂志统计，德国共有114名亿万富翁，是英国的两倍多（见图表）。这也就是说，每72.7万名德国人中就有一名亿万富翁，与美国每53.9万人一名亿万富翁的比例相差并不太大（不过美国共有亿万富翁607人）。据智库德国经济研究所（German Institute for Economic Research）估计，德国最富有的45人的总资产和全国较贫穷的一半人口的总资产大致相当。

这些数字令许多人感到意外，而这印证了杜尔所说的德国富豪的那种态度长期存在。德国的商业大亨比其他任何地方的富翁都更小心翼翼地保护自己的隐私。几乎人人都知道亚马逊老板杰夫·贝佐斯长什么样。大多数法国人都能认出法国首富、奢侈品大王伯纳德·阿尔诺（Bernard Arnault）。但在德语和英语版维基百科上，介绍Lidl和Kaufland两家连锁超市的所有人迪特尔·施瓦茨（Dieter Schwarz）的页面都没有他的照片。试试能不能在那里找到折扣超市阿尔迪（Aldi）的所有人阿尔布雷希特（Albrecht）兄弟的照片吧，或者掌控私人控股企业集团JAB（旗下拥有甜甜圈连锁Krispy Kreme、烘焙连锁Panera Bread及许多其他消费品品牌）的超级富

豪家族莱曼（Reimann）的成员照片。

“我们不想引人注意。”世界上最大的机床制造商之一通快（Trumpf）的老板妮古拉·雷宾格-甘穆莱（Nicola Leibinger-Kammüller）说。她的父亲贝特霍尔德·雷宾格（Berthold Leibinger）从通快的创始人、无子嗣的克里斯蒂安·特伦普夫（Christian Trumpf）手上买下了通快。雷宾格-甘穆莱是一位虔诚的路德教徒，父亲和她以及她的两个弟弟妹妹制定了一份家族行为准则，第三代家族成员将在16岁时签署。准则内容涵盖了公司的继承和股份出售事宜，还包括宗教宽容、谦逊和尊重他人等行为指引。

根据奥托·拜斯海姆管理学院（WHU Otto Beisheim School of Management）和咨询公司普华永道的一项研究，三分之一的德国企业家族都有类似的准则。莱曼家族的家规将保密奉为圭臬，据说要求家族成员在18岁时签署一份契约，承诺不插手家族企业的日常运作、不使用社交媒体、避免在公共场合被拍照及拒绝媒体采访。

有几个原因造成了这种隐姓埋名的喜好。一是大亨们所拥有的企业的特性。在美国，许多巨额财富产生于金融或科技领域。许多德国富豪的成功靠的是通过不起眼的、渐进的技术改善而推进的传统企业，而不是夺人眼球的颠覆性技术飞跃。德国亿万富翁的过半财富都来自零售、制造和建筑等沉闷的行业。德国十大豪门要么是汽车制造商（宝马和大众）、车辆制动系统（克诺尔〔Knorr-Bremse〕）和零部件制造商（舍弗勒〔Schaeffler〕），要么经营超市（施瓦茨和阿尔布雷希特兄弟）。德国许多在机械工程等细分领域里引领全球的“隐形冠军”都低调地生活在乡间。

文化也有其影响。德克·罗斯曼（Dirk Rossmann）创办了以自己的名字命名的连锁药店。他说德国富人们都很低调，因为害怕出洋相，尤其是虑及国人的妒富倾向，以及担心自身安全——特别是在2002年一个银行家族的11岁男孩雅各布·冯·梅茨勒（Jakob von Metzler）惨遭绑匪撕票之后。

和其他国家一样，德国的许多记者比较左倾，本能地对富豪带有敌意。今

年3月，《明星周刊》（Stern）发表了一篇关于“无耻富豪”的封面文章，配图是一把金汤匙。文章认为，德国最富有的5%的人试图通过游说降低税收和在海外隐藏财富来保护自己免受福利国家再分配政策的影响。5月，新闻周刊《时代周报》（Die Zeit）发表了一系列文章探讨“富人责任”，支持征收财富税及提高遗产税。“亿万富翁在德国媒体上是无法获胜的。”托拜厄斯·普利斯特（Tobias Prestel）说。他的普利斯特合伙公司（Prestel & Partner）专为超级富豪的家族办公室组织会议活动。

历史有污点是富豪们保持低调的另一个原因。如今大多数德国亿万富翁都不是白手起家，而是工业王朝的后裔。他们的先辈并非特别低调，也不是只关心本地事务。二战期间一些家族在第三帝国的统治下发达起来。战后，它们的行事风格发生了变化。

莱曼家族的财富可以追溯到1823年约翰·亚当·本基泽尔（Johann Adam Benckiser，缩写为JAB）创立的化学品公司。几年前，莱曼家族委托慕尼黑大学的历史学家保罗·埃克（Paul Erker）调查自己家族在纳粹统治时期的行为。埃克发现，当时莱曼的大家长阿尔伯特和他的儿子一早就热心支持希特勒。他们在自己的企业和家中放任对强制劳工的冷酷虐待。

百乐顺饼干帝国的现任掌门人维尔纳·巴尔森（Werner Bahlsen）26岁的女儿维蕾娜（Verena）最近在被问及百乐顺家族曾剥削强制劳工的问题时，脱口说出那些劳工得到了善待。巴尔森表示，其家族将聘请一位著名的史学家调查前人在纳粹时期的所作所为。（维蕾娜事后为她的“轻率”的言论道歉。）

科万特家族（宝马）、克虏伯家族（钢铁）、保时捷家族和其他大家族也都受到类似的历史污点的困扰。2000年，包括西门子、戴姆勒、德意志银行和大众汽车在内的4760家德国企业与德国政府一起创立了一个基金会，为在纳粹暴行和奴役劳作中幸存下来的人筹集了超过50亿欧元（480亿美元）。莱曼家族当时捐资500万欧元。埃克的初步调查结果公开后，莱曼家族宣布将向慈善机构再捐赠1000万欧元（但没有指明捐给哪家机构）。

不光彩的过去加上行事隐秘，可能是让德国人不喜欢富豪的部分原因。去年，历史学家莱纳·齐特曼（Rainer Zittelmann）为一项研究而委托阿伦斯巴赫研究所（Allensbach Institute）开展了一项问卷。结果显示，人们说起富豪最多想到的词是自私（62%）、拜金（56%）、不计后果

（50%）、贪婪（49%）和傲慢（43%）。只有2%的人承认发家对自己“非常重要”，20%的人说“重要”。调研公司Ipsos MORI对美国人做了类似的问卷，发现39%的年轻受访者表示致富对他们是重要或非常重要的，而年轻人对财富的态度往往比年长者还更具批判性。

齐特曼表示，德国人还比美国人更可能将全球各种弊病归咎于富人。半数德国人认为是富人导致了金融危机或人道主义灾难，而只有四分之一的美国人这样认为。各种调查还显示，如果富有的商人在风险交易中倾家荡产，德国人比美国人、英国人或法国人都更可能幸灾乐祸。

这样的态度解释了为何德国商业大亨会一直保持低调。不管怎么看，罗斯曼的生活方式都不算张扬。他没有智能手机或高档手表，和妻子在一栋并不怎么高档的房子里生活了35年，每八年买一辆新的奔驰。如果他或像他这样的富人发挥影响力，通常都局限于家附近的区域，一般都是某个不起眼的小镇。去年雷宾格-甘穆莱对她所在的教区慷慨捐赠，一份左派报纸在一篇赞美她的人物特写中将她誉为“来自斯瓦比亚（Swabia）的圣母玛利亚”。像她这样的家族可能也与当地政客抱持着密切的关系，通过他们在柏林发出自己的声音。

他们学会了谨慎地发声。2006年，德国家族企业基金会（Stiftung Familienunternehmen）为降低遗产税而大力游说，结果适得其反，整个改革完全失败。十年后，富人的主要全国游说团体德国联邦工业联合会（BDI）、德国雇主联合会（BDA）和家族企业基金会在游说时更为低调，成功通过了更温和的法规——财富继承人只要能将企业保持七年以上，并维持就业岗位和工资水平，就可免于支付遗产税。

随着德国大亨与其他地方的富豪往来增多、公司变得全球化，他们现在开始变得稍微“大声”了一些。这并非总对他们有利。在巴尔森的女儿对强制

劳工的问题做出不知人间疾苦的评论之前，她曾这么回应德国社会民主党青年团的一位领袖将大企业公有化的提议：“我是资本家，我拥有四分之一个百乐顺，这很好。我要买游艇，还要买其他高档玩意。”不过，并不回避媒体的罗斯曼认为，德国富人应该更积极地参政，因为德国政坛缺乏企业进取精神。到目前为止，还鲜有德国富人做这样的尝试，更没有人成功过。

杜尔也提升了自己的知名度。在把自家企业打造成了全球领头羊并在证交所上市后，他进入了公共部门，担任国营德国铁路公司（Deutsche Bahn）的老板。他将其与原东德的国营铁路公司（Reichsbahn）合并，并于1994年转型为私营股份公司。和罗斯曼一样，杜尔也不回避公众的视线，他甚至一度考虑竞选公职，不过最终还是打了退堂鼓。本性难移啊。





Avionics

Drop the pilot

There will be resistance, but crewless planes are on their way

LAST YEAR Boeing's Pilot Outlook report estimated that civil aviation will require 790,000 new commercial pilots over the next two decades. Of those, 261,000 will be needed in Asia and 206,000 in North America. One approach to this problem is to open more flight schools. An alternative is to need fewer pilots. And that requires better technology.

The first autopilot was invented surprisingly early in the history of aviation, in 1912, less than a decade after the Wright brothers' original flight. It used a gyroscope and altimeter to operate a plane's control surfaces to keep it flying straight and level. Since then, autopilots have evolved into flight-management systems that can run almost every part of an aeroplane's journey except taxiing and take-off, and even those are starting to come under automatic control. As recent events have shown, flight-management systems are still not good enough to be trusted completely when lives are at stake. But in a world where automated drones such as America's Global Hawk reconnaissance vehicle routinely fly military missions, and self-driving vehicles are talked of as if they were just around the corner, the question of how large a civilian flight crew needs to be is clearly open for debate.

It is also a pertinent question for the armed forces. In particular, pilotless aircraft can be sent on missions too dangerous for people, and possibly ones that piloted craft would be incapable of performing. This could change how future wars are fought.

Both Airbus and Boeing are preparing for at least a single-pilot commercial-

aviation world. Such a world will require not only reliable flight-management systems, but also a redesign of the cockpit for one-person operation. Both firms are now testing simulators of such cockpits. Airlines are keen. A report published last year by UBS, a bank, suggested that moving to single-pilot operation could save the world's civil-aviation companies \$15bn a year. Going fully pilotless would increase that figure to \$35bn.

Moving to single-pilot operation would require an aircraft's flight-management system to be good enough to take over in a medical emergency that incapacitated a lone aircrew, flying the plane to a nearby airport and landing it safely. For all practical purposes that is true already. It is only during take-off that the human touch is still widely regarded as necessary. Pilots' unions say they are worried about the ability of a single pilot to handle an emergency brought about by a problem with the aircraft itself, such as an engine failure. But how necessary it is to have two crew members to deal with such exceptional circumstances is moot.

Even so, automated flight systems are an area where the innate conservatism of aviation technology manifests itself. For example, flight-control software for civil aviation cannot easily take advantage of the "deep learning" capabilities of artificial intelligence. Regulators are loth to license anything they cannot understand. But the whole point of deep learning is that it reprograms itself in unpredictable ways in response to circumstances. That would be of huge benefit, for it would permit the autopilots of individual planes to learn from each other's experiences.

In civil aviation, then, passenger aircraft are likely to remain twin-crewed machines for some time. But that may not be true of freighters. There would be no customer resistance here either to single-pilot operation or even to full dronification, as soon as that is possible. And if pilotless freighters proved safe, in a world in which self-driving cars had also become commonplace, passengers' attitudes might change.

In America's armed forces the next set of aircraft likely to drop the pilot is helicopters. Much of the work is being conducted under the aegis of the Defence Advanced Research Projects Agency, or DARPA, a research arm of America's defence department. As part of its ALIAS (Aircrew Labour In-Cockpit Automation System) project the Sikorsky Aircraft Corporation, which is the helicopter division of Lockheed Martin, has refitted one of the firm's S76-B commercial models to be able almost to pilot itself.

As Chris Van Buiten, vice-president of innovations at Sikorsky, observes, flying a helicopter is far harder than flying a plane. Helicopters are aerodynamically unstable, so simply keeping them straight and level is a challenge. But the whole point of a helicopter is that it does not just fly straight and level. It can dodge around to avoid obstacles, meaning it can hug the ground—all of which adds to the mental effort of controlling it. And it is often deployed in weather that would make a fixed-wing pilot think twice.

MATRIX, as the company dubs its experimental helicopter co-pilot, has a central processor that receives signals from a range of sensors, and combines these with data from the Global Positioning System and a map of the local terrain stored in its memory banks. The processor then sends appropriate signals to actuators located in various places around the craft's airframe, to control its mechanical systems. The mission-instructions themselves come from MATRIX's human commander, via a tablet computer, but Mr Van Buiten hopes that voice-recognition systems will soon become reliable enough for those instructions to be spoken.

One of the advantages of MATRIX is that it can respond much faster than a human pilot. This is valuable in normal circumstances. In an emergency, it may be crucial. It can, for example, react to an engine failure, assess a score of options for a forced landing, and recognise which is safest, all within a hundredth of a second. A human pilot would need a couple of seconds just

to work out what was going on.

The next step on its journey, which should happen in the autumn, is to test the system on Sikorsky's Black Hawk helicopter. Here it really will, on many occasions, be in sole charge. Field commanders will, as Mr Van Buiten puts it, have the option of two, one or no human pilots on board.

The ideas behind ALIAS are not confined to helicopters. Until 2017 DARPA followed a twin-track approach—the other track being to sponsor Aurora Flight Sciences, a subsidiary of Boeing, to make a system that would physically replace the co-pilot in the cockpit of a fixed-wing aeroplane. Aurora came up with a pair of devices to do the job. One was a specially designed manipulator that operates the aircraft's control yoke and pedals. The other was an adaptation of a commercially available robotic arm that pulled appropriate levers and flipped relevant switches. The system also had vision. Rather than being wired to an aircraft's sensors, it read the instrument display directly and then reacted.

The advantages of this arrangement are obvious. With appropriate programming it would permit the dronification of any existing aircraft. Aurora tested it on two types of fixed-wing plane and also a UH-1 Iroquois helicopter. It was even put through its paces at the controls of a Boeing 737—though those controls were installed in a flight simulator rather than a real aircraft.

What has happened to all this hard work is a mystery. Although DARPA has stopped paying for Aurora's part of ALIAS the firm will not comment on how it is pursuing the matter. The project, now branded Robotic Copilot and described as a "concept development programme", is still on its website, however. And the idea of something that could take the controls of an existing plane with little modification seems an attractive one in the civilian world as well as the military one.

As to future pilotless aircraft, significant benefits come from designing people out from the beginning. Such craft require neither cockpits nor life-support systems. Moreover, freed from the need to sustain a human pilot, they could accelerate faster and manoeuvre more nimbly than is possible for a crewed plane.

That manoeuvrability and acceleration would be particularly advantageous for a fighter jet. And, although autonomous robot fighters are not here yet, something close to that will soon be flying. The idea is to have strike aircraft fly in small squadrons, with a single human acting as squadron leader.

Lockheed Martin tested this idea in 2017 by converting an F-16, an ageing fighter jet, to act as a drone under the command of a piloted lead aircraft. These tests, conducted at Edwards Air Force Base in California, were deemed successful, and one possible version of the future would be to fit out and deploy the American air force's fleet of increasingly obsolete F-16s in this way, while a human master of ceremonies sat in a more modern craft—presumably an F-35—conducting the escorts' actions. Another version of the future sees the robot craft involved in these formations, known as “loyal wingmen”, as being purpose-built. Boeing, indeed, seems to have appropriated and capitalised the term Loyal Wingman to describe its Airpower Teaming System, which was unveiled on February 26th.

Boeing's offering will be 12 metres long, about three-quarters the length of an F-35. Prototypes should fly next year. Intriguingly, the announcement was made, and the prototypes will be built, in Australia—for the Airpower Teaming System is being developed in collaboration with Australia's air force and is intended from the beginning to be available to America's closest allies, Australia apparently being top of the list.

Boeing's loyal wingmen are not the only ones in development. Kratos, a Californian firm that builds drones used by pilots for target practice, is

also working on them. Its first test craft, the UTAP-22 MAKO, based on a target drone, has been flying since 2015. A more advanced vehicle, the XQ58a Valkyrie, took to the air on March 5th, making a successful test flight at Yuma in Arizona. Details of Valkyrie are scarce, but pictures of it suggest the extensive use of stealth technology by its designers.

In the field of military drones, America has only one open rival at the moment: Israel. Its state-run arms firm, Israel Aerospace Industries, produces a reconnaissance drone called Heron. Europe, by contrast, is playing catch-up, and China has said little.

Europe's competitor to America's drones, the snappily titled European Medium Altitude Long Endurance Remotely Piloted Aircraft System, is being put together by Airbus, in collaboration with Dassault Aviation of France and Leonardo of Italy. It should be ready for deployment by 2025. There are no European plans, though, for loyal wingmen. China's military-drone programme is the purview of the Shenyang Aircraft Corporation, a subsidiary of the Aviation Industry Corporation of China, a state-owned company that is based in Liaoning province. This firm has developed a series of experimental drones with names like Wind Blade, Cloud Shadow and Sharp Sword. As far as is known, however, China has no production-model military drones.

America, meanwhile, is looking beyond the vision of loyal wingmen. Both DARPA and the American air force seem to be trying to scale down the size of unmanned aircraft, in favour of numbers. DARPA calls its programme Gremlins. And it is at the heart of the air force's Small Unmanned Systems Flight Plan, published in 2016.

Gremlins will be drones about four metres long, with a wingspan of 3.5 metres, that are dropped, mid-air, from transport aircraft and then picked up again, mid-air, by that mother ship or a similar one, if they survive their

mission. DARPA's contract for the Gremlins programme is held by Dynetics, a firm based in Alabama, and the first test of the craft, pushing some of them out of the back of a C-130, is scheduled for later this year. What they lack in size, Gremlins will make up for in quantity—the idea being to overwhelm enemy defences as a swarm of wasps overwhelms a picnic. If it works, that will create a whole new form of aerial warfare. ■



航空电子学

辞掉飞行员

会有阻力，但无机组飞机正在前来【技术季刊《航空》系列之三】

据去年波音公司的《飞行员展望》(Pilot Outlook)报告估计，未来20年民用航空业将需要79万名新的商业飞行员。其中，亚洲需要26.1万名，北美需要20.6万名。解决这个问题的一种方法是开设更多飞行学校。另一种是降低对飞行员的需求，这就要求技术进步。

在航空史上，自动驾驶仪的发明出人意料的早——1912年，仅仅在莱特兄弟首次飞行之后不到十年。它使用陀螺仪和高度计来操作飞机的控制面，使其直线飞行并保持水平。从那以后，自动驾驶仪已经演变成了飞行管理系统，可以控制飞行过程中除滑行和起飞外的几乎所有部分，如今甚至连这两个动作也开始自动控制了。正如最近的事故所示，当生命受到威胁时，飞行管理系统仍然没有完善到可以完全信任。但是在当今世界，美国“全球鹰”无人侦察机定期执行军事任务，人们谈论无人驾驶汽车好像它们近在眼前，民用飞行机组到底需要多少人显然也是可以讨论的。

对于武装部队来说这也是一个直接相关的问题。特别是无人机可以用于执行那些对人来说过于危险的任务，或许是有人驾驶的飞机没有能力执行的任务。这可能会改变未来战争的方式。

空客和波音至少都在为单人驾驶的商业航空做准备。这样的未来不仅需要可靠的飞行管理系统，还需要重新设计驾驶舱以适应单人操作。两家公司都在测试这种驾驶舱的模拟器。航空公司对此十分热衷。瑞银去年发布的一份报告显示，改为单人驾驶每年可为全球民航企业节省150亿美元。完全无人驾驶将使这一数字增加到350亿美元。

改为单人驾驶的话，一旦出现让这唯一一位机组人员无法工作的紧急身体状况，飞行管理系统就必须能胜任接管飞机，飞往附近的机场并安全降落。就实际效果而言现在就已经是这样了。人类的干预只有在起飞过程中

才被广泛认为是必要的。飞行员工会表示，他们担心单个飞行员能否应对飞机本身的问题带来的紧急情况，例如发动机故障。但是，到底有多大的必要让两名机组人员来处理这种特殊情形尚存争议。

即便如此，自动飞行系统也是航空技术固有的保守性最为凸显的一个领域。例如，民用航空的飞行控制软件不能轻易地利用人工智能的“深度学习”能力。监管机构不愿意批准任何他们无法理解的东西。但使用深度学习的意义恰恰在于，它会以不可预测的方式自行调整以应对环境。这将带来巨大的好处，因为它将允许各架飞机的自动驾驶仪相互学习经验。

这样看来，在民用航空中，客机还可能会保持双人驾驶一段时间。但对货机来说就不一定了。只要技术上可以实现，没有客户会阻止单人驾驶甚至完全无人化。如果无人驾驶货机被证明是安全的，那么在无人驾驶汽车也变得司空见惯的世界里，乘客的态度可能会改变。

在美国的武装部队中，下一批可能去掉飞行员的飞机是直升机。大部分相关工作是在美国国防部的研究机构——国防高级研究计划局（DARPA）——的支持下进行的。作为其ALIAS（驾驶舱机组成员自动化系统）项目的一部分，西科斯基飞机公司（Sikorsky Aircraft Corporation，洛克希德·马丁公司的直升机部门）改装了该公司的一款S76-B商用机型，使之几乎可以自动驾驶。

西科斯基的创新副总裁克里斯·范布伊滕（Chris Van Buiten）发现，驾驶直升机远比驾驶飞机难得多。直升机在空气动力学上是不稳定的，所以单是直线飞行和保持水平这样的操作都是一种挑战。但之所以要用直升机就在于它不仅仅能直线飞行和保持水平。它可以左右闪避，绕开障碍物，这就使它可以贴地飞行——所有这些都增加了驾驶员尝试控制它时的脑力消耗。而且它经常在那些让固定翼飞行员踌躇不前的天气状况下出动。

该公司将它实验性的直升机副驾驶称为MATRIX，它配备了一个中央处理器，可接收来自各种传感器的信号，并将这些信号与来自全球定位系统（GPS）和其记忆库中存储的本地地形图综合。然后，处理器向位于飞行

器机身周围不同位置的致动器发送适当的信号以控制其机械系统。任务指令本身由MATRIX的人类指挥官通过平板电脑给出，但范布伊滕希望语音识别系统很快就会变得足够可靠，让人可以口述指令。

MATRIX的一个优点是它的响应比人类飞行员快得多。这在正常情况下很有价值，而在紧急情况下可能性命攸关。例如，它可以对发动机故障做出反应，为若干种强制着陆的选项评分，并在百分之一秒内找出最安全的选项。而人类飞行员要搞清楚发生了什么就要花费几秒钟。

将在今年秋天进行的下一步是在西科斯基的“黑鹰”直升机上测试这套系统。届时，在许多情况下它真的都将独当一面。正如范布伊滕所说，战地指挥官有两个选择：派出一名人类飞行员，或干脆不用。

ALIAS背后的想法并不局限于直升机。直到2017年，DARPA一直都是双管齐下——它的另一项工作是赞助波音的子公司极光飞行科学（Aurora Flight Sciences）打造一个系统，以实体设备取代固定翼飞机驾驶舱中的副驾驶。极光提出了两套设备方案来完成这项工作。一套用专门设计的操纵器来操作飞机的操纵杆和踏板。另一套用改造的商用机械臂来拉动适当的控制杆，拨动相关的开关。该系统还有视觉。它不是连接到飞机的传感器，而是直接读取仪表盘显示然后做出反应。

这种做法的优点显而易见。通过适当的编程，它就可以把任何现有飞机变成无人机。极光在两种类型的固定翼飞机和UH-1“伊洛魁”（Iroquois）直升机上进行了测试。它甚至曾在波音737的控制台上一展身手——虽然控制台是安装在飞行模拟器而不是真正的飞机上。

所有这些辛勤工作最后怎么样了是一个谜。虽然DARPA已经停止为由极光负责的那部分ALIAS项目付款，但该公司拒绝评论它接下来要怎么干。不过在公司网站上还能找到这个项目，现在被称为“机器人副驾驶”（Robotic Copilot），并被描述为“概念开发计划”。而无论是军用还是民用，不用做多少改动就可以控制现有飞机的想法似乎都很有吸引力。

对于未来的无人驾驶飞机，从一开始就设计为无人控制有很大的好处。这

种飞机既不需要驾驶舱也不需要生命支持系统。此外，由于不需要维持人类飞行员的生存，它们的加速可以比有人机更快，飞行也更灵活。

这种灵活性和加速度对战斗机来说尤其有利。而且，虽然全自主机器人战斗机尚未问世，但某种和它很接近的东西很快就会起飞了。其思路是把攻击机编为小型飞行中队，只需要一个人担任中队长。

洛克希德·马丁公司在2017年测试了这一想法，把一架F-16（一种已经开始显得老式的战斗机）改造为无人机，接受有人驾驶的长机的指令。在加州爱德华兹空军基地进行的这番测试据称取得了成功。一种可能的前景是以这种方式改装和部署美国空军中越来越过时的F-16机队，而人类“主持人”坐在一个更现代的飞机——大概是F-35中——指挥护卫队的行动。另一种对未来的构想是这些编队中的机器人飞机，也就是所谓的“忠诚僚机”，是专门建造的。事实上，波音似乎已经把“忠诚僚机”（Loyal Wingman）这个称法拿过来并首字大写，用来描述它在2月26日发布的“空中力量编队系统”。

波音的产品长12米，大约是F-35长度的四分之三。原型机应该会在明年试飞。有趣的是，公告是在澳大利亚发布的，原型机也将在澳大利亚生产——因为空中力量编队系统是与澳大利亚空军合作开发，意在从一开始就可供美国最亲密的盟友使用。澳大利亚显然排在第一个。

波音的忠诚僚机并非绝无仅有。加州公司Kratos生产给飞行员做标靶练习的无人机，也在从事相关研发。它的第一款测试机UTAP-22 MAKO基于标靶无人机设计，自2015年以来一直在飞行。XQ58a“女武神”（Valkyrie）是一款更先进的机型，于3月5日在亚利桑那州的尤马试飞成功。关于“女武神”的细节很少，但从它的图片可以看出其设计师广泛使用了隐形技术。

在军用无人机领域，美国目前只有一个公开的竞争对手：以色列。它的国营军工企业以色列航空航天工业公司生产一种名为“苍鹭”（Heron）的侦察无人机。相比之下，欧洲还在迎头追赶，而中国几乎悄无声息。

美国无人机的欧洲竞争对手的名字可真够简洁的：“欧洲中空长航时遥控

驾驶航空器系统”。它是空客与法国达索飞机制造公司（Dassault Aviation）及意大利的莱昂纳多公司（Leonardo）合作的产品。它应该在2025年前就可以部署。但欧洲没有“忠诚僚机”的对等计划。中国的军用无人机计划由总部设在辽宁的国有企业沈阳飞机工业公司负责，它是中国航空工业集团的子公司。该公司开发了一系列实验无人机，名为“风刃”、“云影”和“利剑”等。然而据本刊所知，中国尚未有用于量产的军用无人机。

与此同时，美国的设想还不只是“忠诚僚机”。DARPA和美国空军似乎都试图缩小无人机的尺寸，而希望增加数量。DARPA称之为“小精灵”（Gremlins）项目。它是2016年出版的美国空军《小型无人机系统飞行计划》的核心。

“小精灵”无人机长约4米，翼展3.5米，由运输机在半空投放，如果在任务中幸存的话，再由同样的母舰或类似的飞机在空中接载回收。DARPA的“小精灵”项目合同由位于阿拉巴马州的Dynetics公司负责，该机型首次测试安排在今年晚些时候，将从一架C-130的尾部投放它们。“小精灵”的尺寸劣势将用数量弥补——其思路是像一群黄蜂涌向野餐食物那样压倒敌人的防御。如果它奏效的话，将创造一种全新的空战模式。■



Manufacturing

Some assembly required

Composites and electronic twins are transforming construction

THE A350 is a twin-engined airliner that is the top of the range of Airbus's offerings, rolling out of the company's factory in Toulouse, France, at the rate of ten a month. Each of the finished planes sits at the apex of a system of supply chains which fans out across the world, bringing 3.5m components together into a single product. An A350's airframe is composed of seven sections. Three are assembled into the fuselage, two being made at another site in France and the third in Germany. The two wings are made in Britain, then transferred to Germany to be finished. The tail fin and the horizontal-stabiliser assembly are made in Spain.

All of these pieces are flown to Toulouse in special transport aircraft called Belugas—after the whale, which they resemble, rather than the sturgeon, which they do not. They are made, mostly, of carbon-fibre-reinforced plastics (CFRPs). These are composite materials that cannot be riveted in the way metal is because of the damage this causes to the fibres. They are therefore held together by lock-bolts inserted through 10,000 specially drilled holes in the flanges where the sections overlap.

Connecting the sections involves fitting them together, drilling the holes (a process less damaging than riveting), unfitting them, cleaning the holes and surrounding areas of debris, applying a sealant to the flanges, fitting the pieces back together again and then inserting the lock-bolts. At this point the myriad cables which keep a modern aircraft flying, and which have been pre-fitted into the airframe sections, are linked up.

Before their final bonding, however, the fuselage sections have had what

are known as “monuments” installed. These are bits of equipment—galleys, crews’ quarters and so on—that would be too big to carry through the cabin doors later. Afterwards, the rest of the fitting-out is done, the plane is painted in the customer’s livery and the crucial finishing touches, a pair of engines, one under each wing, are added. The whole process takes about a month.

Airbus and its American counterpart Boeing dominate civil aviation and have done so for decades. Airbus was formed in 2000, though it acquired its current name only in 2014, having previously been known as EADS. Boeing took over McDonnell Douglas, its last American rival in the civil-aviation business, in 1997.

That domination has been enhanced yet further by Airbus’s recent absorption of part of the business of Bombardier, a Canadian company, and Boeing’s purchase of a large chunk of Embraer, a Brazilian one. These two were the last firms in the West with even a nominal claim to be independent makers of airliners. A Chinese rival, COMAC, may eventually muscle in. And, in the wreckage that was once the Soviet Union, the United Aircraft Corporation, a merger of Soviet-era firms, clings to life. But, to all intents and purposes, making airliners is at the moment a duopoly.

The cockeyed nature of Airbus’s supply chain, spread across much of western Europe, might be seen as a consequence of the firm’s multinational antecedence and a desire not to put noses out of joint by politically awkward closures of peripheral plants. But Boeing is no better. The supply chain for its 787 Dreamliner, a competitor of the A350, is even more convoluted than for the A350s, as a result of a decision early in the plane’s history to outsource manufacturing of airframe sections to other firms. Despite such self-indulgences, however, competition between the two firms is fierce. The jurisdictions in which they operate are each acutely aware of any knavish tricks by the authorities in the other intended to support the home team,

and are willing to challenge such arrangements in the World Trade Organisation. All this helps drive technological improvements.

In the case of airframes, the biggest technological shift going on is an invisible one, from metal alloys to composite materials—mostly CFRPs. The A350's airframe is 53% composite. The resulting lighter weight, Airbus claims, makes it 25% more efficient, in terms of fuel consumption, than predecessor planes. That is a huge saving for the world's airlines. According to the International Air Transport Association, an industry body, fuel accounts for almost a quarter of airlines' operating expenses—\$180bn in 2018.

Boeing, naturally, matches these claims with claims of its own. The Dreamliner is 50% composite—and again around 20% more efficient than its predecessors. Composites bring advantages beyond lightness. Unlike metals, they do not corrode. Nor do they crack from metal fatigue. They therefore need less maintenance. They do bring problems, though. One is that damage to them is less obvious than to metal, because they do not bend or dent. This is one reason why Airbus fits hundreds of sensors, ranging from voltage meters to strain gauges, all over its A350s. These can warn of problems invisible to the eye. Another disadvantage of composites is that they are not as malleable as metals. Bit by bit, however, that disadvantage is disappearing.

Parts made of composites are constructed by a process called laying up. This builds a component from ribbons or small sheets of carbon-fibre fabric applied to a forming mould together with a resin that hardens when the whole thing is baked in an autoclave. Originally, laying up was done by hand. Then automatic tape-laying machines made things faster and more reliable. These days, matters have improved still further. Giant looms are used to weave carbon-fibre ribbons into huge sheets. These looms can vary the tension in warp and weft in a way that does the job of the forming

mould, creating sheets that reflect from the start the shape of the component of which they will become part. This makes laying up much easier, speeding up production even more.

In civil aviation, that speeding up of production is going to be crucial. Airbus, in a forecast published in 2017, predicted that air traffic will grow at 4.4% a year over the next two decades, requiring some 36,600 new passenger and 830 cargo aircraft at a total value of \$5.8trn (see chart). Boeing's forecasts are, if anything, more bullish: a 4.7% annual growth in traffic, more than 41,000 new aircraft and a total value of \$6.1trn.

To meet such demand, both firms will need to up their game, and they are doing so. Oliver Wyman, a consultancy, said in a report last year that it expected production of Airbus's A320 and Boeing's 737 each to jump from around 40 a month in 2015 to 60 a month this year. Those figures may need to be adjusted a bit after the recent 737 accidents, but the trend is clear.

Techniques like using looms to improve the manufacture of parts contribute to this growth. But grander plans are afoot. According to Grazia Vittadini, Airbus's chief technology officer, the key to the future is connectivity.

It would be easy to dismiss that as a buzzword invented by the marketing department if it were not for all those sensors aboard every A350. The 30 gigabytes of data they transmit every day—and similar, if not quite so abundant, quantities of data from other types of Airbus aircraft—are the basis of a system called Skywise that allows both the firm and its customers to track what is going on across entire fleets of aircraft.

Eventually this will lead to every plane having an electronic twin on the ground. This system is already established for jet engines. Manufacturers create a computer model of each engine they make, and then update it

during or after every flight, using data collected by sensors on board the real thing. That way, the electronic simulacrum can keep an eye on its physical counterpart, flagging up potential problems and predicting better than an arbitrary maintenance schedule when parts need replacing. What works for engines can easily be extended to entire aircraft—and even to a time before an individual plane is born, tracking its components as they are put together. This way, the process of assembly can be monitored, integrated and speeded up.

Further off into the future, plans for new generations of aircraft are already being laid. There is talk, for example, of CFRPs having a serious makeover. The resins currently used to bind the sheets and tapes of fibre together are what are known as thermosetting plastics. Once baked, these hold their shape for ever. Most of the materials that a layman would think of on hearing the word “plastic”, though, are different from this. They are thermoplastics, and can be softened by heating and then remoulded an indefinite number of times. They behave, in other words, like metals. And, like metals, they can be riveted—a process easier than assembling things using lock-bolts. They can also be recycled, which saves money and burnishes a firm’s green credentials.

Looking even further ahead than that, Airbus is now experimenting with spider silk, produced on an industrial scale by genetically modified micro-organisms, for making aircraft components. Such silk is stronger, tougher and lighter than almost any man-made material. Work on it is still at an experimental stage. But Airbus is collaborating with AMSilk, a German biotechnology firm, to develop silk-reinforced polymers that might one day become substitutes for CFRPs.

As to the design of airframes themselves, cautious improvement rather than radical change is the order of the day. No one has forgotten the lesson of the Sonic Cruiser. Though the design for that unbuilt aircraft retained a

cylindrical fuselage for passengers to sit in, it had delta wings aft and a pair of canards at the front for stability. It would, as the name suggests, have cruised at Mach 0.98, just below the speed of sound.

It bombed. No one wanted it, mainly because its fuel consumption would have been too high (most passengers seem to prefer cheap tickets to speedy arrival). There was also a problem with its awkward shape, which would have made it difficult to fit into the existing infrastructure of global airports.

That does not mean that the design of airframes—and wings, in particular—cannot be improved. In January, for example, Boeing announced it was working on a proposal that will change the look of aircraft quite a lot if it is implemented. The Transonic Truss-Braced Wing, as the firm calls it, will have a pair of wings fixed above the fuselage, each supported by a brace that is fixed below the fuselage. This arrangement allows the main wings to be both thin (saving weight overall) and long (which reduces drag). The upshot is the eternal desideratum of better fuel economy.

Airbus, meanwhile, is working on BLADE (Breakthrough Laminar Aircraft Demonstrator in Europe), an experimental wing design that is being test-flown this year. BLADE is an attempt to create a wing that has no irregularities to disrupt the smooth flow of air over its surface. This, too, is intended to reduce drag. BLADE wings have no joints, and therefore no rivets or fasteners, and have smooth, glossy surfaces. They may also be fitted with flaps that deflect insects during take-off and landing.

The delta-wing dream will, nevertheless, not quite go away. In theory, the optimum shape for an aircraft that relies on fixed wings to provide its lift is such a delta, with wings and body blended together so that the whole structure provides lift. Designs for such vehicles pop up from time to time, and might make effective freighters. Whether passengers would like them,

though, is moot. Most seats would be a long way from a window, and evacuation in an emergency might be hard. ■



制造

尚需装配

复合材料和电子双胞胎正在改变飞机制造【技术季刊《航空》系列之二】

A350是一款双引擎客机，是空客产品系列中的佼佼者，在该公司位于法国图卢兹的工厂里以每月十架的速度生产。每架成品飞机位于遍布全球的供应链系统的顶端，将350万个组件整合到一件产品中。A350的机体由七个部分组成。其中三个部分组装成机身：两个在法国另一个地点生产，另一个在德国制造。两翼在英国打造，然后运到德国做最后加工。垂直尾翼和水平尾翼组件在西班牙制造。

所有这些部件都是装在特殊的运输机上飞往图卢兹。这种运输机叫“Beluga”，因为它们的外形像一条“大白鲸”（而不是这个词的另一个意思“鲟鱼”）。它们主要由碳纤维增强塑料（CFRP）制成。这种复合材料不能以铆接金属的方式拼接，因为这会对纤维造成损坏。因此，不同的部分重叠在一起的凸缘上打了一万个特殊钻孔，再插入锁定螺栓把它们固定在一起。

将各部分连接起来的步骤包括：将它们拼在一起，钻孔（这道工序造成的破坏比铆接小），再拆开，清洁钻孔和周围区域的碎屑，在凸缘上涂上密封剂，再次将部件拼在一起，插入锁定螺栓。这时，再把已预先安装到机体各部分中、用来让现代飞机保持飞行的无数根电缆连接起来。

然而，在最终拼合之前，机身部分要安装所谓的“建造物”。它们是一部分设备——厨房、机组休息仓等——因体积太大而无法在后期通过舱门入内。之后会完成其余的装修工作，飞机会涂上客户的专用色彩和图案标志，再完成关键的“最后一笔”——装上一对发动机，每个机翼下面一个。整个过程大约需要一个月。

空客及其美国同行波音主宰了民用航空业几十年。空客重组于2000年，不过它直到2014年才有了现在这个集团名字，之前被称为欧洲航空国防航

天公司（EADS）。1997年，波音接管了民航业务的最后一位美国竞争对手——麦克唐纳-道格拉斯公司（McDonnell Douglas）。

空中客车最近吸收了加拿大庞巴迪公司的部分业务，波音则收购了巴西航空工业公司（Embraer）的一大部分，使市场变得愈发集中。这两家公司是西方最后的（哪怕只是名义上）独立客机制造商。来自中国的竞争对手中国商飞（COMAC）可能最终会加入进来。而在昔日苏联的残余中，由若干苏联时代的公司合并而成的联合航空制造公司（UAC）苟延残喘。但是，不管从什么意义上来说，客机制造业目前属于双寡头垄断。

空客的供应链遍布西欧大部分地区，这种怪异的安排可能是缘于该公司的前身是多国企业，并且关闭外围工厂在政治上十分难堪，公司不想因此激怒他人。但波音也好不到哪里去。对于A350的竞争对手787“梦想客机”来说，由于这款飞机在其发展的早期阶段就决定将机体部件的制造外包给其他公司，它的供应链比A350的还要错综复杂。然而，尽管“任性”到这种程度，两家公司之间的竞争非常激烈。双方所在的司法管辖区都会敏锐地发现另一方的监管机构企图支持自家公司的任何诡计，并不惜在世贸组织中对这些安排提出质疑。这一切有助于推动技术进步。

就机体而言，最大的技术转变是无形的，从金属合金转向复合材料——主要是CFRP。A350的机体有53%是复合材料。空客声称这款飞机因此变得更轻，从而使得它在燃油消耗方面的效率比前代飞机高出25%。这对全球航空公司来说节约了一大笔钱。据行业组织国际航空运输协会（IATA）称，燃料占航空公司运营支出的近四分之一，2018年时达1800亿美元。

波音自然不甘落后。梦想客机的机体有50%为复合材料——与前代产品相比效率也提高了约20%。复合材料带来的优势还不止是轻。它们不像金属会生锈，也不会因金属疲劳而断裂，因此需要的维护较少。不过它们也带来了问题。一则是在损坏处不如金属那么明显，因为它们不会弯曲或凹陷。这就是空客在A350上安装包括电压表和应变计在内的数百种传感器的原因之一。这些仪表可以就肉眼看不到的问题发出警报。复合材料的另一个缺点是不像金属那样具有延展性，但这一点正逐步解决。

由复合材料制成的部件用所谓的“铺层”工艺建造。它将碳纤维织物的条带或小薄片与树脂一起压到成型模具上，当整个部件在热压罐中烘烤时，树脂会硬化。铺层工作最初是手工完成的，后来出现的自动铺带机速度更快、更可靠。如今又有了进一步改善。巨型织机将碳纤维带编织成庞大的片材。这些织机可以改变经纱和纬纱的张力，替代了成型模具的工作，让片材从一开始就反映出其构成部件的形状。这让铺层大大简化，从而进一步加快了生产速度。

在民用航空中，加速生产将变得至关重要。根据空客在2017年公布的预测，未来20年内，航空交通量将以每年4.4%的速度增长，将需要约36,600架新客机和830架货机，总价值达5.8万亿美元（见图表）。波音的预测还要乐观：交通量年增长率为4.7%，新飞机超过41,000架，总价值6.1万亿美元。

要满足这种需求，两家公司都需要更上一层楼，而它们确实在这样做。奥纬咨询公司去年在一份报告中表示，预计空客A320和波音737飞机的产量将从2015年的每月40架左右增加到今年的每月60架。在最近的737事故发生后，这些数字可能需要稍作调整，但趋势确定无疑。

像使用织机来改进零部件制造这样的技术有助于增长。但更宏伟的计划已经启动。空客的首席技术官格拉齐亚·维塔迪尼（Grazia Vittadini）说，未来的关键是网络连接。

如果不是每架A350上都有那么多传感器的话，你可能觉得这无非是营销部门想出来的一个时髦说法罢了。它们每天要传输30吉字节的数据，其他空客机型传输的数据量也差不多（也可能略少一些）。这些数据是一个叫做Skywise的系统的基础，该系统让空客及其客户得以跟踪整个机队的状况。

最终，这将导致每架飞机都有一个地面上的电子双胞胎。喷气发动机已经建立了这样的系统。制造商为其生产的每台发动机都创建了一个计算机模型，在每次飞行期间或之后用采自真实发动机的传感器数据来更新它。这

样，电子模拟机就可以密切跟踪对应的实体发动机，标记潜在问题，并比人为规定的维护计划更好地预测何时需要更换零部件。适用于发动机的做法可以很容易地扩展到整架飞机——甚至可以在飞机诞生之前的某个时间就开始在组装中跟踪部件。这样，组装过程可以被监控、集成和加速。

在更长远的未来，新一代飞机的计划已经开始酝酿。例如，有人在谈论对CFRP做重大改造。目前用于将纤维片材和条带粘合在一起的树脂是所谓的“热固性”塑料。一旦烘烤，它们的形状就将永远保持。然而，外行人在听到“塑料”这个词时会想到的大部分材料都不是这样——它们是“热塑性”塑料，可以通过加热软化，然后无限次地重塑。换句话说，它们就像金属一样。而且，它们和金属一样可以铆接——比使用锁定螺栓来组装更容易。它们还能回收利用，从而节省资金，并让公司的绿色形象更加闪亮。

看得再久远一些，空客正在试验用蜘蛛丝制造飞机部件。这种蜘蛛丝是由转基因微生物以工业规模生产的。这种丝比几乎任何人造材料都更牢固、坚韧和轻盈。此项工作仍处于试验阶段。但空客正在与德国生物技术公司AMSilk合作开发丝增强聚合物，有朝一日可能成为CFRP的替代品。

至于机体本身的设计，普遍的做法是谨慎的改进而非激进的变革。没有人忘记“音速巡航机”（Sonic Cruiser）的教训。虽然这架并未建成的飞机的设计保留了圆柱形机身供乘客乘坐，但它的后部有三角翼，前部有一对鸭翼以保持稳定。顾名思义，它会以0.98马赫的速度巡航，只比音速略低。

结果它一败涂地。没人要它，主要是因为油耗太高了（比起快速到达，大多数乘客似乎还是宁可机票便宜）。其别扭的形状也是个问题，因为这使其难以接入全球机场现有的基础设施。

这并不意味着机体特别是机翼的设计无法改进。例如，今年1月，波音宣布它正在制定一项提案，一旦实施将会大大改变飞机的外观。该公司称其为“跨音速桁架支撑机翼”。它将在机身上方固定一对机翼，每个均由固定在机身下方的支架支撑。这种设计让主翼既薄（减轻整体重量）又长（减少阻力）。其结果是更好的燃油经济性这一永恒的追求。

与此同时，空客正在研究“刀锋”（BLADE，全称“欧洲突破性层流飞机验证机”）。这是一个实验性的机翼设计，今年正在试飞。“刀锋”试图打造一种没有不规则性的机翼，不会扰乱表面流畅的气流。这也是为了减少阻力。“刀锋”机翼没有接头，因此没有铆钉或紧固件，拥有顺滑而有光泽的表面。它们也可能配有在起飞和着陆过程中驱散昆虫的襟翼。

不过，三角翼的梦想不大会完全消散。理论上，为固定翼飞机提供升力的最佳形状是三角形，机翼和机身融合在一起，让整个结构都能提供升力。此类机型设计不时出现，并可能打造出高效的货机。然而，乘客会不会喜欢它还不好说。大多数座位都离窗户很远，在紧急情况下可能很难撤离。





Free exchange

Votes of confidence

Just how compatible are democracy and capitalism?

OF LATE THE world's older democracies have begun to look more vulnerable than venerable. America seems destined for a constitutional showdown between the executive and the legislature. Brexit has mired Britain in a constitutional morass of its own. Such troubles could be mistaken for a comeuppance. In recent years political economists have argued that rising inequality in the Anglo-American world must eventually threaten the foundations of democracy; a book on the theme by Thomas Piketty, a French economist, has sold well over a million copies. That argument channels a time-worn view, held by thinkers from Karl Marx to Friedrich Hayek, that democracy and capitalism may prove incompatible.

As powerfully as such arguments are made, the past century or so tells a different story. The club of rich democracies is not easy to join, but those who get in tend to stay there. Since the dawn of industrialisation, no advanced capitalist democracy has fallen out of the ranks of high-income countries or regressed permanently into authoritarianism. This is not a coincidence, say Torben Iversen of Harvard University and David Soskice of the London School of Economics, in their recent book, "Democracy and Prosperity". Rather, they write, in advanced economies democracy and capitalism tend to reinforce each other. It is a reassuring message, but one that will face severe tests in years to come.

Economists and political theorists have imagined all sorts of ways capitalist democracies might fail. The oldest is the worry that grasping masses will vote to expropriate the wealth (hard-earned or not) of entrepreneurs and landowners—and without secure property rights there can be no capitalism.

Hayek thought that the governments of the early 20th century, in responding to the concerns of the masses, had over-centralised economic decision-making, a road that led eventually to totalitarianism. Other thinkers followed Marx in reckoning that it was the greed of the capitalists that would do the greatest harm. Joseph Schumpeter feared that as firms grew more powerful, they might push a country towards corporatism and clientelism, winning monopoly rights that would generate profits they could share with politicians. Mr Piketty and others say that inequality naturally rises in capitalist countries, and that political power becomes concentrated alongside economic power in an unstable way. Other economists, like Dani Rodrik, have argued that full participation in the global economy forces a country to give up a degree of either national sovereignty or democracy. Lowering barriers to trade means harmonising trade and regulatory policies with other countries, for instance, which reduces each government's ability to accommodate domestic preferences.

But if capitalism and democracy are such uneasy bedfellows, what explains their long co-existence in the rich world? Mr Iversen and Mr Soskice see capitalism and democracy as potentially mutually supporting, with three stabilising pillars. One is a strong government, which constrains the power of large firms and labour unions, and ensures competitive markets. Weaker countries find it harder to resist the short-term expediency of securing power by protecting monopolies. The second is a sizeable middle class, forming a political bloc that shares in the prosperity created by a capitalist economy. A bargain is struck in which the state provides mass higher education on generous terms, while encouraging the development of frontier industries that demand skilled workers. Middle-class households thus reckon that economic growth is likely to benefit them and their children. (Rising inequality is not a threat to capitalist democracies, the authors reckon, because middle-class voters care little about the poor and do not support broader redistribution that could raise their tax bills.)

Providing the education, infrastructure and social safety net that support a prosperous middle class requires substantial tax revenue. For the system to hold a third pillar is needed: large firms that are not very mobile. Before recent rapid globalisation that was no problem. Yet even now firms are more rooted than commonly thought. Though multinationals are adept at shifting production and profits around the world, in a knowledge economy leading firms cannot break their connections to networks of skilled individuals like those in London, New York or Silicon Valley. Their complex business plans and frontier technologies require the know-how developed and dispersed through these local networks. That increases the power of the state relative to firms, and allows it to tax and spend.

Quibble with the details, but the overarching story—immobile companies giving governments a degree of sovereignty, which they self-interestedly use to boost the middle classes—seems a plausible account of the stability of advanced capitalist democracies. It leaves plenty to be concerned about, however. It hinges on the middle classes feeling confident about the economy. A sharp slowdown in growth in real median incomes, as in America and Britain in recent years, might not send voters rushing to the barricades, but could strengthen the appeal of movements that threaten to disturb the status quo. Governments, too, are becoming less responsive to middle-class priorities. America's is too dysfunctional, and Britain's too distracted by Brexit, to focus on improving education, infrastructure and the competitiveness of markets.

Demographic change might also take a toll: older and whiter generations may not much care whether a would-be middle class that does not look like them has opportunities to advance or not. Then, too, the authors may have underestimated the corrosive effect of inequality. Threatening to leave is not the only way the rich can wield power. They control mass media, fund think-tanks and spend on or become political candidates. Proud democracies may well survive this period of turmoil. But it would be a

mistake to assume survival is foreordained. ■



自由交流

信任票

民主和资本主义到底有多相容？

最近世界上的老牌民主国家开始显得更脆弱，而不是更可敬。美国看来注定要在行政和立法部门之间来一场宪法上的对决。脱欧则让英国陷入了宪法的泥潭。这些麻烦可能会被误认为是报应。近年来政治经济学家指出，英美国家不平等的不断加剧最终一定会威胁民主的根基；法国经济学家托马斯·皮凯蒂关于这一主题的著作已经卖出了100多万册。这一论证引出了一个从马克思到哈耶克都持有的老套观点——民主和资本主义可能并不相容。

尽管这些论断掷地有声，过去一个世纪左右的历史却讲述了一个不同的故事。富裕民主国家的俱乐部不易加入，而加入的国家往往都留在那里。自进入工业化时代以来，没有哪个发达资本主义民主国家跌出高收入国家的行列或永久地倒退到独裁主义。哈佛大学的托本·艾弗森（Torben Iversen）和伦敦经济学院的大卫·索斯凯斯（David Soskice）在他们的新书《民主与繁荣》（Democracy and Prosperity）中指出，这并不是巧合。相反，他们写道，在发达经济体里，民主和资本主义往往互相强化。这一说法令人宽慰，但在未来几年将面临严峻的考验。

经济学家和政治理论家曾设想过资本主义民主失败的种种方式。最早的担忧是贪婪的大众会投票剥夺企业家和土地所有者的财富（无论是不是辛苦赚来的），而如果不能确保产权，就不可能有资本主义。哈耶克认为，20世纪初的政府为了回应民众的忧虑，让经济决策过度集中，最终导致了极权主义。其他追随马克思的思想家认为资本家的贪婪才是最大的危害。约瑟夫·熊彼特担心，随着企业变得越来越强大，它们可能会把一个国家推向社团主义和侍从主义，赢得垄断权，从而获取可以与政客分享的利润。皮凯蒂等人认为，不平等在资本主义国家会自然而然地加剧，政治权力会与经济权力一起以一种不稳定的方式变得更加集中。丹尼·罗德里克

(Dani Rodrik) 等其他经济学家认为，全面参与全球经济会迫使一个国家在一定程度上放弃主权或民主。例如，降低贸易壁垒意味着与其他国家协调贸易和监管政策，这削弱了各国政府顾及国内偏好的能力。

但如果资本主义和民主这么同床异梦，该怎么解释它们在富裕世界里的长期共存呢？艾弗森和索斯凯斯认为，资本主义和民主通过三根稳定的支柱，隐隐地互相支持。其一是强有力的政府，它限制大公司和工会的权力，并确保市场竞争。实力较弱的国家会更难抗拒使用通过保护垄断来巩固权力的权宜之计。其二是规模可观的中产阶级，它形成一个政治集团，分享资本主义经济体创造的繁荣。双方达成协议，即国家以慷慨的条件提供大规模的高等教育，同时鼓励发展需要熟练技术工人的前沿产业。因此，中产阶级家庭认为经济增长应该会让自己和自己的后代受益。（作者认为，日益加剧的不平等不会对资本主义民主政体构成威胁，因为中产阶级选民不关心穷人，也不支持可能增加他们税单的更大范围的再分配。）

提供支持中产阶级兴盛的教育、基础设施和社会安全网需要大量税收。要支撑起整个体系还需要第三个支柱：流动性不强的大公司。在近年发生的快速全球化之前，这不是问题。但即使现在，企业的流动性也比人们通常认为的更低。尽管跨国公司擅长在全球范围内转移生产和利润，但在知识经济时代，领先的企业无法切断与伦敦、纽约或硅谷等技术人才网络的联系。它们复杂的商业计划和前沿技术需要这些本地网络发展和传播的专门知识。这增加了政府相对于企业的权力，并让它能征税和支出。

细节上可以挑刺，但主线故事似乎是对发达资本主义民主政体稳定性的合理解释——不流动的公司给予政府一定程度的最高统治权，它们出于自身利益用这一权力来促进中产阶级的发展。但这留下了很多值得关注的地方。这取决于中产阶级对经济的信心。近年来美国和英国的实际收入中值增长大幅放缓，这或许不会让选民冲到路障前，但可能会增加那些有可能扰乱现状的运动的吸引力。政府对中产阶级重视的问题的响应也在减少。美国政府运作严重失灵，英国政府深受脱欧的干扰，无法集中精力改善教育、基础设施和市场竞争力。

人口结构的变化可能也会带来负面影响：白人更多的老一代人可能并不太在意那些外表不像他们的潜在的中产阶级是否有上升的机会。此外，作者可能低估了不平等的侵蚀作用。威胁离开并不是富人使用权力的唯一方式。他们控制着大众媒体，为智库提供资金，为政治候选人提供经费或者自己直接参选。自豪的民主国家很可能会挺过这段动荡的时期。但如果认为幸存是注定的，那可就错了。 ■



Aviation

The future of flight

Despite appearances, aircraft have changed a lot—and will soon change more, writes Geoffrey Carr

ON MARCH 10TH a Boeing 737 MAX, the latest version of that firm's bestselling narrow-bodied airliner, fell from the sky in Ethiopia. All 157 souls on board were lost. This followed the crash off the coast of Java, less than five months earlier, of another 737 MAX. The death toll then was 189. The immediate cause in both cases seems to have been a faulty sensor feeding false data to an avionic flight-management system that had, in turn, had new software which pilots had not been briefed about. The flight-management system insisted on overriding the actions of the pilots, who did not know how to respond. This precipitated a stall rather than, as intended, preventing one.

These two tragedies illuminate the tension between conservatism and innovation that lies at the heart of civil-aviation technology. As a character in "The Leopard", a novel about the revolutionary events of Italy's unification in the 19th century, declares: "If we want things to remain as they are, everything needs to change." Attempts by the industry to follow that advice seem to have been what ultimately caused these crashes.

The 737 goes back many years. It was conceived in the 1960s, when engines were smaller and passengers generally embarked and disembarked using staircases wheeled in for the purpose rather than airbridges connected directly to a terminal building. Small engines allowed, and staircases encouraged, a design that kept the fuselage close to the ground.

By the time the 737 MAX was being planned, this had changed. Modern turbofan engines with wide air intakes required, and airbridges permitted,

alterations to the airframe that also altered its handling characteristics (its trim, to use the jargon). To keep things as they were, and avoid pilots having to recertify to fly the new version, its avionic software was tweaked to make the new plane's trim feel, to a pilot, like the old plane's. That would have been fine as long as the sensors feeding information to those avionics worked properly and the pilots themselves knew what was going on. But they did not.

The case of the 737 MAX is an extreme example of conservatism at work in aircraft design. But retaining the familiar is a recurring theme. A Boeing 707, the plane that ushered in mass intercontinental air transport in the 1950s, appears to the untutored eye much like the current offerings of Boeing and Airbus, the world's principal makers of airliners. Both old and new are portholed tubes that have two swept-back wings sticking out of their sides about halfway along. They have three stabiliser fins—two horizontal and one vertical—at the stern. Pods containing their engines hang on pylons from their wings.

Attempts to change this arrangement have been proposed—most notably Boeing's delta-winged Sonic Cruiser in the early 2000s. But apart from Concorde, a supersonic aircraft in which the delta-winged arrangement was imposed by the laws of physics, such changes have never got anywhere. Engineers know how to keep it safe, and the world's airports have grown in synergy with it. Beneath this conservative geometry, however, airliner technology has improved enormously and is still improving. Better materials are making planes lighter and more comfortable to fly in. Better engines are making them quieter and cheaper to run. And better avionics are, despite exceptions of the sort seen so recently, making them safer (see chart).

Those better avionics also point inexorably in one direction: to a day when

most aircraft will no longer require a pilot. Airlines and their passengers and regulators may take a while to come to terms with this, so it is likely that pilots will sit in cockpits long after they are needed for anything other than the reassurance of the paying public. But armed forces are embracing a pilotless future. Surveillance and missile-carrying drones have been around for a couple of decades. The 2020s will see robot military helicopters introduced and pilotless fighter jets starting to emerge, even though these jets will, at least to begin with, be parts of squadrons that have a human leader in control. Cargo aircraft—military probably and civilian possibly—will be robotised as well.

New technology is also extending the concept of civil aviation. The idea of supersonic transport (SST) for civilians is back on the cards, 16 years after Concorde's last flight. Three firms in America, in particular, have plausible designs for SSTs, appropriate commercial partnerships, and, they hope, sufficient money to get prototypes flying over the next few years. And another old fantasy, flying cars, seems likely to become real in the next few years, as firms both new and old rush to build electrically propelled one- and two-seater aircraft of novel design. Some will act as remotely controlled taxis. Some will be the SUVs of the sky—piloted by their owners over city traffic jams and winding country roads alike.

In these two areas, SSTs and flying cars, change is happening that is reminiscent of the glory days of aeronautics—the half-century after 1903, the year that the Wright brothers made the first widely recognised, heavier-than-air powered flight, at Kitty Hawk, North Carolina. Flying cars especially, if they can be proved safe and manageable by air-traffic-control systems, may change transport networks almost as much as their ground-based brethren did a century ago, by being able to avoid the congestion that the multiplication of those brethren has brought.

Conventional civil aviation is also growing fast. The number of jet airliners

flying may double by 2040 as people, particularly those in Asia who do not fly now, get richer. That will bring environmental problems, for aviation is the least tractable of industries to decarbonisation in order to reduce greenhouse-gas emissions. Aviation fuel packs more energy per kilogram than batteries do. And, so far, attempts to make such fuel synthetically, rather than from petroleum, have foundered on cost. The embrace of, or resistance to, the growth of aviation may depend on whether that, too, can change. ■



航空

飞行的未来

本专题作者杰弗里·卡尔认为，尽管外观还是老样子，飞机已经发生了很大的变化，而且很快还会改变更多【技术季刊《航空》系列之一】

今年3月10日，一架波音737 MAX从埃塞俄比亚上空坠落，机上157人全部丧生。这距离另一架737 MAX在爪哇海岸坠毁还不到五个月，那一次共189人遇难。737 MAX是波音最畅销的窄体客机737系列的最新机型。两起事故的直接原因似乎都是有缺陷的传感器向航空电子飞行管理系统输送了错误的数据，而这个系统里又装有未向飞行员介绍过的新软件。该系统坚持否决了飞行员的操作决策，而飞行员不知道该怎么办了。原本为防止飞机失速而设计的程序反而引向了失速。

两次悲剧凸显了守旧与创新在民用航空技术核心地带的角力。就像记述19世纪意大利统一过程中的革命事件的小说《豹》（The Leopard）中的一个人物所宣称的：“如果我们希望事物保持原样，那么一切都需要改变。”航空业努力听从这一忠告，结果却似乎是从根本上导致了这些坠机事故。

737系列诞生于很多年前。它是在上世纪60年代构想出来的，当时发动机还比较小，乘客一般会通过推到飞机旁的舷梯上下飞机，而非使用直接连接到候机楼的登机桥。发动机小让机身更贴近地面，而使用舷梯更促成了这样的设计。

到规划737 MAX机型时，情况已经改变。使用宽进气口的现代涡轮风扇发动机要求飞机结构做出改变，而使用登机桥上下机也让这种改变成为可能。机体的改动继而改变了飞机的操纵特性（用行话说就是“配平”）。为让一切保持原样，并让飞行员无需重新认证就能驾驶新机型，波音对航空电子软件做了些调整，让飞行员在操纵新飞机时感觉和开老机型时一样。假如向这些电子软件传输信息的传感器正常运作，并且飞行员们又清楚知道在发生什么，那么这么干并没有什么问题。可惜实际上并非如此。

737 MAX的案例是“守旧”影响飞机设计的一个极端例子。但是，保留人们已经熟悉的东西是一个反复出现的主题。上世纪50年代，波音707的出现开启了大规模洲际航空的时代。但在外行人眼中，这款飞机和波音、空客这两大飞机制造商现在的产品无甚差别。新老飞机一样都是带舷窗的大管子；机身大约一半处有两个后掠机翼向两侧伸出；机尾装有三个稳定翼——两个水平，一个垂直；装有发动机的吊舱挂在机翼下方的支架上。

人们已经提出过改变这种构造的尝试。最出名的是波音在本世纪初推出的三角翼“音速巡航机”（Sonic Cruiser）。但除了超音速飞机“协和号”（Concorde）因为物理定律而必须使用三角翼外，这类变化从未普及。工程师们知道如何保证安全性，而世界各地的机场也与之协同发展。然而，在几何结构大致不变的表面之下，民航技术已经大大改进，并且仍在提升。更好的材料使飞机变得更轻巧，乘坐体验更舒适。改进的发动机减少了噪音，也降低了运营成本。尽管最近出现了那种例外情形，更先进的航空电子设备让客机变得更加安全（见图表）。

那些更好的航空电子设备还毅然决然地指向一个方向：大多数飞机都不再需要飞行员的那一天。航空公司、乘客以及监管部门可能尚需要一些时间才能接受这种变化，所以在很长一段时间里，飞行员应该还会继续坐在驾驶舱内，即便他们的存在只是为了让花钱坐飞机的民众感到安心。但军队已经在拥抱一个无人驾驶的未来。用于侦查和运载导弹的无人机已经存在了二三十年。到2020年代，我们将看到机器人军用直升机和无人驾驶战机开始出现，它们至少会开始成为由人类领导的飞行中队的成员。货运飞机也会改用机器人驾驶员——军用货机在这方面的可能性比民用的更大。

新技术也在扩展民用航空的概念。在协和号最后一次飞行的16年后，将超音速运输（SST）用于民航的想法再度流行。尤其有三家美国公司已经拿出了似乎合理的SST设计，建立了恰当的商业合作关系；它们希望还能拿到足够的资金，在未来几年内把原型机送上天空。而另一个古老的梦想——会飞的车——似乎很可能在未来几年里实现，因为新老企业都在竞相制造全新设计的一人座或二人座电动飞机。它们有些会充当遥控出租车，

有些会成为空中SUV——由车主自己驾驶，飞越拥堵的城市和蜿蜒的乡村道路。

在超音速飞机和会飞的车这两个领域，正在发生的变化让人想起航空业的辉煌岁月——1903年后的半个世纪。那一年，在北卡罗来纳州的小鹰镇

（Kitty Hawk），莱特兄弟完成了第一次被世人广泛认可、用动力驱动重于空气的航空器的飞行。特别是会飞的车，如果它们被证明是安全的，且能由空中交通管制系统管理，那么它们给交通网络带来的改变或许将堪比一个世纪前开始在地上跑的车，因为它们能绕过这些地上的兄弟们迅速增殖造成的拥堵。

传统民航业也在快速增长。随着人们变得更富有一一尤其是亚洲那些现在还不乘飞机的人——到2040年，服役喷气式客机的数量可能会翻一番。这将带来环境问题，因为航空业是最不容易通过脱碳来减排的行业。航空燃料每公斤的能量密度要高于电池，而到目前为止用人工合成而非石油制造这种燃料的尝试已经因为成本问题而失败了。航空业的扩张是受到欢迎还是被抵制，可能也将取决于这一点能否改变。 ■



Clearing houses

Flight to safety

Have regulators created a new type of financial monster?

GRIMSTAD, NORWAY, is an unlikely setting for financial-market shenanigans. But the fishing town is home to Einar Aas, a trader who took huge bets on Scandinavian energy markets. His 15 minutes of infamy came in September 2018, when his bets went spectacularly wrong. Unable to cover his losses, he blew a €114m (\$133m) hole in the capital buffers of Nasdaq Clearing, which handled his trades. Other members of the clearing house—mostly banks and energy-trading companies—were called upon to replenish its buffers.

The affair sent shivers down regulators' spines everywhere. In the midst of the global financial crisis in 2009, leaders at the G20 summit in Pittsburgh decided that the chaotic world of derivatives needed to be made safer by ensuring that they were centrally cleared. A decade later the notional value of all derivatives outstanding globally stands at a trifling \$639trn, of which 68% are centrally cleared through a handful of clearing houses. Collectively these institutions contain one of the biggest concentrations of financial risk on the planet.

Regulators fret most about a murky subset of derivatives: those that are traded over the counter by dealers and investors, rather than on exchanges. The notional value of these OTC derivatives is \$544trn, of which 62% are centrally cleared (see chart). That is up from just 26% before the crisis. The share will rise further: traders who avoid clearing houses will soon be financially penalised by new rules.

All this raises a queasy question: does central clearing, which was meant

to make the system safer, come with new risks of its own? To answer that you have to understand Mr Aas's fiasco better and peer into the complex cascades of liability that clearing houses manage.

A call like Mr Aas's is rare. Before trading through a clearing house, the parties must post an "initial margin". When Lehman Brothers defaulted in 2008 a British clearing house, LCH, was able to cover all Lehman's trades with its initial margin. If bets are souring, clearing houses can demand extra "variation margin". Mr Aas posted a further \$42m as markets moved against him. But when he failed to meet another margin call on September 10th, his positions were liquidated. Nasdaq had to dip into its default fund—a pool of money collected from its members.

Nasdaq's Scandinavian clearing house is tiny compared with the biggest, like LCH, which clears more than half the global market for interest-rate swaps, or ICE, which dominates clearing for credit-default swaps. The optimistic view is that had Mr Aas been a smaller fish, or the pond bigger and more liquid, Nasdaq might have been able to find buyers for his positions.

Some regulators are unwilling to brush off the episode quite so easily. In a letter in March to Randal Quarles, the American Federal Reserve's chief bank regulator, Paul Tucker, a former deputy governor of the Bank of England, expressed alarm that a single trader could wipe out two-thirds of the default fund of a clearing house—albeit a relative tiddler. It augured badly for giant institutions, he argued.

Clearing houses can work as intended only if no one believes they can fail. Their purpose is to sit between market participants. If a hedge fund buys \$100m-worth of Apple shares from an investment bank, say, and the transaction is centrally cleared, it is the clearing house that guarantees the bank gets its \$100m and the fund gets its shares. For simple transactions this

is a small role. Cash-equity trades are settled within two days. The risk that a party goes bust before settlement is minimal.

Now suppose the fund wants to buy an option—say, the right to buy \$100m-worth of Apple shares at today's price in a year's time. The price it pays—the premium—will settle quickly, but the parties' ongoing exposure will vary during the year. If Apple's share price rises sharply before its end, the right to buy those shares at the old price becomes more valuable. If the bank holding the shares goes bust before the year is out, the clearing house will be on the hook. The longer the time between execution and settlement, the bigger this credit risk. It is magnified when products are highly leveraged, as options generally are.

That is still better than the alternative—a bilateral trade, in the industry argot—in which the bank and fund face each other for the life of the option. This requires each to keep tabs on the other's creditworthiness, which is hard when they do not know each other's positions. If the fund wanted to close its position early, for example, it might sell an offsetting position to another bank. It would then appear to each bank that the fund was exposed to movements in Apple's share price, though in reality its risks would cancel out. If its trades had been centrally cleared, that would be obvious to everyone. This lack of transparency played a big part in the financial crisis—hence regulators' desire to shift from bilateral to central clearing.

The trouble is that central clearing creates new risks. Incentives are skewed when the risk of default is spread across a group, making a weak counterparty everybody's problem. Market participants may become less choosy about their counterparties. And most clearing houses are for-profit entities. Their profits rise with transaction volume, but losses for bad trades are largely borne by their members. That is a standing temptation to lower standards.

Skimpy margin requirements or shallow default funds increase the chance that the default of a big member would leave a clearing house with large unmatched positions. It would then have just four possible sources of capital: its owner, usually an exchange; its members, usually investment banks; its customers, mostly investment funds—or, in extremis, the taxpayer.

Each has problems. It is unclear that owners could be obliged (or could afford) to cover much. If a big burden were to fall on members, they too might be forced to default, or decide to cut their losses and walk away. If a clearing house looked likely to call on its customers' margin, they might pre-emptively step back, closing positions to reduce their margin requirements and perhaps starting a market panic. And financial regulators are rightly determined that taxpayers should not be landed with the bill for another financial crisis.

Clearing houses have collapsed before. In 1974 a Parisian house was felled by members defaulting on margin calls when sugar prices plummeted. In 1983 one in Kuala Lumpur came to grief when palm-oil futures crashed. But only one has been deemed too big to fail. After global stockmarkets crashed in 1987, the Hong Kong Futures Exchange clearing house collapsed and regulators shuttered the stock exchange while the government and city-state's largest banks arranged a bail-out.

A clearing-house collapse now would have far bigger repercussions. In his March letter Mr Tucker said that a clearing house that could not withstand a member's default could be a "devastating mechanism for transmitting distress across the financial system". Central counterparties, he said, were "super-systemic".

The shift to central clearing has been most pronounced in interest-rate derivatives, but is visible in other categories, such as credit derivatives,

too. And it will continue. According to research by Citibank, an American investment bank, from September 2020, when margin requirements for uncleared trades come fully into force, investors may have to post three or four times as much margin when trading bilaterally as when using a clearing house.

Regulators have reduced the risk that derivatives will cause as much disruption as they did a decade ago. But they have created a new group of institutions that are too big to fail. Without certainty about where a clearing house in distress can seek capital, its members and customers will be more likely to behave in ways that mean it needs that capital. Rules intended to protect taxpayers may have the paradoxical effect of putting them back on the hook. ■



清算所

避险

监管机构造就了一种新的金融怪兽吗？

挪威的渔村格里姆斯塔（Grimstad）可不像是能上演什么金融市场鬼把戏的地方。然而这里却是交易商艾纳·奥斯（Einar Aas）的家乡。奥斯将巨额赌注押在斯堪的纳维亚的能源市场上。2018年9月，由于押注出现重大失误，他在15分钟里犯下臭名昭彰的恶行。由于无力弥补亏损，他令处理交易的纳斯达克清算所损失了1.14亿欧元（1.33亿美元）的缓冲资本。清算所的其他会员——主要是银行和能源交易公司——被要求补充缓冲资本。

这起事件让世界各地的监管机构不寒而栗。早在2009年全球金融危机期间，参加匹兹堡G20峰会的各国领导人就决定，需要确保金融衍生品被集中清算，以让这个混乱的市场变得更安全。十年后，全球所有未清偿衍生品的名义价值仅为639万亿美元，其中68%是通过少数几家清算所集中清算的。这些清算所构成了全球金融风险最集中的地方之一。

监管机构最担心那类不透明的衍生品，也就是由交易商和投资者在场外交易而不是在交易所里交易的衍生品。这些场外交易衍生品的名义价值为544万亿美元，其中62%是集中清算的（见图表）。而金融危机前这一比例仅为26%。很快将实施的新规会对绕开清算所的交易商进行财务处罚，因而这一比例还会进一步上升。

所有这些引发了一个令人不安的问题：原本旨在让金融体系更加安全的集中清算，其本身是否带来了新的风险？要回答这个问题，必须更清楚地了解奥斯的惨败是怎么回事，并深入探究清算所管理的复杂的责任联动体系。

像奥斯收到的催单很少见。在通过清算所进行交易之前，交易双方必须缴纳“初始保证金”。2008年雷曼兄弟违约时，伦敦清算所（LCH）就得以用

雷曼的初始保证金覆盖了雷曼的所有交易。如果押注显现问题，清算所可以要求另外的“变动保证金”。奥斯就在市场对其不利时又缴纳了4200万美元。但当他在9月10日未能再次满足追缴保证金的要求时，他的头寸就被清算。纳斯达克不得不动用自己的违约基金——从其会员那里收取的资金。

伦敦清算所囊括了全球利率互换市场一半以上的清算业务，洲际交易所（ICE）则主导着全球信用违约掉期的清算业务。与这些世界上最大的清算所相比，纳斯达克的斯堪的纳维亚清算所的规模微不足道。乐观的看法是，如果奥斯是条小点的鱼，或者鱼塘再大些、流动性再强些，纳斯达克或许能为奥斯的头寸找到买家。

一些监管机构不愿如此轻易地将这起事件一笔勾销。英国央行前副行长保罗·塔克（Paul Tucker）在3月写给美联储负责银行监管的兰德尔·夸尔斯（Randal Quarles）的一封信中说，单单一名交易商就能让一家清算所（尽管规模相对较小）损失掉三分之二的违约金，实在让他震惊。他认为，这对大清算所来说是个坏兆头。

只有在没人相信清算所也会倒闭的情况下，它才能正常运转。清算所是介于各个市场参与者之间的机构。例如，如果一只对冲基金从一家投资银行购买了价值1亿美元的苹果公司股票，并且这笔交易是集中清算的，那么清算所就能保证投资银行得到1亿美元，同时对冲基金得到相应的苹果股票。对于简单的交易，清算所起到的作用很小。股票现金交易在两天内结算。一方在结算前破产的风险很小。

下面假设该基金想要购买一个期权，比如在一年内以现在的价格购买价值1亿美元苹果股票的权利。该基金为获得该期权所需支付的费用，即权利金，将很快结算，但各方在接下来的一年中面临的风险敞口将有所不同。如果苹果股价在到期前大幅上涨，以原来的价格购买这些股票的权利就变得更有价值。如果持有该股票的银行不出一年破产了，清算所就会陷入困境。执行和结算间的时间跨度越长，这种信用风险就越大。如果产品的杠杆率很高，信用风险就会加剧，期权通常也是如此。

这仍然要好于另一种选择，也就是行话所说的“双边交易”。在这种交易中，银行和基金在整个期权期内直接与对方打交道。这就要求双方都要密切关注对方的信用状况，而当双方互不知道对方的头寸时，这就很难做到。例如，如果该基金想提前平仓，它可能会将抵消性头寸出售给另一家银行。这样一来，两家银行都会认为该基金可能面临苹果股价波动带来的风险，尽管实际上其风险是会相互抵消的。如果交易是集中清算的，风险抵消对各方来说都是显而易见的。这种缺乏透明度的做法对金融危机的发生起了很大的作用，因此监管机构希望从双边交易转向集中清算。

问题是集中清算带来了新的风险。当违约的风险分散到整个群体，使较脆弱的交易对手成为所有人的问题时，交易动机就被扭曲了。市场参与者可能不再那么挑剔交易对手。大多数清算所都是以盈利为目的的实体。交易量大，清算所的利润就高，而糟糕交易的损失却主要由其会员承担。这就一直诱使清算所降低标准。

对保证金的要求过低或者违约金不足，会增加大会员违约而给清算所留下大量未成交头寸的可能。这种情况下清算所只有以下四种可能的资金来源：其所有者，通常是交易所；其会员，通常是投资银行；其客户，主要是投资基金；或者在最糟糕的情况下，就是纳税人。

每一种资金来源都有问题。尚不清楚清算所有的所有者是否有义务（或有能力）支付大笔资金。如果重担落在会员身上，他们也有可能被迫违约，或者决定止损并退出。如果清算所看上去有要求客户缴纳保证金的迹象，客户可能会先发制人地退一步，平仓以降低清算所对自己的保证金要求，这或许会引发市场恐慌。而金融监管机构坚定地主张纳税人不应该为另一场金融危机埋单——这是对的。

清算所有倒闭的先例。1974年，糖价暴跌，巴黎一家清算所因会员拖欠保证金而倒闭。1983年，棕榈油期货崩盘，吉隆坡一家清算所关门大吉。但只有一家清算所被认为“大到不能倒”。1987年全球股市崩盘后，香港期货交易所清算所破产，监管机构暂停了其证券交易业务，而政府和香港最大的几家银行为其安排了纾困资金。

如今清算所破产带来的震动会比过去大得多。塔克在3月的信中表示，一家无法承受会员违约的清算所可能是“在金融系统中传播困境的毁灭性机制”。他表示，中央交易对手的“全局影响力非同寻常”。

向集中清算的转变在利率衍生品中表现得最为明显，而在信用等其他衍生品中也看得到。这种转变还会继续下去。根据美国花旗投资银行的研究，从2020年9月起，也就是对未清算交易的保证金要求全面生效时，投资者在双边交易中必须缴纳的保证金可能是在清算所交易的三到四倍。

监管机构已经降低了衍生品引发十年前那样的混乱的风险，但也造就了新一类“大到不能倒”的机构。如果不能确定一家陷入困境的清算所可以从何处募集资金，那么其会员和客户的做法就更有可能暴露清算所资金短缺。旨在保护纳税人的规则可能产生自相矛盾的结果，使他们再次受到拖累。





Urban air mobility

Where's my flying car?

It's almost here, but not quite as you expected it

BLACKFLY IS ONE of the strangest flying machines yet built. Its body resembles a small whale—though, when flying, the whale is facing backwards. Attached to its nose and tail are two wings, angled to the horizontal. Each wing sports four propellers. Seen from below when airborne, the thing resembles a slightly flattened letter H (pictured). Its inventor, Marcus Leng, and its sponsor, Larry Page, co-founder of Google, hope it will spawn a transport revolution.

People have talked of flying cars for years, with little to show for it. In part that is because they took the idea of being car-like too literally. In part it was because the technology was not yet available to build them. Blackfly in no physical way resembles a car. It is a single-seater, and wheelless (its convex belly means that it can land on most surfaces, rocking its way to stability after landing so that it needs no undercarriage). Yet it is aimed at the car-owning classes. It has a car-like cruising speed of 100kph (62mph), and a range of between 40 and 60 kilometres. More than 95% of domestic car journeys undertaken in America are shorter than 50km, and a majority involve only the driver.

As to technology, Blackfly has a carbon-fibre airframe, electric motors for propulsion, lithium-ion batteries to provide the power, and smart software to stop the pilot accidentally killing himself or anyone else. Moreover, Blackfly has been designed so that it qualifies, in America, as an ultralight. That means the person flying it is required to have neither licence nor training (though the firm will, in practice, insist on customers undertaking an induction course before they take delivery).

Urban air mobility is the buzz phrase behind Blackfly. And the firm is not alone. A bunch of companies, many of them, like Opener, founded specifically for the purpose, have come up recently with a plethora of designs for single or two-seat personal air transport. That is catnip to technophiles like Mr Page.

Like Blackfly, most of the new designs derive their motive power from arrays of electrically driven propellers, an arrangement pioneered by the small, “multicopter” drones that took to the air a decade or so ago. Some firms have simply scaled drones up. One such is eHang, a Chinese outfit that was already in the drone-manufacturing business before the idea of urban air mobility took off. eHang’s two-seater, the 216, was unveiled on April 4th at a show in Vienna. It has a cabin that sprouts eight struts, each fitted with two propellers. Unlike Blackfly, which is piloted by its occupant, the 216 will be, at least to start with, a robot, for eHang’s initial plan is to run the craft as taxis rather than private vehicles.

Another firm building a scaled-up drone is Volocopter, a German startup. The two-seat cabin of its eponymous vehicle is attached below an 18-propeller structure that resembles a spider’s web built of curved strands of silk. This, like eHang’s craft, will offer a preprogrammed point-to-point service for avoiding traffic jams. A second German company, Lilium, has another approach. Its prototype, which has rear-mounted wings, a pair of canards and is propelled by electrically powered ducted fans rather than propellers, made its maiden flight in May.

Back in Silicon Valley Kitty Hawk, yet another firm part-owned by Mr Page, has also added wings to provide extra lift. Its two-seater, Cora, has 12 small lifting propellers and a single, large, rear-mounted one to drive the thing forward when in flight. And Airbus’s special-projects unit, A3, also based in Silicon Valley, has come up with Vahana, a craft that has four rotatable propeller-laden wings. These point upwards for take-off and landing, and

forwards for level flight. Even Boeing has belatedly joined the party, having unveiled its own, so far nameless, offering in January.

Unlike everything else discussed in this report—even the return of supersonic passenger aircraft—urban air mobility has the potential to change the way society works. It is not exactly a disruptive technology, at least not yet. Planes, trains and automobiles will continue to run more or less as now. But if flying cars really take off, as it were, it would be a transformative technology, for local transport networks would surely change quite a lot.

As with supersonic passenger planes, the private firms involved in this field have a tendency to make optimistic claims. But some really are getting close to commercial operation. In April eHang received permission from the Chinese government to begin test flights, such as island-hopping, with passengers. Volocopter will be conducting trials of its craft in Singapore later this year, also with a view to starting an air-taxi service. And Opener plans to start making Blackfly commercially by the end of the year. One city to keep a particular eye on is São Paulo, in Brazil, where the authorities already permit taxi journeys by helicopter to avoid the crowded streets below. Success there would be a model for other large cities, particularly ones in middle-income countries that also have inadequate roads.

Integrating such taxis into air-traffic-control systems should not be too hard. One model of the future is that, as has been suggested for ground cars, increased automation will mean people just call for a flying car when they need one, and it will fly in to pick them up, flight plan filed and ready. Moreover, there are fewer obstacles and surprises in the sky than on the ground, so pilotless flying cars may be easier to build than driverless road cars. If firms like Opener have their way, though, private pilots will buy them for the sheer joy of being in control. That will require new air-traffic-control systems, perhaps ones in which craft talk directly to one another, rather

than being centrally managed.

Back in the more mainstream part of aviation, too, the future looks bright. Fleets are growing as more people in more parts of the world can afford to travel. To pluck another analogy from the unification of Italy, it was said then that “railways will serve to sew up the Italian boot.” The growth of air transport is doing something similar to the planet. Despite recent tragedies, flying is getting safer. It is also getting cheaper and, at least on a per passenger-kilometre basis, greener. The Hegelian synthesis of technological conservatism and innovation that governs the field is, both literally and metaphorically, delivering. ■



城市空中机动性

我的飞车呢？

它快到了，但和你想的不大一样【技术季刊《航空》系列之五】

“黑蝇”是迄今建成的最奇怪的飞行器之一。它的机身像一条小鲸鱼——虽然飞行时这条鱼是面朝后方的。它的鼻子和尾巴上装着两个水平的翅膀，每个翅膀上有四个螺旋桨。当它飞上天时，从下面看就像一个略粗短的字母H（如图）。它的发明者马库斯·伦格（Marcus Leng）以及资助者、谷歌联合创始人拉里·佩奇期盼它带来一场交通革命。

人们谈论“飞行汽车”已有很多年，但一直还没见到过什么。这其中有些原因是大家都太过执着于“像汽车”这件事，还有部分原因是不具备制造它们的技术。“黑蝇”在物理构造上完全不像一辆车。它只有一个座位，而且没有轮子（它凸起的腹部意味着它可以降落在大多数表面，摇摇晃晃直至稳定下来，因此不需要起落架）。但它的目标用户是开车一族。它的巡航速度为每小时100公里，续航里程为40至60公里。美国国内95%以上的汽车行程都在50公里以内，且大多数时候车里都只有驾驶员一人。

至于技术方面，“黑蝇”拥有碳纤维机体、推进它的电动马达、提供动力的锂离子电池，以及能防止飞行员意外杀死自己或别人的智能软件。此外，它的设计满足美国超轻型飞机的要求。这意味着驾驶员既不需要执照也不需要接受培训（不过这家公司会坚持要求客户在提货前参加一门指导课程）。

“城市空中机动性”是“黑蝇”背后的流行词汇。这家公司并非单打独斗。有一批公司近来推出了大量单座或双人座个人空运设计，其中有许多公司和开拓者（Opener）一样是专门为此创建的。这让佩奇这样的技术迷兴奋不已。

和“黑蝇”一样，这些新设计大都是从电动螺旋桨阵列中获得动力——大约在10年前升空的小型“多旋翼”无人机开创了这种动力设计。一些公司只是

简单地把无人机变大了。中国的亿航就是其中之一。它在“城市空中机动性”的概念出现之前就已经在无人机制造业里耕耘了。双座的“亿航216”于4月4日在维也纳举行的一场展示活动中亮相。从它的机舱向外伸出八根机臂，每根配有两个螺旋桨。和“黑蝇”由乘坐者来驾驶不同，“亿航216”至少最初会由机器人驾驶，因为该公司的初步计划是把它用作“飞的”而非私家车。

另一家正在打造无人机扩大版的公司是德国创业公司Volocopter。其同名飞行器的双座舱位于一个18桨结构的下方。这个结构很像由弧形丝线组成的蜘蛛网。和亿航的飞行器一样，它将提供预编程的点对点运输服务来避开交通拥堵。另一家德国公司百合（Lilium）采用了另一种结构。它的原型机带有后置机翼、一对鸭翼，由电动管翼而非螺旋桨驱动，已于5月完成首航。

回到硅谷，同样由佩奇部分持有的小鹰（Kitty Hawk）公司也增加了机翼以提供额外升力。它的双座Cora有12个小型升降螺旋桨，以及一个用于在飞行中提供向前推进力的大型后置螺旋桨。空客位于硅谷的特殊项目部门A3则推出了“神的坐骑”（Vahana），它有四个装有螺旋桨的旋转机翼。这些机翼在起飞和着陆时向上竖起，在水平飞行时向前伸。连波音最终也加入了这个梯队，在1月份公布了自家尚未命名的产品。

不同于本报道讨论的所有其他内容——包括超音速客机的回归，“城市空中机动性”有可能改变社会的运作方式。它不完全是一种颠覆性技术，至少现在还不是。飞机、火车和汽车将或多或少继续像现在这样运行。但如果飞行汽车真的“起飞了”，那将是一种变革性技术，因为本地交通网络势必会发生很大的变化。

和超音速客机一样，涉足这个领域的私营公司往往也会发表乐观的言论。不过一些公司确实已经接近商业运作。4月，亿航获得中国政府许可，可启动像“跳岛游”这样的载人试飞。今年晚些时候，Volocopter将在新加坡试飞，它同样计划以“飞的”起步。而“开拓者”计划在今年年底前开始将“黑蝇”商业化。一个特别值得关注的城市是巴西圣保罗，那里的相关部门已

经允许人们搭乘直升机的士以绕过地面上拥堵的街道。如果成功，它将成为其他大城市的典范，尤其是中等收入国家中那些道路设施尚不充足的城市。

将这类“飞的”整合到空中交通管制系统中应该不会太难。未来的一种模式就和人们对地面汽车的期待一样，随着自动化程度的提高，人们只需在有需要时召唤一辆飞的，它就会飞来接人，同时飞行计划申报完成。此外，天空中的障碍物和意外情形比地面上更少，因此无人驾驶飞行汽车可能比无人驾驶路面汽车更容易建造。不过，如果像开拓者这类公司获得了成功，那么私人飞行员会想要享受操纵飞机的乐趣而购买它们。这就需要新的空中交管系统，也许这个系统中的飞机会直接彼此通信而不是被集中管控。

回到航空业更主流的部分，未来看起来也很光明。随着世界上更多地区的人们能够负担得起航空旅行，机队正在扩大。再从意大利统一的历史中借一个类比，当时有人说“铁路将帮忙补好意大利靴子”。空运的发展正给地球带来类似的影响。尽管最近发生了悲剧事故，但飞行正变得越来越安全。它也变得越来越便宜，而且，至少以每客公里来衡量，它也更环保了。技术保守主义和创新的辩证结合主导着这个领域，正在交付其成果。





Fintech in India

E-rupification

Indians are switching to digital payments in droves

THE ALLEYS of the 150-year-old Chor (Thieves') Bazaar, a colourfully named flea market in Mumbai, are crammed with goats, used tyres, speakers, drills and other assorted ephemera. But even in this unlikely place, modern payment methods are gaining a foothold. In stalls abutting the market, bags of sand can be paid for by providing a phone number or scanning a QR (quick response) code. Many countries have seen digital payments take off in the past few years; in India, where little over a decade ago a cheque could take more than two weeks to clear, it feels like a revolution.

It is one that has been shaped, not always intentionally, by government policies. September 2010 saw the arrival of Aadhaar, a system of biometric IDs that could be used to open a bank account. After becoming prime minister in 2014, Narendra Modi chivvied bankers to open accounts for everyone. Around 360m basic “Jan Dhan” (people’s wealth) accounts were opened, adding to the 243m accounts already in existence. But many sat empty, or held just a rupee or two put in by banks under government pressure to reduce the number of zero-balance accounts.

Two further developments gave those unused accounts a purpose. The first was the launch in 2016 of the Unified Payments Interface (UPI), an interbank money-transfer system. The second was “demonetisation” later that year, when 86% of banknotes in circulation were recalled. That caused economic carnage—but also gave digital payments a galvanic boost. Paytm, India’s largest digital-wallet firm, took out ads thanking Mr Modi for the move.

Paytm now claims 371m users. PhonePe, a subsidiary of Walmart-owned

Flipkart, claims more than 150m, and BHIM, run by a government-led bank co-operative, 46m. The value of digital transactions has risen more than 50-fold in the past two years, with many more smaller payments (see chart). Even the drivers of Mumbai's three-wheeled auto-rickshaws have begun accepting payments that go through UPI to their (presumably new) bank accounts.

China's giant payment apps, WeChat and Alipay, send transfers between their digital wallets, going through an official clearing house. Cryptocurrencies, which some tout as a possible future for digital money, touch the regulated financial system only when they are bought and sold. By contrast India's pioneers, which started with digital wallets, are fast becoming interoperable with UPI, which sends money directly between bank accounts. The result is both well integrated with the banking system and flexible enough to allow innovation in serving customers.

Regulators are happy with the system, says Saurabh Tripathi of BCG, a consultancy, since it protects deposits, increases financial inclusion and cuts tax evasion from unreported cash deals. It also suits banks, since they get fine-grained information on transactions that can be used for credit analysis and product customisation.

The global tech giants like the look of it, too. Google Pay is already available in India and Amazon Pay plans to launch soon. WhatsApp, which has 300m Indian users, has run a trial of a payments service with 1m of them, though the government's requests regarding privacy and data-localisation are delaying it going nationwide. The success of other dominant chat apps that have moved into payments, such as WeChat Pay in China and Kakao Pay in South Korea, suggests that whenever its launch happens, it will go with a bang. ■



印度金融科技

铸造电子卢比

印度人正在大批转用数字支付

孟买有一个150年历史的跳蚤市场，名字生动有趣，叫“小偷市场”（Chor Bazaar），拥挤的通道上有山羊、旧轮胎、音箱、钻孔机和其他各种各样的小东西。即使是在这样一个地方，现代支付手段也找到了落脚点。在与市场相邻的货摊上，可以通过出示手机号码或者扫描二维码来购买成袋的沙子。过去几年里，很多国家见证了数字支付的起飞；而在印度，十来年前结算一张支票还需要两周多时间，数字支付的到来仿佛是一场革命。

它是由政府政策在有意无意间塑造的。2010年9月，印度政府推出了名为Aadhaar的生物身份识别系统，可用于开设银行账户。2014年莫迪当选总理后，督促银行为每个人开设账户。在已有的2.43亿个银行账户外，大约又开设了3.6亿个“个人财富”基本账户。但其中很多是空户，或者只存有一两个卢比——是银行迫于政府要求减少零余额账户的压力而存入的。

两个后续发展让这些空置账户派上了用场。第一个是2016年推出的银行间资金转移系统“统一支付接口”（UPI）。第二个是2016年底实施的“废钞令”，废除了86%的流通纸币。这严重打击了经济，但也突然而大力地推动了数字支付的发展。印度最大的数字钱包公司Paytm打出广告感谢莫迪的这一举措。

Paytm如今号称自己有3.71亿用户；沃尔玛旗下Flipkart的子公司PhonePe自称有1.5亿多用户；由政府主导的银行合作机构运营的BHIM钱包则有4600万用户。过去两年里，数字交易额增长了50多倍，其中小额支付大大增加（见图表）。连孟买的三轮出租车司机也开始接受通过UPI付款到他们的银行账户（想来是新开的）。

中国的支付巨头微信和支付宝通过官方清算所在它们的数字钱包间转账。

加密货币（有些人将其推崇为数字货币的一种可能的前景）只有在买卖这些货币时才会接触到受监管的金融系统。相比之下，从数字钱包起步的印度行业先锋们正在迅速地实现与UPI（它在银行账户间直接转账）的互通互联。其结果是既与银行系统良好结合，又足够灵活而创造出在服务客户上创新的空间。

监管机构对这个系统很满意，波士顿咨询公司的索罗伯·特里帕西

（Saurabh Tripathi）说，因为它保护了存款、提高了金融包容性、减少了未报告现金交易产生的逃税。它对银行也很有用，因为银行可以获得详细的交易信息，用于信用分析和定制产品。

全球科技巨头也乐见它的发展。Google Pay已经进入印度，Amazon Pay计划很快在那里推出。在印度已有3亿用户的WhatsApp已经在100万名用户中测试了支付服务，尽管政府在隐私和数据本地化方面的要求延迟了它在全国的推广。其他主流聊天应用在支付功能上取得的成功（如中国的微信支付和韩国的Kakao Pay）显示，无论WhatsApp何时全面推出支付服务，都会一飞冲天。■



Faster than sound

Tomorrow never dies

Breakfast in London, dinner in Sydney

ON OCTOBER 24TH 2003 Concorde made its last commercial flight. It carried a full load of passengers, 100 of them, from New York to London. And it did so in three and a half hours. It was able to make the journey so rapidly because its top speed was Mach 2.04—just over twice the velocity of sound.

In its day, Concorde was a superb piece of engineering. But it was also a vanity project, cooked up in the early 1960s by the British and French governments. Issues like profit were ignored. However superb the engineering, with the technology then available the profitable operation of such a plane was impossible.

Technology moves on, though, and several truly commercial undertakings think the time is now ripe for something similar. Most of the running is being made by three American firms, Aerion, Boom and Spike. Aerion's offering, the AS2, is a 12-seater intended to fly at Mach 1.4. Overture, the aircraft planned by Boom, will get to Mach 2.2. It will carry 55-75 passengers. Spike's proposal, the S-512, lies between these extremes. It is intended to carry 18 passengers at Mach 1.6. All three firms think that improvements in materials, engine design and the understanding of aerodynamics mean their proposed craft can be operated profitably and without too much discomfort, in the form of sonic booms, to those on the ground below.

In February Aerion signed a development deal with Boeing. It also has an arrangement with GE to develop a supersonic engine called Affinity, capable of operating efficiently both subsonically and supersonically. The plan is to

attach these, three at a time, to an airframe built by Spirit AeroSystems, a large manufacturer of airframe components. And all this will come to pass, Aerion claims, by 2023—the current target for the AS2 to take off.

Boom has yet to announce a propulsion system for Overture. But it, too, has development money, having received a tranche of \$41m in venture funding in 2017 and a further \$100m this January. And it will soon have a prototype, a one-third-scale aircraft that it calls Baby Boom. This is powered by three of General Electric's J85-15 engines—the military versions of the CJ610, an established workhorse of business jets. All being well, Baby Boom will take to the air early next year and fly at Mach 2.2.

Like Boom, Spike has yet to pick an engine, though it plans to do so by the end of the year. It also plans a subsonic demonstration flight in June, and a supersonic demonstration next year. Whether supersonic commercial aviation really will work this time should thus be clear by the mid 2020s. A few visionaries are, however, looking beyond the merely supersonic. They want to go hypersonic—beyond Mach 5. That would make it possible to fly to an airport's antipodes in less than four hours.

At this speed the physics get scary. Air entering a hypersonic jet engine would be travelling at more than 1.7km per second. Slowing this air down sufficiently for it to be manageable would convert its kinetic energy into heat so intense that it would melt most of the materials of which such an engine might be made.

All this explains why existing hypersonic vehicles—namely satellite-launchers—are rocket-propelled. A rocket carries its own oxidant and so does not need to breathe air. The only alternative that has been tested experimentally is called a supersonic-combustion ramjet. This does not require the incoming air to be slowed down to the same extent as a turbofan. But it has to be accelerated to Mach 5 to start operating, usually by a rocket.

A small British company called Reaction Engines does, however, have an alternative on offer. Skylon, as it calls its design, would be powered by engines able to switch between air and liquid oxygen. They are known as Synergetic Air Breathing Rocket Engines (SABRES) and would be fuelled by liquid hydrogen, which has a temperature of less than 20 degrees above absolute zero. The trick, when a SABRE is in air-breathing mode, would be to use this coldness to absorb heat generated by the inrushing air before it could cause damage. A heat-exchanger intended to do this was tested successfully in April.

At best, the chances of a tiny team working in the metaphorical equivalent of a garden shed cracking the problem of air-breathing hypersonic flight are slim. But perhaps they are not zero. The fundamental design looks sound, and there has, over the years, been enough interest from outsiders such as Boeing, Rolls-Royce and BAE to keep the dream alive.

If Skylon does eventually fly, its first use is likely to be as an unmanned space plane carrying objects into orbit. But one day, perhaps, it or a successor will—for those rich enough—make popping over to Sydney for a weekend break seem just the thing. ■



超越音速

明日帝国

伦敦早餐，悉尼晚宴【技术季刊《航空》系列之四】

二〇〇三年10月24日，协和号完成了最后一次商业飞行。它满载着100名乘客从纽约飞抵伦敦。整趟旅程花了不到三个半小时。之所以能如此之快是因为它的最高速度达到2.04马赫，超出音速一倍有余。

在它的那个年代，协和号是一项工程杰作。但它也是个面子工程，由英国和法国政府在上世纪60年代初联手研制而成。像利润这样的议题被搁在一侧。但是，不管工程水平多么卓越，就那个年代具备的技术水平来说，这样一架飞机是不可能盈利的。

但技术不断发展，而几家真正的商业企业认为现在对这类飞机来说时机已经成熟。主要领跑的是三家美国公司：Aerion、Boom和Spike。Aerion的产品AS2是一架12座飞机，计划以1.4马赫的速度飞行。Boom规划中的飞机“序曲”（Overture）的速度将达2.2马赫，搭载55至75名乘客。Spike的提案S-512介于两者之间，计划以1.6马赫的速度搭载18名乘客。三家公司都相信，鉴于材料和引擎设计的改进以及对空气动力学的掌握，它们设计的飞机将能实现盈利，而且飞行中产生的音爆不会给地面人群带来太多不适。

Aerion在2月份与波音签署了一项开发协议。它还与通用电气公司有一项协定，开发名为“亲近”（Affinity）的超音速引擎，在亚音速和超音速下都能高效运作。其计划是把三个这样的引擎装载到由大型飞机结构件制造商Spirit AeroSystems制造的机体上。Aerion声称所有这些工作将在2023年前完成——目前的目标是AS2将在这一年起飞。

Boom尚未宣布Overture的推进系统。但它也不缺研发资金——2017年获得第一笔4100万美元的风险融资，今年1月又拿到了1亿美元。而且它很快将有一架原型机问世，这架名为“婴儿潮”（Baby Boom）的飞机是“序曲”的

三分之一大。它由通用电气的三台J85-15发动机驱动。这款发动机是公务机常用引擎CJ610的军用版本。如果一切顺利，“婴儿潮”将在明年初起飞，以2.2马赫的速度飞行。

和Boom一样，Spike尚未选好引擎，但计划在今年年底前完成这一步。它还计划在6月举行一次亚音速演示飞行，明年完成一次超音速演示飞行。所以，超音速商用航空这一次是否真的能够腾飞，答案将在2020年代中期以前揭晓。不过，一些梦想者的兴趣还不止于超音速。他们想要“极音速”——超过5马赫。这就有可能用不到四小时的时间从一个机场飞至它在地球上的对跖点。

在这种速度下，物理动态会变得可怕。进入极音速喷气发动机的空气将以每秒超过1.7公里的速度行进。要让这些空气的速度下降到可控的程度，就要把动能转化为热能，而热力之强会把可能用来制作发动机的大部分材料都熔化掉。

这就是为什么现有的极音速飞行器——也就是卫星发射器——是由火箭推进的。火箭自带氧化剂，因而不需要吸入空气。唯一经过实验测试的替代方案叫做超音速燃烧冲压发动机。它无需让进入的空气降速到类似于涡扇的水平，但它必须加速到5马赫后（通常用火箭推进）才能开始运作。

不过，一家名为“反应发动机”（Reaction Engines）的英国小公司提出了另一种方案。这项名为Skylon的设计所用的发动机将能在使用空气和液氧之间来回切换。这些发动机被称为协同吸气式火箭发动机（SABRE），将使用液氢作燃料，而它的温度距离绝对零度还不到20度。关键在于，当这种发动机处于吸气模式时，将利用这种低温来吸纳进入的空气所产生的热量，使其免于造成损害。为此设计的热交换器已于4月测试成功。

再怎么说，一个小团队，在一个好比小花棚的地方工作，就能解开吸气式极音速飞行的难题的可能性终究是很小的。但也许不是完全没有。基础设计看起来很合理，而且多年以来外界（比如波音、罗尔斯·罗伊斯和英国BAE公司等）对它表达的兴趣足够多，使得这个梦想一直没有凋零。

如果Skylon最终飞了起来，那么它的首个应用很可能是一台运载物品到太空轨道的无人驾驶太空飞机。但也许有那么一天，它或它的下一代产品会让飞到悉尼度周末变成富人们理想的休假方式。■



Cruise lines in China

Not what it was

What slumping demand for cruises says about Chinese tourists

WESTERNERS IMAGINE Chinese travellers to be different from them. The rise in the number of large tour groups in European cities has stoked fears of “overtourism” among locals. Chinese tourists’ supposed preference for only visiting popular landmarks, their taste for Chinese food and their addiction to luxury shopping are widely mocked. But the tastes of Chinese travellers are, in fact, rapidly converging with international norms—nowhere more so than on cruise ships.

America dominates the cruise industry. Carnival, Royal Caribbean and Norwegian Cruise Line, which control nearly 80% of the global market between them, are based there. Just over half of the 26m people who went on a cruise in 2018 were American, reckons Cruise Market Watch, a data-provider. But China is catching up. Between 2013 and 2016 number of Chinese cruise-goers grew at a compound annual rate of 70%. In 2016 they overtook Germans to become the second-biggest cruise-going nation. Last year 2.4m Chinese holidayed on the high seas, spending around \$3bn out of a global total of \$46bn.

Now the industry is entering choppy waters in China, even as cruise passenger numbers increase almost everywhere else. Chinese passenger numbers dipped by 1-2% in 2018 and are estimated to fall by a further 5-15% this year. What happened?

Cruise lines owed their early success to offering Chinese tourists what they wanted: “floating shopping malls with casinos” in the words of David Beckel of Bernstein, a research firm. At sea they could bypass the country’s strict

gambling laws (just as the original American “booze cruises” in the 1920s were a way of getting around Prohibition) and snap up duty-free Western brands. Shops on Royal Caribbean and Carnival voyages were regularly stripped bare of everything from Bulgari necklaces to South Korean rice cookers.

No longer, it seems. Chinese tastes are fast becoming more sophisticated, observes Alex Dichter of McKinsey, a consultancy. Surveys suggest that visiting landmarks and shopping have been dethroned as top reasons for travelling. Nowadays taking a break from work to recharge and to experience local cultures tend to be the top of the list. The emphasis is on experiences, not things—like travellers in the West, in other words. Oliver Wyman, a consultancy, found that the share of Chinese holiday spending on shopping fell from 41% in 2016 to 32% by 2018.

As a result, cruise lines that have gone too native, or that rely too much on shopping for profits, have suffered. Norwegian launched its first ship built especially for China in 2017, armed with shops, gambling machines, Asian restaurants and a karaoke bar. Two years later, amid disappointing ticket sales, Norwegian spent \$50m ripping out all the Chinese fripperies and moved the ship to Alaskan fjords. In 2018 Royal Caribbean scuttled SkySea Cruises, a joint venture with Ctrip, a Chinese online travel agency, when it discovered it could make more money running its own vessels with fewer nods to local taste. Carnival maintains its joint venture with CSSC, a state-owned Chinese firm. One reason might be to appease regulators keen to boost Chinese shipyards’ order books.

Royal Caribbean has found it more lucrative to offer a Western experience at sea at a premium price than to compete against cheap Chinese resorts. It is among the few lines in China that makes money, claims Richard Fain, its executive chairman. It is still adding more ships. On June 6th *Spectrum of the Seas*, its newest vessel, embarked on its maiden voyage from Shanghai

carrying nearly 5,000 passengers.

Mr Fain thinks that the Chinese market will eventually rebound. Analysts at Goldman Sachs, a bank, reckon that just 0.5% of potential passengers in China took a cruise in 2017, compared with over 4% in America. Pierfrancesco Vago, executive chairman of MSC Cruises, the world's fourth-largest line, blames regulation. Western lines cannot sail between two Chinese ports. China is thinking about relaxing some of these rules, but only for domestic firms, which are few in number and tiny in size. To grow, they—and their regulators—may need to turn international. ■ ■



邮轮公司在中国

今不如昔

邮轮游需求骤降。中国游客怎么了？

在西方人的想象中，中国的旅行者和他们不一样。前往欧洲城市的大型旅行团越来越多，引发了当地人对“过度旅游”的担忧。一般认为，中国游客只去热门景点，爱吃中餐，痴迷于购买奢侈品——种种这些令他们广受嘲笑。但事实上，中国游客的口味正在迅速向国际常态靠拢——在乘邮轮旅行方面最是如此。

美国主导了邮轮业。嘉年华、皇家加勒比和诺唯真这三家邮轮公司控制了全球市场的近80%，它们的总部都在美国。据数据供应商“邮轮市场观察”（Cruise Market Watch）估计，2018年乘坐邮轮的2600万人中，美国人占了一半略多。但中国正在迎头赶上。2013年到2016年间，参加邮轮游的中国游客数量的年复合增长率为70%。2016年，他们的人数超过了德国人，中国因而晋升为全球第二大邮轮客源地。去年有240万中国人在公海上度假，在全球总计460亿美元的邮轮游消费中贡献了30亿美元。

不过，这个行业在中国进入了一片不平静的水域，即便在几乎其他任何地方邮轮乘客数量都在增长。中国乘客的人数在2018年下降了1%到2%，预计今年还会再减少5%到15%。到底发生了什么？

邮轮公司早期的成功源自向中国游客提供他们想要的东西，用研究公司盛博的大卫·贝克尔（David Beckel）的话说，就是“带赌场的漂移购物中心”。在海上，他们可以绕过中国严格的赌博法（就像上世纪20年代人们为绕过禁酒令而登上美国最早的“豪饮邮轮”那样），还可抢购西方品牌的免税商品。皇家加勒比和嘉年华邮轮上的商店经常被扫荡一空，从宝格丽项链到韩国电饭煲一件不剩。

现在的情形似乎不复往日。咨询公司麦肯锡的亚历克斯·迪希特（Alex Dichter）认为，中国人的品味正在迅速提高。调查显示，游览标志性景

点和购物已不再是中国人出游的首要原因。如今，放下工作为自己充充电和体验当地文化往往是最重要的原因。他们注重的是体验，而不是有形的事物——换句话说，就和西方旅行者一样。咨询公司奥纬（Oliver Wyman）发现，中国人的购物支出在度假总消费中的占比从2016年的41%下降到了2018年的32%。

结果，那些太过“入乡随俗”或过度依赖购物来盈利的邮轮公司受到了打击。诺唯真于2017年推出了首艘专门为中国打造的邮轮，上面配备了商店、赌博机、亚洲餐厅和一间KTV。船票销量令人失望，两年后诺唯真又花5000万美元拆掉了所有针对中国人的浮夸低俗的设施，把船挪到了阿拉斯加的峡湾。皇家加勒比在2018年关闭了与中国在线旅行社携程的合资企业天海邮轮，因为它发现运营自己的、并未太多迎合地方口味的邮轮可以赚到更多钱。嘉年华仍保留着与中国国有企业中船集团的合资公司，一个原因可能是为安抚急切想要提升中国造船厂订单的监管机构。

皇家加勒比发现，比起与廉价的中国度假村竞争，以高价在海上提供西方体验更有利可图。其执行董事长理查德·费恩（Richard Fain）称，它是在中国少数赚钱的邮轮公司之一。皇家加勒比还在扩大船队。6月6日，其最新的邮轮“海洋光谱号”（Spectrum of the Seas）载着近5000名乘客从上海启动首航。

费恩认为中国市场最终会反弹。高盛分析师估计，2017年中国仅有0.5%的潜在乘客乘坐了邮轮，在美国这个数字超过4%。世界第四大邮轮公司地中海邮轮（MSC Cruises）的执行董事长皮尔弗朗西斯科·瓦戈（Pierfrancesco Vago）将这归咎于监管。西方邮轮公司不能在两个中国港口之间航行。中国正考虑放宽这些规则中的一部分，但仅限于对本土企业，它们数量少，规模也小。这些企业若要成长，它们以及监管者可能需要向国际靠拢。■



Facebook

Coin flip

The social network's grand designs for virtual cash could be surprisingly consequential—including for itself

A GLOBAL DIGITAL currency would make sending money across the world as easy as texting. It would do away with fees, delays and other barriers to the flow of cash. It might give those in less developed countries access to the financial system and a means to protect hard-earned wages against runaway inflation. It could trigger a wave of innovation in finance, much as the internet did in online services.

That, in a nutshell, is what Facebook promised on June 18th. Within a year, the social network will launch a new currency to be known as Libra, in honour of an ancient Roman unit of mass—it is also the word for “pound” in many romance languages. Inevitably, Facebook dished out a generous helping of trendy words like crypto and blockchain. Unable to contain its appetite for Silicon Valley platitudes, Facebook claimed that its mission was to “empower billions of people”. Making money or strengthening its market power are, apparently, a sideshow.

Notwithstanding the guff, the commercial potential is indeed significant—as are the potential problems. If each of Facebook's 2.4bn users converted a slice of their savings into Libras, it could become a widely circulated currency. It could also, if broadly adopted, vest unprecedented power in the hands of its issuer. In a tacit acknowledgment that its mishandling of user data, tolerance of the spread of misinformation and other sins have devalued its stock with policymakers, users and potential partners—though not investors—Facebook wants to outsource the running of Libra to a consortium of worthies recruited from the world of finance,

technology and NGOs. The consequences for the global financial system could be significant. So could the impact on Facebook's business.

If the project lives up to the mock-ups, buying, selling, holding, sending and receiving Libras will become a doddle. It can be done in Facebook's Messenger app or WhatsApp, another messaging-service-cum-social-network it owns—and, later next year, in a stand-alone app.

So far, so familiar. Messenger already offers payments to Americans. WhatsApp is testing a similar function in India. But these services do not cross borders, and require users to have a bank account. Fintech firms like TransferWise, which offer international transfers, take a 4-5% cut to wire \$200, a third less than Western Union. But Libra will be much cheaper, and require no bank accounts: more Bitcoin than Venmo.

Except that, unlike Bitcoins and other cryptocurrencies, Libras will change hands in seconds, not minutes, for next to nothing, not a few dollars. The system should handle 1,000 transactions a second at its launch, and more later, compared with no more than seven a second for Bitcoin. The virtual coins will be bought with real money, which will top up the reserve backing the currency. This should prevent wild price swings from speculation.

If it works, Libra could be a money-spinner for Facebook, albeit not directly. Notional transaction fees would not generate much revenue. But Libras should allow Facebook to charge more for online ads, by making purchases of advertised products quicker and simpler. It could furnish a new source of data to target adverts, making up for user information Facebook will forgo with the "pivot to privacy", which Mark Zuckerberg, its boss, proclaimed in March in respect of messaging. Facebook may catch up with WeChat, a Chinese super-app which offers payments and other services, and whose foreign ambitions are on hold as the Sino-American trade war rages on.

Technically and financially, Facebook could probably pull off such an ambitious undertaking on its own. But not politically. Its culture is less amoral than it was in its youth, when it aspired to “move fast and break things”—but only a bit. Chary consumers may choose not to entrust their money to a social network which has, until recently, leaked their personal data left and right. Unless users are on board, merchants may be reluctant to embrace the currency, however hassle-free.

Enter the Libra consortium. The association, to be based in Geneva, will take over from Facebook before the first Libra has been spent, and manage the hard-currency reserves. Facebook has enlisted 28 other prospective founding members out of an envisaged 100, each with equal voting rights and operating a node in a decentralised system which issues coins. They include financial firms (Visa, Stripe), online services (Spotify, Uber), cryptocurrency wallets (Anchorage, Coinbase), venture capitalists (Andreessen Horowitz, Union Square Ventures) and charities (Kiva, Mercy Corps)—though, for the time being, no banks. Not a libertarian alternative to the existing financial system, in other words, but a complement.

To add credibility to its promise, broken in the past, to keep social and financial data separate, Facebook has created a subsidiary, Calibra, to run Libra services within its apps. It is unlikely to face hurdles to uptake from Apple or Google. It is impossible to imagine them expelling Messenger and WhatsApp—and later other providers Facebook is inviting to the open-source project—from their app stores, as they have done with other cryptocurrency offerings, many of which were scams.

To get Libra going, the consortium will pay merchants to offer discounts to customers who use the new currency, financed by a \$10m one-off fee each member pays for a seat at the table. Eventually, Facebook would like anybody, not just the consortium, to be able to generate the currency, transfer it and offer services on top of its “blockchain” (crypto-speak for the

database that keeps track of who owns what). At that point, Libra would turn into Bitcoin, minus the kinks and the libertarianism.

In a project with so many moving parts, much can go wrong. Although Facebook says it has a working prototype, the technology is untested; sceptics doubt that a 100-node system, let alone a bigger one, could process thousands of transactions per second. Hackers are doubtless champing at the bit.

Then there are consortium dynamics. Facebook will have to prove to the other 99 Libra members that it is truly prepared to give up control. At the same time, because important decisions need a two-thirds majority, someone has to knock heads together. The history of information technology is littered with initiatives that collapsed under the weight of internal conflict.

The biggest barrier may be political. Facebook has apparently consulted many regulators. The providers of digital wallets will have to comply with national rules, such as those against money-laundering. Calibra, whose integration into Messenger and WhatsApp will initially make it the dominant wallet, is bound to stoke competition concerns. These may recede as the currency grows bigger and more decentralised, only to be replaced by worries about financial stability.

Libra's success, then, is far from assured. But it could prove useful even if it flops, for it offers a blueprint for how Facebook itself could one day be governed. The Libra Association's main task is to oversee the blockchain, ensuring, for instance, that Calibra does not enjoy privileged access to it. An equivalent Facebook Association, some observers have ventured, could be composed of representatives of users, advertisers, data-protection authorities and so on. Their job could be to oversee the "social graph", another database, which lists all of Facebook's users and the links between

them—and to guarantee that Facebook users can post to another social network, and vice versa.

Calls for a Facebook constitution along these lines have grown louder as the social network's influence on world affairs, from election-meddling in America to genocide in Myanmar, has become apparent. Mr Zuckerberg is no stranger to such thinking. In 2009 Facebook let users vote on big changes in its privacy policies but abandoned the experiment with global democracy a few years later. Last year Mr Zuckerberg announced that Facebook wanted to set up a “content review board” of independent experts—a kind of “Supreme Court”, in his words, which would make “the final judgment call on what should be acceptable speech”.

Asked whether Libra could serve as a model for Facebook, David Marcus, who is in charge of the project, replies that it marks “a coming of age, the moment we recognise that there are some things that we shouldn’t control—and a radical departure from the traditional way of operating things”. Perhaps. But checks and balances would almost certainly make Facebook less profitable. It would be ironic if a new digital currency marked the beginning of the end of Facebook’s money-minting days. ■ ■



Facebook

抛硬币

这家社交网络公司对虚拟货币的宏伟设计可能会带来意想不到的重大后果——包括对它自己

一种全球数字货币能让全球汇款变得像发信息一样简单，而且没有费用、延迟和其他妨碍资金流动的障碍。它可能会让欠发达国家的人们得以进入金融系统，并保护他们来之不易的薪水不被失控的通货膨胀吞噬。它可能会引发一个金融创新的浪潮，就像互联网催生了在线服务那样。

简而言之，这就是Facebook在6月18日给出的承诺。Facebook将在一年之内推出一种叫做Libra的新货币。Libra是古罗马重量单位，在许多罗曼语系语言中表示“磅”的意思。毫不意外地，Facebook大量使用了加密和区块链等时髦词汇来造势。对于硅谷常用的那些陈词滥调，它也按捺不住地拿将过来，声称其使命是“为数十亿人赋权”，就好像赚钱或增强自己的市场支配力只是次要的事似的。

尽管空话不少，这个项目的商业潜力确实巨大——潜在的问题同样不可小觑。如果Facebook的24亿用户将他们的一部分储蓄换成Libra，它就可能成为一种广泛流通的货币。如果被广泛采用，它还会赋予Libra的发行者前所未有的权力。Facebook想把Libra的运营外包给一个从金融、技术行业以及非政府组织中招募“大V”来组成的联营组织。这等同于默认了它此前对用户数据处理不当、对传播虚假信息的容忍等过失已经损害了政策制定者、用户和潜在合作伙伴对它的信任（尽管投资者不为所动）。该项目可能对全球金融体系产生重大影响，对Facebook自身的业务也一样。

如果Libra项目真如其模型所示，那么购买、出售、持有、发送和接收Libra将变得轻而易举。所有这些操作都可以在Facebook的Messenger应用或另一个消息服务兼社交网络WhatsApp上完成，明年晚些时候还会推出一个独立运作的应用。

这些听上去都不新鲜。Messenger已经在向美国人提供支付服务。WhatsApp正在印度测试类似的功能。但是，这些服务都没有跨越国界，而且要求用户拥有银行帐户。像TransferWise这类提供国际转账的金融科技公司就转帐200美元收取4%至5%的手续费，比西联汇款低三分之一。但Libra会便宜得多，而且不需要有银行账户——它更像比特币而不是Venmo。

不过与比特币和其他加密货币不同的是，Libra的交易速度不是几分钟，而是几秒，成本也不是几美元，而是接近零。该系统在刚启动时应该可以每秒处理1000笔交易，以后还会更多，而比特币每秒最多只能处理七笔交易。Libra将以法币购买，将让这一虚拟货币有真实资产储备作为支持。这应该可以防止投机引发的大幅价格波动。

如果成功，Libra可能会成为Facebook的摇钱树，尽管不是直接带来收益。名义上的交易手续费不会产生太多收入。但Libra可以让购买广告产品变得更快更简单，使得Facebook可以提高对在线广告的收费。Facebook的老板马克·扎克伯格在3月宣布在消息服务上将“以隐私为先”，而Libra可以弥补Facebook因此而放弃的用户信息，为定向广告提供新的数据来源。Facebook可能会追上微信，由于中美贸易战战火持续，这款提供支付和其他服务的中国超级应用在海外发展的抱负暂时无法施展。

从技术和金融上来说，Facebook或许能凭一己之力成就此大业。但在政治上不行。相比Facebook渴望“迅速行动，打破常规”的发展初期，它的企业文化对道德的关心有所增加，但也只是增加了一点点。谨慎的消费者可能不会选择把钱交给一个不久之前还在频繁泄露他们个人数据的社交网络。除非用户参与，否则不管用起来多方便，商家可能也不愿意接受这种新货币。

所以就有了Libra联营组织。其总部将设在日内瓦，将在Libra首次使用之前就从Facebook手上将它接管过来，并管理它的硬通货储备。Facebook已经招募到了另外28个潜在创始成员，目标是扩展到100个，每个成员拥有同等投票权，在分散的货币发行系统中各自运营一个节点。它们包括金融

公司（Visa、Stripe）、在线服务公司（Spotify、优步）、加密货币钱包（Anchorage、Coinbase）、风险投资公司（安德森·霍洛维茨[Andreessen Horowitz]、联合广场风投[Union Square Ventures]）和慈善机构（Kiva、Mercy Corps），不过目前还没有银行加入。换句话说，Libra不是现有金融体系的自由主义替代品，而是一种补充。

Facebook承诺保持社交数据和财务数据的分离。为增加这一承诺的可信度——毕竟它曾屡次失信——它创建了子公司Calibra，在其应用中运行Libra服务。它的推广不太可能面临来自苹果或谷歌的障碍。这两家公司曾把其他加密货币应用（其中很多是欺骗性的）从它们的应用商店中下架，但我们无法想象它们会如此对待Messenger和WhatsApp，以及Facebook正在邀请加入这一开源项目的其他供应商。

为让Libra落地，Libra联营组织将补贴商家，让它们向使用新货币的客户提供折扣，资金将来自每个加入该组织的创始成员一次性缴纳的1000万美元费用。最终，Facebook希望任何人，而不仅仅是该组织，都能生成和转移Libra，并根据Libra的“区块链”（加密行业术语，指跟踪谁手上有什么的数据）提供服务。到那时，Libra就变成了比特币，但少了比特币的缺陷和自由意志主义精神内核。

一个有着这么多不确定部分的项目可能会出很多错。虽然Facebook表示它有一个可行的系统原型，但该技术尚未经过测试。怀疑论者质疑一个100个节点的系统真能做到每秒处理数千笔交易——更别说一个更大的系统了。毫无疑问，黑客们已经在磨刀霍霍了。

然后还有联营组织内部关系的问题。Facebook将必须向其他99个Libra成员证明它真的愿意放弃控制权。与此同时，由于重要决策需要获得三分之二的多数票才能通过，必须有人从中周旋。信息技术的历史上随处可见被内部冲突压垮的方案。

最大的障碍可能在政治上。Facebook显然已经咨询了许多监管机构。数字钱包供应商必须遵守反洗钱等国家法规。Calibra与Messenger和WhatsApp

的整合会让它从一开始就成为主导的数字钱包，必将引发对竞争的关切。随着Libra日益扩张和分散，这种紧张可能会消退，但又会被对金融稳定性的担忧所取代。

因此，Libra的成功远未板上钉钉。但即使失败，它仍可能是有用的，因为它为有朝一日如何治理Facebook自身提供了一种蓝图。Libra联营组织的主要任务是监督区块链，例如确保Calibra不享有使用该数据库的特权。一些观察人士试探性地提出可以同样建立一个“Facebook协会”，由用户、广告主、数据保护机构等的代表组成。它们的工作可能是监督“社交图谱”——列出Facebook所有用户以及他们彼此间关系的另一个数据库，并保证Facebook用户可以把内容发布到另一个社交网络，反之亦然。

从扰乱美国选举到缅甸的种族灭绝，Facebook对全球事务的影响日益显著，呼吁Facebook建立此类治理架构的声音也随之高涨。扎克伯格对这类想法并不陌生。Facebook在2009年让用户就其隐私政策的重大变化投票，但几年后放弃了这个全球民主实验。去年他宣称Facebook希望建立一个由独立专家组成的“内容审查委员会”——用他的话说是某种“最高法院”，将对“什么应该是可接受的言论做出终裁”。

当被问及Libra是否可能成为Facebook的治理模型时，Libra项目的负责人大卫·马库斯（David Marcus）回答说，它标志着“一个时代的到来，此时我们认识到有些事情是我们不该控制的——同时它也标志着对传统运营方式的彻底背离”。也许吧。但制衡机制几乎肯定会让Facebook的盈利能力下降。如果一种新的数字货币成为Facebook“印钞机”停摆的开始，那就太讽刺了。 ■



Libra and banking

Libralised finance

What Facebook's new currency means for the banking system

CONSUMERS WILL probably view holding Facebook's new currency, Libra, as an alternative to putting money in the bank. If they see it as an attractive alternative, Libras could proliferate. If every Westerner held in Libra an amount equal to one-tenth of their bank deposits today, the new currency outstanding would be worth over \$2trn. How worried should banks be?

At first pass, Libra looks like a banking system of sorts. The “Libra Reserve” will hold enough liquid safe assets to back every Libra it issues. A staunch minority of economists has for decades called for this sort of arrangement—dubbed “narrow banking”—to replace the existing “fractional reserve” model, under which deposits at banks are backed by mortgages and other illiquid loans. Narrow banks, they argue, would not suffer runs. On the surface, the only obvious difference between the Libra Reserve and a narrow bank is that the former will hold assets denominated in a variety of (still-to-be-specified) currencies.

Yet look closer and the Libra Reserve will not be a bank, narrow or otherwise. Some of the safe assets it holds will themselves be deposits in fractional-reserve banks. It will not have access to central-bank money, which is used to clear transactions between banks.

Buying Libras will not shrink the volume of deposits in the banking system. Suppose a Briton uses money in his bank account to buy Libras. He would transfer pounds to the Libra Reserve or another seller, who would need a sterling bank account to receive payment. The deposit would live on in that account. In modern banking systems deposits can pass between accounts,

be converted into cash, or be used to repay bank loans or buy assets from banks. They cannot simply disappear into non-banks.

Does that mean banks can relax? Hardly. First, Libra could cause bank balance-sheets to shrink, should the Libra Reserve use customers' funds to buy securities like government debt from banks. Second, Libra could crimp juicy bank revenues from cross-border payments, which Facebook wants to cost virtually nothing.

Third, Facebook could yet decide to become a fully fledged bank itself. The firm says this is not in its plans, but the temptation will surely grow if Libra takes off. Facebook's data already have immense potential to help with lending decisions. Although the Libra Reserve will be mostly independent of Facebook, the firm will offer its own digital wallet, Calibra, for consumers who want to hand over the key to their digital currency for safekeeping—and with it, their personal financial data.

Individual Libra-holders face other risks. One is currency fluctuations. If, say, the yen rises against the basket to which Libra is pegged, Japanese holders of Libra will lose out. The new currency will not yield interest (though neither do many bank deposits nowadays). Shops may welcome a shift away from card payments, which often levy high fees on transactions. Consumers, who enjoy perks that often come with credit cards, may not. There will be no government-provided deposit insurance for Libra. Lastly, the public might shun Libra for non-financial reasons such as privacy, which Facebook has repeatedly failed to safeguard.

Still, the strength of Facebook's existing platform, and the incentives that will be on offer to encourage Libra's use, could be enough for the currency to thrive. If it does, banks might eventually want to hold Libras themselves, and perhaps to run digital wallets to compete with Calibra. In any case, Facebook is likely to develop a suite of financial services, much as WeChat

and Alibaba, two Chinese internet giants, have done in China. Both banks and regulators had better watch closely. ■ ■



Libra与银行业

金融“自由化”？

Facebook的新货币对银行系统影响几何

消费者可能会将持有Facebook的新货币Libra视为在银行存钱之外的另一种选择。如果他们认为这种选择有吸引力，Libra的数量就会激增。假如每个西方人持有的Libra数额相当于他们今天银行存款的十分之一，那么这种新货币的发行总额就将超过2万亿美元。对此银行该多担心呢？

乍一看，Libra似乎算得上某种银行系统。“Libra储备”（Libra Reserve）将持有足够的流动性安全资产为其发行的每一个Libra背书。几十年来，少数经济学家一直在坚定地呼吁用这类“狭义银行”模式来取代现有的“部分准备金”制度——后者靠抵押贷款和其他非流动性贷款来支持银行存款。他们认为，狭义银行不会遭遇挤兑。从表面上看，Libra储备与狭义银行之间唯一的明显区别，是其持有的资产将以多种货币计价（哪些币种仍有待确定）。

然而仔细观察就会发现，Libra储备不会构成一家银行，不管是狭义的还是广义的。它持有的一些安全资产本身就是“部分准备金银行”的存款。它将不能使用用于跨行清算交易的央行存款。

购买Libra不会减少银行系统的存款量。假设一个英国人用自己的银行存款来买Libra：他会将英镑转到Libra储备或其他卖家那里，卖家需要一个英镑银行账户才能收到付款。付款将继续存在卖家的账户中。在现代银行系统中，存款可以在账户间转移，可以转换为现金，也可以用于偿还银行贷款或者从银行购买资产。存款不会简单地从这里消失，进入到非银行机构中。

这是否意味着银行就能高枕无忧？很难。首先，如果Libra储备动用客户资金从银行购买政府债券等证券，Libra可能导致银行资产负债表缩水。其次，鉴于Facebook有意实现几近免费的跨境支付，Libra可能会削减银

行从这类支付中获得的丰厚收入。

第三，Facebook仍可决定让自己变身一家完全成熟的银行。尽管Facebook表示它并无此意，但如果Libra迅速走红，诱惑肯定会增加。Facebook的数据已经具备可以帮助贷款决策的巨大潜能。尽管Libra储备基本不会受Facebook控制，但Facebook将提供自己的数字钱包Calibra，供那些想委托保管自己的数字货币秘钥的消费者使用——而他们同时交出的还有个人财务数据。

个人持有Libra还面临其他风险。其一是货币波动。比方说，如果日元兑Libra锚定的一篮子货币升值了，日本的Libra持有者就会亏损。Libra这种新货币不会有利息收益（尽管现在许多银行存款也都没有利息）。因为信用卡支付往往会收取不菲的交易费，商家可能希望转而使用其他支付方式，但常常从信用卡支付中受惠的消费者可能不会这么想。Libra没有政府提供的存款保险。最后，公众可能会因隐私等非财务原因对Libra敬而远之，毕竟Facebook已多次发生隐私泄漏事件。

不过，以Facebook现有平台的实力，以及未来为鼓励消费者使用Libra而推出的优惠措施，可能足以推动Libra蓬勃发展。如果是这样，银行可能最终希望自己持有Libra，或者经营数字钱包来与Calibra竞争。无论如何，Facebook应该都会开发出一系列金融服务，就像两家中国互联网巨头微信和阿里巴巴在本国所做的那样。银行和监管机构还是密切关注为好。





Buttonwood

Beggar thy neighbour

Low interest rates and sluggish growth mean the world is primed for currency wars

IN 2010, AS the euro zone's sovereign-debt crisis escalated, the euro fell sharply, from \$1.45 to \$1.19. Soon the talk in America was of a second round of quantitative easing by the Federal Reserve. Was this a coincidence? Many in euro land thought not. QE2, as it came to be known, seemed to them to be mostly a means to a weaker dollar. The grumbles went beyond Europe. That September Guido Mantega, Brazil's finance minister, said his country was under fire in an international currency war.

Now the bellyaching comes from America. On June 18th Mario Draghi, the president of the European Central Bank (ECB), said at a conference in Sintra, Portugal, that the bank stood ready to relax its monetary policy further if the euro-zone economy did not improve. Bond yields fell. So did the euro. President Donald Trump took to Twitter to denounce Mr Draghi for "unfair" currency manipulation. Earlier this month Steven Mnuchin, Mr Trump's Treasury secretary, had fired a warning shot in the direction of Beijing on currency policy. If China stopped trying to support the yuan, he seemed to suggest, that could be understood as an effort to weaken it.

The guns have been holstered again. A pow-wow between Mr Trump and Xi Jinping, China's president, at a G20 summit in Osaka late last month raised hopes that, at the very least, the trade war between their two countries does not escalate. A trade truce ought to cool the war of words over exchange rates, too—but not for long. Interest rates are low. The use of fiscal policy is constrained by either politics or debt burdens. A cheaper currency is one of the few ways left to gin up an economy. A world of sluggish GDP growth is one that is primed for a currency war.

Despite Mr Draghi's best efforts, the exchange rate to watch is dollar-yuan, not euro-dollar. The yuan increasingly sets the tone for global currencies—and, by extension, for financial markets. China has allowed its currency to respond somewhat to market pressures since August 2015. But it has been kept in a fairly tight trading range against the dollar (see chart). These small changes matter. The currencies of China's big trading partners, such as the euro, have got caught up in the yuan's shifting tides, rising and falling in sympathy. Seven yuan to the dollar has been seen as an important threshold. Should the yuan ever breach that level, it would surely drag other currencies down with it.

Any hints that Beijing may be prepared to let the yuan go beyond seven are thus significant. Simon Derrick of BNY Mellon points to two developments in this regard. The first is the publication in late May of a seemingly well-sourced article in the *South China Morning Post* on trade negotiations with America. A sticking point, it said, was the yuan. China favours currency "flexibility"—not for an export advantage but to ensure stability. America is unsympathetic. Then, on June 7th, the governor of China's central bank, Yi Gang, told Bloomberg that a flexible currency was to be desired as it "provides an automatic stabiliser for the economy". He also hinted that there was no red line at seven.

There is a topsy-turvy logic to currency wars. The winners are the currencies that fall in value. In such a race to the bottom, investors seek to back the losers. In times of trouble they will go for the usual boltholes: the yen, the Swiss franc and gold, all of which have been lifted by trade-war anxiety. The dollar stays strong because America has high interest rates, by rich-world standards, and a strong economy. But when growth slows and interest rates fall, says Kit Juckes of Société Générale, a French bank, other factors come into play. These include trade balances and valuation.

The yen stands out. Japan runs a current-account surplus. And the yen is cheap based on measures of purchasing-power parity, including rough-and-ready gauges, such as *The Economist's* Big Mac Index. The Swiss franc is also backed by a hefty current-account surplus, even if it looks expensive. Gold gets a look-in mainly because there are so few good alternatives to holding dollars.

In 2010 the cheap dollar irked everyone outside America. Now the dear dollar bothers America, or at least its president. In the slow-brewing currency war, America is both victim and perpetrator. “If you start a trade war with your biggest trading partners, they get a weak currency and you get a strong one,” says Mr Juckes. If Mr Trump wants a cheaper dollar, declaring trade peace might be the best way to get it. Otherwise, America risks waging a currency war on itself. ■



梧桐

以邻为壑

低利率和增长低迷让全球货币战一触即发

二〇一〇年，随着欧元区主权债务危机升级，欧元大幅下挫，从1欧元兑1.45美元跌至1.19美元。不久，美国传出了美联储启动第二轮量化宽松政策（简称QE2）的消息。这是巧合吗？欧元区许多人不这么认为。在他们看来，QE2似乎主要是为了让美元贬值。不止欧洲怨声载道。巴西财政部长吉多·曼特加（Guido Mantega）在同年9月表示，巴西在国际货币战中遭受了炮火。

现在轮到美国埋怨了。6月18日，欧洲央行行长马里奥·德拉吉（Mario Draghi）在葡萄牙辛特拉（Sintra）的一次会议上表示，如果欧元区经济没有改善，欧洲央行将进一步放宽货币政策。债券收益率下跌，欧元也在跌。特朗普在推特上谴责德拉吉“不公平”操纵汇率。6月上旬，特朗普政府的财政部长史蒂文·努钦（Steven Mnuchin）已就货币政策向北京发出警告。他似乎暗示，假如中国政府停止支撑人民币的努力，那么就可以看作是在推动人民币贬值。

但各方再次停火。6月底在大阪举行的G20峰会上，特朗普与中国国家主席习近平会晤，让人们燃起了对中美贸易战至少不会再升级的希望。贸易战休停也会使围绕汇率的舌战冷却下来——但也只是暂时的。目前各国利率处于低位。财政政策的使用受到政治或债务负担的制约。贬值货币是所剩无几可以刺激经济的手段之一。各国GDP增长低迷让全球货币战一触即发。

尽管德拉吉倾尽全力，但焦点还是美元兑人民币汇率，而非欧元兑美元汇率。人民币越来越多地确定着全球货币的基调，因而也愈发左右着金融市场的走势。自2015年8月以来，中国已允许其货币根据市场压力有一定程度的浮动。但人民币兑美元的变化一直被保持在一个很窄的范围内（见图

表）。这些小变化很重要。中国大型贸易伙伴的货币，如欧元，已被卷入人民币的变动走势中，涨跌相随。七元人民币兑一美元被视为一个重要关口。如果人民币破七，势必也将把其他货币一道拉低。

因此，如果有任何迹象显示中国政府准备让人民币破七，那将事关重大。纽约梅隆银行（BNY Mellon）的西蒙·德里克（Simon Derrick）指出了这方面的两个进展。首先是《南华早报》在5月下旬刊登的一篇关于中美贸易谈判的文章。这篇看似调查充分的报道指出，谈判的一个僵持点是人民币。中国倾向于让货币有“弹性”，并非为争取出口优势，而是要确保稳定。美国对此不认同。然后，6月7日，中国人民银行行长易纲对彭博社表示，增强人民币弹性是有益的，因为它“发挥了经济自动稳定器的作用”。他还暗示没有把“七”当作红线。

货币战有一个颠倒的逻辑。赢家是价值下跌的货币。在这样一个货币竞相贬值的过程中，投资者追捧输家。遇到危机时，他们会出逃至常规避险地带：日元、瑞士法郎和黄金，这三者都已经因为人们对贸易战的忧虑而升值。美元保持强劲，因为美国利率高（按富国标准而言），经济增长强劲。但是，法国兴业银行的基特·朱克斯（Kit Juckes）表示，当增长放缓、利率下降时，其他因素会开始起作用，包括贸易差额和货币定价。

日元脱颖而出。日本拥有经常账户盈余。而且按购买力平价衡量（包括本刊的巨无霸指数等粗略衡量标准），日元很便宜。瑞士法郎虽然看似昂贵，但同样拥有巨大的经常账户盈余作支撑。黄金被看上主要是因为好的美元替代品太少。

2010年，廉价的美元让美国以外的所有人头疼。现在，高昂的美元令美国烦恼，至少是令其总统烦恼。在慢慢酝酿的货币战中，美国既是受害人也是加害者。“和自己最大的贸易伙伴开打贸易战，对方的货币会贬值，而你自己的货币会走强。”朱克斯说。特朗普要是希望美元走低，在贸易战上握手言和可能是最佳途径。否则，美国就有向自己开打货币战的风险。





Demography

Missing millions

The UN revises down its population forecasts

THE UNITED NATIONS is the world's most important watcher of human tides. Its demographers have a good record of predicting global population change, although they have made mistakes about individual countries. So it is worth paying attention when the UN revises its figures, as it does every few years. The latest bulletin is especially surprising.

Recent revisions have sent the projected global population upwards. The one released on June 17th cuts it back. The UN now thinks the world will contain a little over 9.7bn people in 2050 and just under 10.9bn in 2100. The first figure is 37m lower than the UN forecast two years ago. The latter is 309m lower—almost an America's worth of people revised away.

Birth rates are falling faster than expected in some developing countries. In the late 1980s Kenya had a fertility rate of 6.5, implying a woman could expect to have that many children. Two years ago the UN reckoned Kenya's fertility rate would drop to 2.1 (the point at which the population sustains itself naturally) only in the late 2070s. Because of new data, it now thinks Kenya will reach that point a decade earlier. Uganda also looks less fecund. A smaller cut to India's fertility rate has a big effect on the global population forecasts because India has so many people.

The UN's population model assumes that countries with fertility rates well below two will bounce back a little. Even in countries where babies have become rare, most people continue to believe that the ideal family contains two or even three kids. But the recovery keeps failing to happen in some places, so the demographers have changed their forecasts in a second way.

They now expect some countries with extremely low birth rates, such as Italy, Japan and South Korea, to stay that way for years. Korea, which has a fertility rate of just 1.1, is now expected to have 30m people in 2100—down from 51m today.

Another change has to do with death. Most people are living longer. The biggest improvement is in east and southern Africa, where HIV is being treated better. In America, however, the opioid epidemic has pushed up the death rate, especially for men. The chance of a 15-year-old boy dying by the age of 50 is now higher in America than in Bangladesh. It would be nice if the American forecast, at least, proved to be too pessimistic. ■ ■



人口统计

抹掉了几个亿

联合国下调了人口预测数字

联合国是最重要的人口趋势观测机构。它的人口统计学家对全球人口变化的预测一向较为准确，虽然在个别国家上有过失误。因此联合国每过几年对数据所做的修正值得关注。最新发布的数字尤其令人吃惊。

联合国近些年对全球人口的预测都是向上调整。而6月17日发布的数字却做了下调。它现在认为，2050年世界人口将略多于97亿，到2100年将略少于109亿。相比两年前的预测结果，这两个数字分别被下调了3700万和3.09亿——后者抹去了将近一整个美国的人口。

在部分发展中国家，出生率正以快于预期的速度下降。上世纪80年代末，肯尼亚的生育率为6.5，即一名妇女预期会生6.5个孩子。两年前，联合国估计肯尼亚的生育率要到本世纪70年代末才会下降到2.1（即人口自然更替水平）。而基于最新的数据，联合国认为该国的生育率会提前10年降落到这个点。乌干达的生育率也被进一步下调。相比之下，对印度生育率的下调幅度更小些，但该国人口众多，因而这一调整给全球人口预测带来了很大的影响。

联合国的人口统计模型假定，生育率远低于2的国家会略微反弹。即使在出生率极低的国家，大多数人仍然认为理想的家庭应该有两个、甚至三个孩子。但是，在一些地区，生育率一直都没有回升，因此人口统计学家做出了第二类调整：他们现在预计，意大利、日本和韩国等一些出生率极低的国家在多年内还将继续这种状态。比如，生育率仅为1.1的韩国预计在2100年的人口为3000万，远低于目前的5100万。

另一个变化与死亡率有关。大多数人都更长寿了。因为艾滋病治疗的改善，非洲的东部和南部地区的寿命提升最为显著。然而，在美国，阿片类药物的滥用推高了死亡率，尤其是男性死亡率。现在，美国15岁男孩在50

岁前死亡的几率高于孟加拉国。至少，如果对美国的预测被证明过于悲观了，倒是件好事。 ■



Music and economics

The gig economy

What the music industry reveals about economics, and vice versa

WHAT CAN music tickets tell you about supply and demand, and the working of secondary markets? How do operas in early 19th-century Italy provide a natural experiment in the impact of copyright law on creativity? And how do the finances of a global concert tour illustrate Baumol's cost disease? These are the sorts of questions that Alan Krueger, a chairman of the Council of Economic Advisers under Barack Obama, answers in "Rockonomics". Mr Krueger died in March, before the publication of his book—which, as its title hints, sets out to emulate "Freakonomics" (a bestselling pop-economics compendium from 2005), only with added guitar solos.

The economics of the music industry matter for several reasons, Mr Krueger argues. For a start, they illuminate how the business works, which is widely misunderstood, despite the role of music in many people's lives. They provide an early and informative example of an industry coping with digital disruption. But Mr Krueger dreams that his inquiry might attest to the value of the discipline of economics itself, and help restore its reputation with both the public and policymakers. "A broader audience might be willing—even eager—to listen if the story of the economic forces disrupting our world is told through the prism of the music industry," he writes.

Mr Krueger's love of music shines through as he anatomises the industry's finances and its increasingly "winner takes all" nature. Today the top 5% of performers claim 85% of concert revenue, for example, and the top 1% take 60%. He looks at how recording and touring revenues have changed, the business model of streaming, how contracts work and whether political

activism makes business sense for artists. He analyses why tickets are usually underpriced—and how Taylor Swift (pictured), Jay-Z and others have pioneered “slow ticketing”, whereby tickets are released gradually, so shows do not sell out straight away.

He also provides much wonkish detail on radio royalties and the evolution of copyright law. (It turns out that the number and quality of new operas increased in the parts of Italy where Napoleon imposed French copyright law; Rossini and Verdi were among the beneficiaries.) He notes that William Baumol used the example of a string quartet when formulating his “cost disease” theory about the relationship between prices and productivity. A detailed analysis of the peculiarities of the Chinese music market is followed by a nod towards behavioural economics and music’s impact on happiness. There are also interviews with solo artists, bands and music executives.

Because it focuses on a single field, “Rockonomics” lacks the variety of “Freakonomics”. Despite its aspirations, the book is more effective at using economics to explain the music industry than vice versa. For readers with a budding interest in economics, other tomes will prove a more effective gateway drug. But for anyone thinking of entering the music industry, or working in it already, “Rockonomics” is an eye-opening and entertaining read. ■ ■



音乐与经济学

演艺零工经济

音乐产业与经济学如何相互揭示【《摇滚经济学》书评】

音乐演出门票可以告诉你有关供需和二级市场运作的哪些事？19世纪初意大利的歌剧如何为研究版权法对创意的影响提供了自然实验？一次全球巡回演唱会的财务状况又如何揭示了“鲍莫尔成本病”现象？奥巴马任期内的经济顾问委员会主席艾伦·克鲁格（Alan Krueger）在《摇滚经济学》（Rockonomics）一书中回答了这些问题。克鲁格于今年3月去世，当时这本书还没有出版。正如书名所示，《摇滚经济学》意在用一段段“吉他独奏”，向2005年出版的畅销书、通俗经济学故事集《魔鬼经济学》（Freakonomics）致敬。

克鲁格认为，对音乐产业的经济学研究意义重大，这有几个原因。首先，它们可以揭示音乐产业的运作方式。而人们对这件事普遍存在误解，尽管音乐在许多人的生活中扮演着重要角色。它们也提供了一个信息丰富的早期案例，显示一个行业如何应对数字化革命的颠覆。但克鲁格希望他的这番探究可以证明经济学本身的价值，从而有助于恢复经济学在公众及政策制定者中的声誉。“如果能通过音乐产业来讲述经济力量颠覆世界的故事，那么可能有更广泛层面的受众愿意、甚至渴望倾听这个故事。”他写道。

克鲁格对音乐的热爱在这番努力中表露无遗。他剖析了音乐行业的财务状况，以及它愈演愈烈的“赢家通吃”特性。例如，今天顶尖5%的艺人拿走了音乐演出总收入的85%；顶尖的1%拿走了60%。他观察唱片和巡演收入的变化、流媒体的商业模式、合同运作方式，以及积极参与政治活动对艺人是否有商业上的价值。他分析为何门票通常都定价过低，而泰勒·斯威夫特（Taylor Swift，如图）和Jay-Z等人又是如何率先推出了“慢售票”策略（分批放出门票，以避免瞬间售罄）。

他还就电台支付音乐版权费以及版权法的演变提供了许多学究式的细节。事实证明，在拿破仑施行法国版权法的意大利部分地区，新歌剧的数量和质量都提高了；意大利作曲家罗西尼、威尔第都在受益者之列。克鲁格指出，威廉·鲍莫尔（William Baumol）在构建关于价格与生产率之间关系的“成本病”理论时，使用了弦乐四重奏的例子。在详细分析了中国音乐市场的独特性之后，他论述了行为经济学以及音乐对幸福感的影响。书中还有对艺人、乐队及音乐公司高管的采访。

因为只集中分析单个领域，《摇滚经济学》不像《魔鬼经济学》那样丰富多样。尽管克鲁格希望这本书能让音乐产业和经济学相互印证，但它做得更好的还是用经济学解释音乐产业，而不是反过来。对那些刚刚开始对经济学感兴趣的读者来说，其他大部头书籍会是更有效的入门读物；但对于想进入音乐行业或已经投身该行业的人来说，《摇滚经济学》会是一次大开眼界、趣味十足的阅读体验。 ■



The Economist Film

Why is vanilla so expensive?

In recent years, natural vanilla has sometimes been more expensive than silver by weight. The price rise is due partly to global demand.



经济学人视频

为什么香草如此昂贵？

近年来，天然香草的价格有时甚至超过了同等重量的白银。全球需求是价格飙升的部分原因。



The internet's next act

You ain't seen nothing yet

The second half of humanity is joining the internet. They will change it, and it will change them

IN 2007 MORE humans lived in cities than outside them for the first time. It was a transition 5,000 years in the making. The internet has been quicker to reach the halfway mark. Over 50% of the planet's population is now online, a mere quarter of a century after the web first took off among tech-savvy types in the West. The second half of the internet revolution has begun. It is changing how society works—and also creating a new business puzzle.

Most new users are in the emerging world; some 726m people came online in the past three years alone. China is still growing fast. But much of the rise is coming from poorer places, notably India and Africa. Having seen what fake news and trolling has done to public discourse in rich countries, many observers worry about politics being debased, from the polarisation of India's electorate to the persecution of Myanmar's Rohingya minority. On the positive side, charities and aid workers talk endlessly and earnestly about how smartphones will allow farmers to check crop prices, let villagers sign up for online education and help doctors boost vaccination rates.

Less well appreciated is that the main attractions of being online are the same for the second half as they were for the first. Socialising and play, not work and self-improvement, are the draw. Porn is popular. Messaging apps help friends stay in touch, and let migrant workers say goodnight to their children back home. People entertain their friends—and strangers—on social media with goofy home-made videos on YouTube or TikTok, an app focused on short, humorous clips. Cheap data plans and thumb drives bring pirated films to millions who may never have been to a cinema. Dating

apps are more popular than farming advice; video games are more popular than either. Such boons are unlikely to make their way into many UN development reports. But they are a boost to the stock of human happiness.

For businesses, the second half of the internet offers a vast pool of customers. It also brings a headache—most of these new users are too poor to spend very much. Tens of billions of dollars in venture-capital money have flowed into internet startups in emerging markets, excluding China. The Silicon Valley giants have built up big user bases—over 1.5bn Facebook users are in developing countries. YouTube, a video site owned by Google, is increasingly dominated by non-Western users. Last year Walmart spent \$16bn buying Flipkart, an Indian e-commerce giant. Jumia, an e-commerce firm with 4m customers in Nigeria and 13 other African countries, floated in New York in April.

Despite these firms' punchy valuations, they are still looking for sustainable business models. Reliance Jio, an Indian firm, has sunk \$37bn into building a high-speed mobile network and acquiring a big base of mostly poor users. Each Facebook user in Asia generates only \$11 of advertising revenue a year, compared with \$112 for a North American one. The combined revenue of all the internet firms in emerging markets (excluding China) is perhaps \$100bn a year. That is about the same size as Comcast, America's 31st-biggest listed firm by sales.

Nonetheless, the impact of these firms on business will get bigger in two ways. First, they will grow fast—although whether fast enough to justify their valuations remains to be seen. To maximise their chances, many are offering not just a single service (such as search or video), as Western firms tended to in their early years, but a bundle of services in one app instead, in the hope of making more money per user. This approach was pioneered in China by Alibaba and Tencent. Go-Jek in Indonesia offers ride-hailing, payments, drug prescriptions and massages. Facebook is pushing a digital

payments system in India through its chat service, WhatsApp.

The second is that in the emerging world, established firms are likely to be disrupted more quickly than incumbents were in the rich world. They have less infrastructure, such as warehouses and retail sites, to act as a barrier to entry. Many people, especially outside the big cities, lack access to their services entirely. Beer, shampoo and other consumer-goods firms could find that as marketing goes digital, new insurgent brands gain traction faster. Banks will be forced to adapt quickly to digital payments or die. Viewed this way, there is a huge amount of money at stake—the total market value of incumbent firms in the emerging world, outside China, is \$8trn. If you thought the first half of the internet revolution was disruptive, just wait until you see the second act. ■ ■ ■



互联网的下一幕

好戏在后头

地球另一半人口正在接入互联网。他们会改变互联网，互联网也会改变他们

地球上住在城市里的人数在2007年首次超过了住在城市外的人数。这一转变历时五千年。互联网达到“过半”目标的速度要快得多。超过50%的地球人口现在都已联网，这距离网络在西方国家的科技发烧友中首先流行起来不过25年。互联网革命的后半段已经开始。它正在改变社会的运作方式，同时带来一个新的商业谜题。

互联网的新用户大多来自新兴市场：仅过去三年里就有约7.26亿人接入网络。中国的互联网用户数仍在快速增长。但大部分增长来自更贫困的地区，尤其是印度和非洲。看到虚假新闻和煽动性言论对富裕国家公众舆论的影响后，许多观察人士担心政治风气正被败坏——从印度选民的两极分化，到缅甸对少数民族罗兴亚人的迫害。从积极的一面看，慈善机构和救援人员滔滔不绝、满腔热情地谈论着智能手机如何能让农民们查看农作物价格、让村民们报名接受在线教育，帮助医生提高疫苗接种率。

不那么让人津津乐道的一点是，吸引地球上其余一半人上网的主要原因和前一半人一样，不是为了工作或自我提高，而是为了社交和娱乐。色情内容很受欢迎。消息应用让朋友们保持联系，让在外地工作的人能向留在家里的孩子道晚安。人们在社交媒体上用YouTube或抖音（一款专注于搞笑短视频的应用）上自制的傻里傻气的视频取悦朋友和陌生人。便宜的流量套餐和闪存盘为数百万可能至今未去过电影院的人带来了盗版电影。约会应用比耕种建议更流行，电子游戏又比这两者都更受欢迎。这类福利不太可能出现在联合国的众多发展报告中，但它们的确增加了人类的幸福感。

对于企业来说，互联网的下半程发展提供了一个巨大的客户群。但这也带来了一个麻烦---大多数新用户很穷，没多少钱可花。在不包括中国在内的新兴市场，已经有数百亿美元的风险资本流入了互联网创业公司。硅谷巨

头们已经在那里建立了庞大的用户基础，Facebook有超过15亿用户在发展中国家。谷歌旗下视频网站YouTube渐渐由非西方用户占据了主流。去年，沃尔玛斥资160亿美元收购了印度电子商务巨头Flipkart。电子商务公司Jumia在尼日利亚和其他13个非洲国家拥有400万客户，今年4月在纽约上市。

尽管这些公司的估值很高，但它们仍在寻找可持续的商业模式。印度公司Reliance Jio已投入370亿美元建设高速移动网络，而它获得的庞大客户中大部分为贫困人群。Facebook在亚洲的每名用户每年只产生11美元的广告收入，而北美用户为112美元。在除中国外的新兴市场，全体互联网公司的年收入总额可能为1000亿美元，与美国第31大上市公司康卡斯特（Comcast）的销售额相当。

尽管如此，这些公司将从两方面对商业产生更大的影响。首先，它们将快速增长，尽管增速是否足以支撑其估值仍有待观察。为尽量提高成功的机会，许多公司不是像早期的西方公司那样提供单一的服务（如搜索或视频），而是在一个应用中提供一系列服务，以期在每个用户上赚到更多钱。这种方法由阿里巴巴和腾讯在中国率先采用。Go-Jek在印尼提供叫车、支付、开药和按摩服务。Facebook正通过其聊天应用WhatsApp在印度推出一个数字支付系统。

其次，在新兴市场，成熟企业被颠覆的速度很可能要比过去在发达国家所发生的更快。它们拥有的可作为准入门槛的基础设施（如仓库和零售场所）更少。许多人——特别是大城市以外的人群——完全无法使用它们的服务。啤酒、洗发水和其他消费品公司可能会发现，随着营销走向数字化，新生的“叛军”品牌会更快地获得吸引力。银行将被迫迅速适应数字支付，否则就会倒闭。从这个角度来看，一大笔资本岌岌可危——在中国以外的新兴市场，成熟企业的总市值为八万亿美元。如果你认为互联网革命的前半段是颠覆性的，那等着看第二幕如何吧。■



Chinese technology

The balance of processing power

An American ban hits at the core of China's supercomputer industry

IN 2000 CHINA had two supercomputers ranked among the world's fastest 500. Ten years later a machine named Tianhe-1A topped the global league table. It was, though, based on Intel chips. So when in 2015 America barred its giant chipmaker from selling to four Chinese supercomputer labs—fearing that the machines were being used to simulate nuclear blasts—it might have expected China's progress in the field to slow. Instead, China unveiled another supercomputer, Sunway TaihuLight, that led that ranking in 2016 and 2017—this time powered entirely by home-grown microprocessors. The latest American sanctions will nevertheless bite.

On June 21st America's Commerce Department blacklisted another five Chinese supercomputing entities on the grounds that they too pose a threat to national security. The export ban prohibits American firms from selling them chips and “interconnects” that allow chips to talk to each other. An army-led institute that designed chips for the latest world-beating machine is on the list, as is Sugon, which has built a third of China's 100 fastest ones.

So is Hygon, born of a joint venture in 2016 between Sugon and Advanced Micro Devices (AMD), an American semiconductor firm. Intel chips dominate high-powered computing in desktops, servers and supercomputers. But AMD makes advanced ones compatible with Intel's technology. The \$293m arrangement gave Hygon the ability to make slightly slower near-replicas of AMD's designs—and China a domestic manufacturer of crucial components.

The latest ban chokes off practically all of AMD's dealings with Hygon.

Transfer of intellectual property and technical support are proscribed. The manufacturer of the copycat chips, GlobalFoundries, is American, so it too is banned from working with Hygon. Finding an alternative foundry would require onerous tweaks to the chips' design. AMD has carefully transferred only as much knowledge as Hygon needs to copy but not reverse-engineer them.

A blow, for sure—but perhaps not a knockout. Last year new American computers ended China's dominance; it will be pouring money into reclaiming it. Jack Dongarra, a supercomputing expert at the University of Tennessee who has scrutinised Sunway's chip, calls it “very impressive”. Rumours have spread of a big new supercomputer powered by AMD's licensed chips whirring in a Chinese lab.

To China the blacklisting, days before President Donald Trump met his Chinese counterpart, Xi Jinping, at the G20 summit in Japan, smacks of a negotiating ploy in the two countries' trade war. At the summit Mr Trump said he would ease export restrictions placed on Huawei, a Chinese telecoms giant. Even if he doesn't, Intel and Micron, another chipmaker, are already circumventing the Huawei ban in ways they claim are legal, according to the *New York Times*. FedEx is suing America's government over the “impossible” job of inspecting parcels to blacklisted Chinese firms. Chipping away at Chinese computing progress is tough. ■ ■



中国技术

计算能力的天平

美国的一道禁令打击了中国超级计算机产业的核心

二〇〇〇年，中国有两台超级计算机跻身“世界超级计算机500强”。十年后，“天河一号A”登上了该排行榜的榜首。不过，它用的是英特尔的芯片。所以，当美国于2015年禁止其芯片巨头向四家中国超级计算机实验室出售芯片时（因为担心这些机器会被用于模拟核爆），它可能以为这会延缓中国在该领域的发展。结果，中国推出了另一台超级计算机“神威·太湖之光”，在2016年和2017年都位列榜首，而这台计算机用的全部是国产微处理器。不过，美国最新的制裁措施仍然会产生显著影响。

6月21日，美国商务部又把五家中国超级计算机实体列入出口黑名单，理由是这些实体也对美国国家安全构成威胁。出口禁令禁止美国公司向它们出售芯片和让芯片互联的“连接器”产品。一家为“神威·太湖之光”设计芯片的军工研究所也在黑名单之内，此外还有中科曙光，中国最快的一百台计算机中有三分之一由它制造。

中科曙光在2016年和美国半导体公司AMD合资成立的海光也在名单上。英特尔的芯片主导了台式机、服务器和超级计算机的高性能计算环节。但AMD生产的先进芯片可与英特尔的技术兼容。海光花费了2.93亿美元，让曙光能生产出和AMD的设计几乎相同的芯片，只是速度稍慢些。这也让中国拥有了一家关键部件的国内制造商。

最新的禁令几乎阻断了AMD与海光之间的所有交易。它禁止转让知识产权和提供技术支持。仿制芯片的制造商格罗方德（GlobalFoundries）是一家美国公司，所以也被禁止为海光代工。寻找替代它的代工厂需要对芯片的设计做繁重的调整。谨慎的AMD仅向海光转移了仿造芯片所必需的技术，但不足以进行逆向工程。

对中国芯片业的打击是肯定的，但可能还不足以将它击垮。去年，新的美国超级计算机终结了中国在这一领域的领先地位，而中国势必将倾注资金夺回桂冠。田纳西大学的超级计算专家杰克·唐加拉（Jack Dongarra）曾经仔细研究过“神威·太湖之光”的芯片，称其“非常令人赞叹”。有传言说，中国的某个实验室正在研发采用AMD授权芯片的大型新型超级计算机。

此次黑名单发布几天后，特朗普和习近平在日本举行的G20峰会上见面。在中国看来，这个时间点的选择很可能是两国贸易战中的一个谈判伎俩。在峰会上，特朗普表示他将放宽对中国电信巨头华为的出口限制。而即使他不真的放宽限制，据《纽约时报》报道，英特尔和另一家芯片制造商美光（Micron）也已经在以它们声称合法的方式规避华为禁令。联邦快递正在就检查运往入列黑名单的中国公司的包裹这一“不可能完成”的工作起诉美国政府。要削弱中国计算能力的进步没那么容易。 ■



Financial services

Can the City survive Brexit?

The biggest international financial centre in the world faces its toughest test

THE WORLD has a handful of great commercial hubs. Silicon Valley dominates technology. For electronics, head to Shenzhen. The home of luxury is Paris and the capital of outsourcing is Bangalore, in India. One of the mightiest clusters of all is London, which hosts the globe's largest international financial centre. Within a square mile on the Thames, a multinational firm can sell \$5bn of shares in 20 minutes, or a European startup can raise seed finance from Asian pensioners. You can insure container ships or a pop star's vocal cords. Companies can hedge the risk that a factory anywhere on the planet will face a volatile currency or hurricanes and a rising sea level a decade from now.

This metropolis of money, known as the City, generates £120bn (\$152bn) of output a year—as much as Germany's car industry. Because it allocates capital and distributes risk at a vast scale, its influence is global. But now, with a “no-deal” conclusion looking increasingly likely after a change of leader of the Conservative Party, Brexit threatens to rupture Britain's financial links with the European Union. If Labour wins the next election under Jeremy Corbyn, Britain will also end up with its most left-wing government since 1945, one that is deeply hostile to capital and markets. Either outcome would make the EU poorer and damage London's position. Together, they could change the workings of the global financial system.

London's prowess is something to behold. It hosts 37% of the world's currency dealing and 18% of cross-border lending. It is a hub for derivatives, asset management, insurance and investment banks. Relations with Europe are particularly intimate. The City generates a quarter of its income from the

continent, and Europe gets a quarter of its financial services from London, often the most sophisticated ones. French or Italian firms go to London to meet investors or organise a takeover. When the European Central Bank buys bonds as part of its monetary policy, the sellers are very often asset managers and banks domiciled in Britain. Some 90% of European interest-rate swaps are cleared through the City's plumbing.

The City's history is long but serpentine. In 1873 Walter Bagehot, *The Economist's* then-editor, wrote of its "natural pre-eminence". In fact decades of decline lay ahead. A revival began in the 1960s when the offshore market for dollar lending boomed. Another lift came with the stockmarket deregulation of Big Bang in 1986 and again after 2000 when London became a centre for trading the euro and emerging markets. Even the financial crisis of 2008 did not do much damage to the City's standing abroad. Today the magic formula has many parts: openness to people and capital, the time zone, proximity to subsea data cables, and posh schools. But, above all, it relies on stable politics and regulation, close ties to America and seamless ones to Europe. Brexit and Mr Corbyn threaten this formula in three ways.

The first is by ripping up the legal framework, as the EU cancels the "passports" that let City firms operate across the continent. Activity may move in search of certainty. The second is by the remaining 27 EU members adopting an industrial policy that uses regulation to compel financial firms to move to the euro zone. As Amsterdam, Frankfurt and Paris jostle for business, this fight is turning ugly. And the last is from within Britain—if a Corbyn government takes the country back decades, with nationalisation at below-market prices, a financial-transactions tax, a tough line on mergers and acquisitions and possibly even capital controls. If a Labour government also attacks private schools and second homes, London's giant pools of capital will disappear faster than a trader's cocktail.

Given the sums at stake—London hosts \$20trn of bank assets and

securities—you might expect a grand bargain between the EU and its financial hub. Some chance. Britain has spurned the option of staying in the single market. A bespoke deal for financial services is not on the table because the EU is loth to grant special favours to a departing country. It is as if New York and Wall Street were divorcing America without any agreement. Thanks to temporary licences, the risk of a financial crisis on Brexit day is slim. But these arrangements will not last long—the deal over derivatives, say, expires next year.

Behind the stand-off is a deep divide. The City could keep free access to the EU if it agreed to be regulated by it. But Britain rightly fears handing control of its largest industry to the bloc, particularly if the EU's unspoken goal is to shrink London. Europe's motives blend principle and greed. It wants to supervise its own financial system, but also to grab jobs and tax revenues from London. In the long run the most likely set-up is “equivalence”, in which firms receive recognition from Europe. The catch is that, as Switzerland is discovering, this can be withdrawn at any time, leading to a state of permanent instability. That threat will lead to a drift of activity and people into the euro zone as EU authorities win full sovereignty over the euro zone's capital markets.

This sounds good for the EU, but it is likely to be a pyrrhic victory. The continent's financial system is balkanised and dominated by sluggish banks. New business will be spread across several cities, fragmenting activity further. Europe's heavy-handed regulation may prompt non-EU business to stay away. Ultimately the costs of a less efficient financial system are likely to outweigh the extra income from capturing business from London. The annual bill for every 0.1 percentage-point increase in euro-zone firms' cost of funding amounts to €32bn, or 0.3% of GDP.

And what of the City? It has a chance of prospering. Its links with America remain tight. It will have to try to keep Europe close, too, while increasing

its non-EU international business from today's share of 25-30%, and developing new strengths in fintech and green finance. The biggest danger is that it has lost the battle of ideas at home. Many Britons, not just Mr Corbyn, resent the City's post-crisis bail-out—no matter that British banks have since tripled their capital buffers, and thus pose little threat to taxpayers. Even Margaret Thatcher, who oversaw Big Bang in the 1980s, disliked flash bankers. But Britons cannot ignore the £65bn, or 3% of GDP, of annual tax that the City pays towards hospitals and schools. For a country that is losing friends fast, having a global, sophisticated industry is a blessing, not a curse. ■ ■



金融服务

金融城前途几何？

全球最大的国际金融中心面临最严峻的挑战

全球顶尖商业中心屈指可数。硅谷主导科技产业，深圳主打电子产品，巴黎是奢侈品之乡，印度的班加罗尔是外包之都。最强大的集群之一伦敦则拥有全球最大的国际金融中心。在泰晤士河沿岸一平方英里的区域内，一家跨国公司可以在20分钟内售出50亿美元的股票，一家欧洲创业公司可以从亚洲养老基金那里融到种子资金。你可以为集装箱货船或一位流行歌星的声带投保。企业可以为地球上任何地方的工厂在未来十年内将面临的货币波动、飓风或海平面上升等风险做对冲。

这个被称为伦敦金融城的资本重镇每年的经济产值高达1200亿英镑（1520亿美元）——和整个德国的汽车产业差不多。它分配资本、分散风险的规模巨大，因此具有全球影响力。但现在，保守党党首更迭之后，“无协议”脱欧的可能性似乎越来越大，这可能会割裂英国与欧盟的金融联系。如果工党在杰里米·科尔宾（Jeremy Corbyn）的带领下赢得下一次选举，将成为1945年以来英国最左翼的政府，对资本和市场都极不友好。两种结果都会削弱欧盟的经济，同时损害伦敦的地位。两者叠加可能会改变全球金融体系的运作。

伦敦的实力有目共睹。它的货币交易和跨境贷款量分别占全球的37%和18%。它是衍生品、资产管理、保险和投资银行的中心。它与欧洲的关系尤为密切。金融城收入的四分之一来自欧洲大陆，而欧洲大陆所需的金融服务有四分之一从伦敦获得，通常还是最复杂的那类服务。法国或意大利的公司会选择前往伦敦会见投资者或安排收购。当欧洲央行调整货币政策而购买债券时，卖方通常是总部设在英国的资产管理公司和银行。约90%的欧洲利率掉期产品通过金融城的金融网络清算。

金融城的历史悠久而曲折。1873年，时任《经济学人》总编辑的白芝浩

(Walter Bagehot) 曾写到它具有“天然优势”。事实上，之后的几十年金融城一直在走下坡路。它的复兴始于上世纪60年代，当时美元贷款的离岸市场蓬勃发展。1986年对股市放松管制的“金融大爆炸”政策实施以及2000年伦敦成为欧元和新兴市场的交易中心后，金融城两次受到提振。即使是2008年的金融危机也没有对它的海外地位造成太大的损害。今天，维续金融城地位的神奇配方包含多个元素：对人和资本的开放、所处时区、临近海底数据电缆，以及精英学校。但最重要的是，它依赖稳定的政治和监管、与美国的紧密联系，以及与欧洲的无缝对接。英国脱欧和科尔宾从三个方面威胁到这个配方。

首先是破坏法律框架，因为脱欧后欧盟会取消允许金融城的公司在欧洲大陆运营的“护照”。金融活动可能会转移到确定性更高的地方。其次，其余27个欧盟成员国采取产业政策，利用监管来迫使金融公司迁往欧元区。随着阿姆斯特丹、法兰克福和巴黎竞相争夺业务，这场战争正日益白热化。最后一个威胁来自英国国内——如果科尔宾领导的政府以低于市场的价格进行国有化，征收金融交易税，对并购采取强硬政策，甚至进行资本管制，英国将倒退几十年。如果工党政府再向私立学校和第二套房开刀，伦敦巨大的资本池将比交易员杯中的鸡尾酒消失得更快。

鉴于受威胁的资产规模巨大——伦敦聚集了价值20万亿美元的银行资产和证券——你可能以为欧盟与其金融中心之间会达成一项重大协议。机会不大啊。英国已经狂傲地拒绝了留在单一市场的选择。目前也没有专门为金融业谈一份协议这个选项，因为欧盟不愿意给予一个脱离它的国家特殊待遇。这就好像纽约和华尔街没有达成任何协议就脱离美国一样。由于有临时牌照，在英国脱欧当天就发生金融危机的风险很小。但这种安排只是暂时的，比如衍生品交易临时牌照将于明年到期。

僵持的背后是深刻的分歧。如果同意接受欧盟监管，金融城可以继续自由进入欧盟市场。但英国自然要担心把自己最大产业的控制权交给欧盟，特别是如果欧盟隐藏的目标是降低伦敦的影响力的话。欧洲的动机混合了原则和贪念。它希望监督自己的金融体系，但同时也想从伦敦抢夺职位和税收。从长远来看，最有可能采用的方式是通过“等同性”机制让英国的金融

企业获得欧洲的认可。问题在于，正如瑞士所发现的那样，这种认可随时可能被撤销，这就导致了永久的不稳定状态。随着欧盟当局赢得对欧元区资本市场的完全管治权，这种威胁将导致金融活动和从业人员逐渐转入欧元区。

这听上去对欧盟不错，却很可能是一场得不偿失的胜利。欧洲大陆的金融体系已经“巴尔干化”，且由疲弱的银行主导。新业务将分散在几个城市，令金融活动进一步分裂。欧洲严格的监管可能会促使非欧盟企业远离欧洲。最终，金融系统效率变低带来的成本可能会超过从伦敦抢夺业务所带来的额外收入。欧元区企业的融资成本每增加0.1个百分点，每年增加的成本总计320亿欧元，占GDP的0.3%。

那金融城又如何呢？它仍有繁荣的机会。它和美国的关系仍然紧密。它必须努力也与欧洲维持密切关系，与此同时增加其非欧盟国际业务（目前占其总业务的25%至30%），还要发展自己在金融科技和绿色金融领域里的新优势。它面临的最大危险是它在国内的舆论之争中已经失利。许多英国人，不仅仅是科尔宾，对伦敦在金融危机后救市的做法深感不满——尽管英国的银行此后将资本缓冲增至以前的三倍，因而对纳税构成的威胁已经微乎其微。即使是在上世纪80年代采取“金融大爆炸”政策的撒切尔夫人也不喜欢招摇的银行家。但英国人不能忽视金融城每年缴纳的650亿英镑税收（相当于英国GDP的3%），这些钱被用于资助医院和学校。对于一个正在快速失去朋友的国家来说，拥有一个全球性的尖端产业是福不是祸。





Delays in the skies

A holding pattern

Air-traffic control is a mess. Unions and other vested interests block reform

AT FIRST GLANCE, the industrial estate near Maastricht's out-of-the-way airport, hardly appears the future of civil aviation. But it houses the Maastricht Upper Area Control Centre (MUAC), where up to 100 air-traffic controllers work at a time to ensure that planes flying high above Belgium, Luxembourg, the Netherlands and north-western Germany do not bump into each other. Covering one of Europe's busiest air spaces, every day its controllers guide 1,200 planes through a 16km (10-mile) gap in Belgium between two military no-flight zones—without any near misses.

Founded in 1972 by Eurocontrol, an intergovernmental agency, MUAC was the world's first attempt to pool controllers between countries. Still the only such venture, it is one of the most modern and cost-efficient control centres in Europe. That is partly thanks to its use of technology. Pilots and controllers at MUAC, for instance, communicate through digital messages—much faster than speaking over a two-way radio. "Here is the future," beams John Santurbano, MUAC's director. It is a future few countries are embracing, though rising congestion is making flight delays and cancellations more common across the world.

MUAC's control room, alas, is far from typical. Most air-traffic controllers still rely on technologies used in the second world war. Planes are located by radar, though global-positioning satellites are cheaper and more accurate. Information is exchanged by voice radio instead of by data link. And—hard to credit in the digital age—in America controllers still hand each other slips of paper to track aircraft. Meanwhile, small drones—invisible to radar and impervious to voice messages—are proliferating and flying higher.

The system cannot cope with demand. And across the world, heavier traffic and constrained control capacity are leading to big increases in flight delays and cancellations. In America the length of delays caused by air-traffic control problems soared by 69% between 2012 and 2017. In China the average delay per domestic flight spiked by 50% in 2017 and remains at an average of 15 minutes per flight. In Europe things are worsening faster than anywhere (see chart). Last year, according to Eurocontrol, the length of delays due to en route air-traffic-flow problems grew by 105%. Over 60% of those delays were because of a lack of capacity or staff, 25% were weather-related and 14% caused by strikes by controllers and others. Eamonn Brennan, boss of Eurocontrol, expects things to be as bad, if not worse, this year.

The cost of this is huge. Eurocontrol estimates that the delays and cancellations caused by air-traffic-flow problems cost the European economy €17.6bn (\$20.8bn) last year, up by 28% on 2017. Holding planes in the air and making them fly farther wastes fuel. More efficient air-traffic control could bring fuel savings of 5-10% per flight, reckons Graham Spinardi of the University of Edinburgh. Moreover, public confidence has been shaken by several near-misses. In 2017 an Air Canada jet carrying 140 people misunderstood the controllers' instructions and nearly landed on a taxiway where four aircraft were parked. In 2016 an Eva Air flight from Los Angeles flew perilously close to a mountain peak after an air-traffic controller's instructions confused right with left.

This is just what controlling air traffic is intended to avoid. The current system developed in the 1950s after a series of deadly mid-air collisions. In 1956 two aircraft collided over the Grand Canyon, killing all 128 on board. Soon after, in 1958, America gave the FAA the power to manage air traffic over its territory. Other countries soon set up their own air-traffic-control systems.

The market for air-traffic services is worth over \$14bn, according to Markets and Markets, a research firm. But unlike airlines and airports, air-traffic control is, with few exceptions, still run by national governments. Of the EU's 28 member states the air-traffic services of only two—Britain and Italy—have private shareholders.

The drawbacks to the present system of managing air traffic were evident even in the 1950s. In 1960 Britain, France, Germany and the Benelux countries set up Eurocontrol, intending to merge their airspaces. In 2001 the goal of creating a “Single European Sky” became official EU policy. The hope was that it would boost efficiency and that economies of scale would save money. A single air-traffic regulator could carve the continent into blocks based on traffic flows rather than national borders.

But, apart from the small area covered by MUAC, virtually no progress has been made since 1960. One reason is that Britain and France want to retain sovereignty over their skies for military reasons. But opposition also comes from the controllers themselves. Last October ATCEUC, an umbrella group for controller unions in Europe, attacked the idea of setting targets for improving air-traffic services as “a waste of time and effort”. Trade unions see a merger as a backdoor for introducing new technology. That would cut costs for airlines and passengers—and threaten controllers’ jobs. The ATCEUC insists that “humans have to remain at the core of air-traffic management”. Moreover, unions and national politicians do not want a single regulator moving well-paid jobs to places in eastern Europe with cheaper labour.

Razvan Bucuroiu, Eurocontrol’s head of network strategy, says that, blocked from fully integrating national systems, Eurocontrol is trying to reduce delays by encouraging airlines and national air-traffic managers to divert flights to less busy routes. It has also redesigned flight paths as far away as Malmö in Sweden to accommodate the new airport in Istanbul, which fully

opened in April.

But these measures will only “stop the bleeding for one summer”, explains Thomas Reynaert of A4E, an airline-trade body based in Brussels. The extra capacity they produce will be gobbled up by rising demand for air travel. And the longer flights the plans entail will waste even more fuel.

So the EU is changing tack, releasing a report in April calling for the creation of a “Digital European Sky”. Instead of merging each country’s air-traffic manager, the focus is on cutting costs by, for example, setting a common standard for digitisation to ensure each country invests in compatible systems. A reform of licensing, which limits controllers to working only in one region, would also encourage them to move to where they are needed.

This reflects a realisation in Brussels that merging air-traffic-control services would not be a magic bullet. After all, America and China, continent-sized countries with single air-traffic control services, still endure rising congestion.

In many places, options are limited by the closure of air space for military purposes. In China four-fifths of air space is reserved for military use, according to the Centre for Asia Pacific Aviation, a consultancy. So the thin corridors open to civil aircraft are congested. Britain has dealt with this by closing military air space only during air-force exercises, instead of all the time as in the rest of Europe and China.

That governments run air-traffic systems themselves adds to the problems. In America for instance, the FAA, a government agency, is vulnerable to budget cuts from Congress and cannot borrow to invest in new technology to boost productivity. As a result, in 2017 the cost for each flight-hour controlled was almost a third less in Canada than in America, where Nav Canada is an independent company allowed to borrow. For instance, it has

replaced paper slips with digital ones, and is licensing that technology to other control systems around the world. Public ownership may also encourage excessive pay demands from trade unions. In 2010 the Spanish government found that at least ten controllers were paid over €810,000 (\$1.1m) a year. Today the average Spanish controller takes home more than €200,000 a year—over seven times the average salary in the country and more than pilots earn. France's militant air-traffic controllers spent the equivalent of nearly nine months on strike between 2004 and 2016, according to a report by a finance committee of the French Senate—mainly because of sympathy strikes for other public-sector workers.

Nonetheless, airlines argue that privatisation alone is not the answer. Air-traffic services can charge extortionate prices whether or not they are in public hands, notes Kenny Jacobs of Ryanair, Europe's largest low-cost carrier. MUAC, for instance, made a profit margin of 70% in 2017. Air-traffic-control services should have to compete against each other to lower costs, argues Andrew Charlton of Aviation Advocacy, a consultancy based in Switzerland. If different private companies had franchises for different blocks, they could offer airlines competing prices and services to attract flights. And governments could encourage competition by holding auctions for these contracts every five or ten years.

Nowhere has yet gone that far. But some countries do already contract out control of their upper-air space. Australia, Fiji and New Zealand have long run the upper-air space over Pacific islands for the islands' governments. HungaroControl, Hungary's forward-thinking air-traffic-control service, has done the same for Kosovo since 2014. It is also a pioneer of remote air-traffic-control towers for airports, hoping eventually to use its cheaper local labour to offer control-tower services to other airports from its base in Budapest.

Even so, real reform that will stop air-traffic-control failures from wrecking

millions of holidays each summer is unlikely without more political will, says David McMillan of the ATM Policy Institute, a think-tank in Geneva. EU officials privately concede that in the short term they have given up hope of merging air-traffic services in the way Eurocontrol originally intended. Similarly, in America, a tentative proposal to split air-traffic-control services from the FAA into a separate entity, as in the rest of the developed world, was last year grounded in Congress. Although big airlines, airports and controller unions supported the proposals, the business-aviation lobby opposed them, worried that private jets might eventually be forced to pay for the air-traffic services they currently get free, thanks to American taxpayers.

And so, back at MUAC in Maastricht, Mr Santurbano jokes that if he had to advise a young person today on how to find a well-paid job unlikely to be disrupted by automation for decades to come, he would suggest air-traffic control. “That’s how well reform is going in this industry.” ■



空中延误

盘旋待降

空中交通管制问题多多。工会和其他既得利益者阻挠改革

乍看起来，位于偏远的马斯特里赫特机场（Maastricht）附近的这片工业区似乎与民航业的未来沾不上边。但这里坐落着马斯特里赫特高空空域管制中心（以下简称MUAC）。同一时间里有多达100名空中交通管制员在这里忙碌，以确保在比利时、卢森堡、荷兰以及德国西北部上空飞行的飞机不会相撞。该中心管控着欧洲最繁忙的空域之一，空管员们每天要引导1200架飞机穿过比利时一段夹在两个军事禁飞区之间、16公里的狭窄通道，不能有任何险情发生。

由政府间机构欧洲航空安全组织（以下简称Eurocontrol）于1972年创立的MUAC在世界上首开了国家间共享空管员的先河，并且仍然是独此一家。它是欧洲现代化程度最高、成本效益最高的控制中心之一，这在一定程度上得益于对技术的运用。例如，在MUAC，飞行员和空管员通过数字信息交流，速度比双向无线电通话快得多。“这里就是未来的样子。”MUAC的主管约翰·圣图尔巴诺（John Santurbano）微笑着说。然而并没有什么国家正在积极实现这样的未来，尽管在世界各地，日益严重的拥堵让航班延误和取消变得更加司空见惯。

MUAC的控制室远未普及。世界上大多数空管员仍然依赖二战时期的技
术。尽管使用全球定位卫星成本更低也更精准，但他们还在用雷达定位飞
机。信息交流是通过语音无线电而非数据传输器完成。并且，很难想象在
数字化时代，美国的空管员还在互传纸条来追踪飞机。而与此同时，雷达
捕捉不到、对语音信息又置若罔闻的小型无人机不仅数量激增，飞得也更
高了。

这样的空管系统跟不上需求。在世界各地，更繁忙的交通和吃紧的调控能
力使得航班延误和取消大幅增加。在美国，2012年至2017年间，由空管问

题导致的航班延误时长飙升了69%。2017年，中国每趟国内航班的平均延误时间飙升了50%，目前仍为15分钟。欧洲情况恶化的速度超过其他任何地方（见图表）。根据Eurocontrol的数据，去年因航路交通流量问题导致的航班延误时长增加了105%。航班延误有超过60%是因空管能力或人手不足引起，25%与天气有关，还有14%是由空管员及其他工作人员罢工所致。Eurocontrol的负责人埃蒙·布伦南（Eamonn Brennan）预计，今年的情况至少会和去年一样糟。

由此付出的代价是巨大的。Eurocontrol估计，去年因空中交通流量问题造成的航班延误和取消给欧洲经济带来的损失达176亿欧元（208亿美元），比2017年增长了28%。让飞机在空中盘旋或者绕飞都会浪费燃油，而根据爱丁堡大学的格雷厄姆·斯皮纳迪（Graham Spinardi）估算，更高效的空管系统可以为每架航班节省5%到10%的燃油。此外，多次发生险情也动摇了公众的信心。2017年，加拿大航空一架载有140人的喷气飞机误解了空管员的指令，险些降落在一条停有四架飞机的滑行道上。2016年，由于空管员的指令混淆了左右，长荣航空一架从洛杉矶起飞的飞机飞到了一座山峰边，非常危险。

而这恰恰是空管系统意图避免的。现行系统是在上世纪50年代一连串致命空中撞机事故发生后开发的。1956年，两架飞机在大峡谷上空相撞，机上128人全部遇难。很快，美国在1958年授权联邦航空管理局（以下简称FAA）管理国家领空的交通。其他国家随后也建立了自己的空中交通管制系统。

根据调研公司Markets and Markets的数据，空管服务的市场价值超过140亿美元。但有别于航空公司和机场，空管部门基本上仍由国家政府经营，少有例外。在欧盟28个成员国中，只有英国和意大利两国的空管服务有私人股东。

现行空管系统的缺陷在50年代就已经显现出来。1960年，英国、法国、德国，以及荷比卢三国建立了Eurocontrol，意在实现空域一体化。2001

年，欧盟将打造“欧洲单一天空”定为官方政策，希望以此提高效率，并通过规模经济节约资金。单一的空中交通监管机构可以根据交通流量而非国家边界把欧洲大陆划分成若干区域。

但是，自1960年以来，除了MUAC负责的一小块区域之外，其他地方几无进展。其中一个原因是英法两国出于军事原因希望保留各自的领空主权。但空管员们自己也持反对意见。去年10月，欧洲各国空管员工会的协调组织ATCEUC抨击了制定目标改进空管服务的想法，说那是“浪费时间和精力”。工会认为整合空管系统是为了暗中引进新技术，这将为航空公司和乘客省钱，但却会威胁空管员的饭碗。ATCEUC坚称“人必须依然是空管的核心”。此外，工会和各政客不希望单一的监管机构将高薪工作转移到劳动力相对低廉的东欧国家。

Eurocontrol的网络战略主管拉兹万·布库罗尤（Razvan Bucuroiu）表示，在无法充分整合各国空管系统的情况下，Eurocontrol正试图鼓励航空公司和各国空管机构将航班改道至不太繁忙的航线，以减少延误。随着今年4月伊斯坦布尔新机场的全面投用，该组织还重新设计了远至瑞典马尔默（Malmö）的航线。

但是，总部位于布鲁塞尔的航空业协会A4E的托马斯·雷纳特（Thomas Reynaert）解释说，这些措施也只能“止血一个夏天”。它们增加的空管能力将很快被日益增长的航空出行需求所抵消。而且这些新设计的航线越长，就越浪费飞机燃油。

因此欧盟正在改变策略。4月，它发布了一份报告，呼吁创建“数字欧洲天空”。它不再试图整合各国的空管系统，而将重点放在了降低成本上，例如设定统一的数字化标准，以确保各国投资建立相互兼容的系统。过去空管员被限定只能在一个地区工作，欧盟也将改革执业制度，鼓励他们到有需要的地方去。

由此可见，欧盟已经认识到整合空管服务并非灵丹妙药。毕竟，像美国和中国这两个和欧洲大陆一般大小的国家虽然都拥有单一的空管服务，也依

然经受着交通堵塞日益严重的压力。

在许多地方，因军事用途而关闭的领空让选择变得有限。根据咨询公司亚太航空中心（Centre for Asia Pacific Aviation）的数据，中国五分之四的领空留为军用。因此，开放给民航的狭窄通道就非常拥挤。英国的解决之道是只在空军演习期间才关闭军事空域，而不像欧洲其他国家和中国那样一直关闭。

政府直接运营空管系统也带来了问题。例如在美国，作为政府机构的FAA很容易受到国会削减预算的影响，并且不能通过贷款投资新技术来提高生产率。结果是，2017年加拿大每个飞行小时的管制成本比美国低近三分之一。加拿大航管公司（Nav Canada）是一家可以贷款的独立公司，它已经将纸质飞行进程单换成了电子版，并将这项技术授权给世界各地的其他空管系统。公有的属性还可能促使工会要求过高的薪资。2010年，西班牙政府发现至少有10名空管员的年薪超过81万欧元（110万美元）。如今，西班牙空管员的平均年薪超过20万欧元，是该国平均工资的七倍多，并且高于飞行员的收入。法国参议院财政委员会的一份报告显示，2004年至2016年间，好斗的法国空管员们总共罢工了近九个月，主要是为了支援其他国有部门的工人罢工。

尽管如此，航空公司认为单靠私有化并不能解决问题。欧洲最大的廉价航空公司瑞安航空（Ryanair）的肯尼·雅各布斯（Kenny Jacobs）指出，空管服务无论是否国有，都可能收费过高。例如，2017年MUAC的利润率为70%。瑞士咨询公司Aviation Advocacy的安德鲁·查尔顿（Andrew Charlton）认为，空管服务必须要相互竞争以降低成本。如果不同的私营公司拥有不同区域的特许经营权，它们就可以为航空公司提供具有竞争力的价格和服务来吸引航班。政府可以每五年或十年拍卖这些特许合约来鼓励竞争。

还没有什么地方走得这么远。不过一些国家已经将自己的空域管制外包。长期以来，澳大利亚、斐济和新西兰一直在为太平洋岛屿国家的政府管理空域。匈牙利高瞻远瞩的空管服务机构HungaroControl自2014年以来一直

为科索沃提供这项服务。它还是远程机场管制塔台的先行者，希望最终能利用匈牙利当地更廉价的劳动力，从位于布达佩斯的总部向其他机场提供管制塔台服务。

尽管如此，如果没有更大的政治决心，不太可能出现真正的变革，让每年夏季数以百万计的假期不再被空管失灵毁掉，日内瓦智库ATM政策研究所（ATM Policy Institute）的大卫·麦克米伦（David McMillan）表示。欧盟官员私下承认，短期内他们对按照Eurocontrol最初的意图整合空管服务不抱希望。同样，在美国，一项仿照其他国家、将FAA的空管服务剥离为一个独立实体的初步提案去年在国会搁浅。尽管这些提议受到大型航空公司、机场和空管员工会的支持，却遭到了商务航空游说团体的反对，他们担心私人飞机最终可能被迫缴纳空管服务费，而目前这笔费用由美国的纳税人买单。

因此，回到马斯特里赫特的MUAC，圣图尔巴诺开玩笑说，如果今天要他指点一位年轻人怎么找到一份薪水高、未来几十年内又不大会被自动化淘汰的工作，他会建议去空管部门。“我们这一行的改革就是这么成功。” ■



China and Africa

Beijing curbs its enthusiasm

China's lending to Africa is starting to mirror the West's

FOR TEN days in May Uhuru Kenyatta, Kenya's president, vanished from view. Kenyans feigned concern on Twitter, using the hashtag #FindPresidentUhuru. A missing-person poster appealed for information on the whereabouts of a five-foot-eight African male last seen in Beijing. A government spokeswoman sought to reassure the public: Mr Kenyatta had been in his office "meditating". But others speculate that the president was in a funk after his trip to China failed to yield a new loan for the next phase of Kenya's ambitious \$10bn railway.

Mr Kenyatta could be forgiven for feeling piqued. Beijing's largesse to Africa has sometimes seemed limitless (see chart). In September China promised another \$60bn in aid and loans to the continent. Xi Jinping, its president, promised the money would come with "no political strings attached". John Magufuli, Tanzania's strongman president, was delighted. The West, he griped, made its money dependent on "strange conditions", such as insisting that Tanzania should not lock up gay men. "China is a true friend," he enthused. Its assistance comes "free of charge".

Being chummy with China has served Tanzania well. It has received more than \$2bn in loans since 2010, reckons the China-Africa Research Initiative at Johns Hopkins University. In 2013 China agreed to finance and build a \$10bn port in Bagamoyo, once a big slave- and ivory-trading entrepôt but now a sleepy fishing village.

Kenya has done even better. It was an early African member of the Belt and Road Initiative, China's global infrastructure project. It scooped up at least

\$9.8bn between 2006 and 2017, making it Africa's third-largest recipient of Chinese loans.

Mr Kenyatta must have reckoned that his railway project, on which he has staked much political capital, was due another cut of Mr Xi's cash. Not only has it been one of China's highest-profile projects in Africa, but Beijing has already doled out \$4.7bn to finance its first two sections. An almost 500km stretch between the port of Mombasa and the capital, Nairobi, is up and running. The second is nearly completed. Kenya had assumed that China would fork out the \$3.5bn needed for the penultimate section, to Kisumu on Lake Victoria. If China's ultimate vision was a railway network connecting resource-rich inland states to Indian Ocean ports, why stop funding the project halfway through?

Some Africans suspect that China deliberately lends countries more than they can repay in order to seize strategic assets when they default. They point to the Chinese-financed port at Hambantota in Sri Lanka. After the project flopped commercially, a Chinese state-owned firm took control. Hambantota would be a handy place to park Chinese naval vessels seeking to patrol the Indian Ocean. "The situation that Sri Lanka got itself into may not turn out to be unusual," says Mutula Kilonzo, a prominent Kenyan senator. "It is going to happen to African countries, too. The conditions of many loans are...a debt trap."

Deborah Brautigam at Johns Hopkins argues that Hambantota is an exception. She looked at more than 3,000 projects overseas financed by China, and found that it was the only example of such an asset being seized to cover a debt.

Nonetheless, African leaders are spooked. Dialogue with the Chinese is becoming edgier. On June 7th Mr Magufuli indefinitely suspended construction at Bagamoyo, balking at demands from the project's Chinese

partner for a 99-year lease and a ban on port development elsewhere in Tanzania. Moving smoothly from cheerleader to critic, he accused the firm of setting “tough conditions that can only be accepted by mad people”. Last year Sierra Leone scrapped a Chinese-funded project to build a new international airport for fear that it would involve too much debt.

The perception of a plot to turn the Indian Ocean into a Chinese lake endangers the political capital China has amassed in Africa. Since Mr Kenyatta came to power in 2013, public debt has nearly tripled. Last year the IMF raised the country’s risk of debt distress from low to moderate. If Kenya defaults, China risks being blamed.

China’s hesitation also reflects the uneven performance of past projects. A railway between Djibouti and Addis Ababa, completed in 2017, cost China’s state-owned insurer Sinosure \$1bn in losses, its chief economist said last year. Corruption and mismanagement drive up costs. Sometimes plans smack of unreasonable optimism. Bagamoyo’s port was expected to handle more containers than Rotterdam, Europe’s biggest freight terminal.

Kenya’s railway has had its critics from the outset. Corruption made it a ludicrously expensive venture, costing twice the international average per kilometre of track. The railway’s freight-carrying capacity was miscalculated and has proved to be only 40% of what was predicted. It was meant to be cheaper to ship goods up the line than send them by road. Even though the opposite has proved true, Mr Kenyatta’s government has forced all containers coming out of the port onto the railway. Hapless traders in Mombasa have to pay for goods arriving by sea to be sent to Nairobi and back again as a result. China seems to have belatedly realised that throwing good money after bad would be an error.

So it is embracing caution instead. When Mr Kenyatta and his delegation arrived in Beijing in May, they were treated to an unfamiliar experience,

according to a presidential adviser. The Kenyans were questioned not only about their sums, but about corruption. Mr Kenyatta was asked how he would afford a census and a referendum on constitutional change. The Chinese even wanted to know if he planned to stand for office again (he is obliged to stand down in 2022). “It was like talking to the World Bank,” grumbled another aide.

Mr Kenyatta did not return from Beijing empty-handed. He agreed to export avocados to China and won funds for a data centre and a road connecting Nairobi’s suburbs to its airport. Such laudably modest deals should be celebrated. Mr Xi might not be about to champion human rights, but China’s shift closer to Western lending standards is a step in the right direction. ■■



中国和非洲

克制热情

中国对非洲的贷款开始效仿西方

五月，肯尼亚总统乌胡鲁·肯雅塔从人们的视野里消失了10天。肯尼亚人在推特上用“#寻找总统乌胡鲁”的话题标签佯装关注。一则寻人启事呼吁大家提供线索，寻找一位身高5英尺8英寸的非洲男子的下落，他最后一次出现在北京。一位政府发言人试图安抚公众，说肯雅塔一直在办公室里“沉思”。但其他人猜测总统访华后陷入了恐慌，因为他没能为肯尼亚雄心勃勃、投资100亿美元的铁路项目的下一阶段拿到新贷款。

肯雅塔受到打击也情有可原。北京对非洲的慷慨有时候好像无穷无尽（见图表）。去年9月，中国承诺再向非洲提供600亿美元的援助和贷款。国家主席习近平承诺说这些钱“不附加任何政治条件”。坦桑尼亚的铁腕总统约翰·马古富力（John Magufuli）很高兴。他抱怨说，西方的援助总是附带一些“奇怪的条件”，比如坚持认为坦桑尼亚不应该关押男同性恋。“中国是真朋友。”他热切地说道。它的帮助是“无偿的”。

同中国搞好关系让坦桑尼亚受益匪浅。约翰·霍普金斯大学的中非研究所（China-Africa Research Initiative）估计，自2010年以来，坦桑尼亚已获得超过20亿美元的中国贷款。2013年，中国同意为投资100亿美元的巴加莫约港（Bagamoyo）提供融资并负责建设。巴加莫约曾是一个奴隶和象牙贸易的大转口港，如今是个沉寂的渔村。

肯尼亚受益就更多了。它是较早参与中国全球基础设施项目“一带一路”的非洲国家。2006年至2017年期间，它至少吸收了98亿美元的中国贷款，在非洲国家中排第三位。

肯雅塔此前肯定以为，他在铁路项目上押注了很多政治资本，理应从习近平的资金中再分一杯羹。这条铁路是中国在非洲最引人注目的项目之一，

而且中国政府已拨出47亿美元为项目的前两期提供融资。蒙巴萨港和肯尼亚首都内罗毕之间近五百公里的铁路段已经开通运行。第二段接近完工。肯尼亚原以为中国会为到维多利亚湖（Lake Victoria）畔的基苏木（Kisumu）的倒数第二段铁路提供35亿美元。如果中国的最终愿景是建设一个连接资源丰富的非洲内陆各国和印度洋港口的铁路网，为什么要中途停止资助该项目呢？

有些非洲人怀疑，中国故意向一些国家提供超出其偿还能力的贷款，目的是在这些国家违约时夺取它们的战略资产。他们以位于斯里兰卡由中国融资的汉班托塔港（Hambantota）为例。该项目在商业上失败后，一家中国国有企业取得了控制权。汉班托塔可以成为中国海军舰艇在印度洋巡逻时一个便利的停泊点。“斯里兰卡陷入的这种状况可能不会是什么特例。”肯尼亚著名的参议员穆图拉·基隆佐（Mutula Kilonzo）说。“它也会在非洲国家发生。许多贷款的条件是……债务陷阱。”

约翰霍普金斯大学的黛博拉·布罗蒂加姆（Deborah Brautigam）则认为汉班托塔只是一个个案。她研究了三千多个由中国融资的海外项目，发现这是唯一一个这类资产被没收以偿还债务的例子。

但非洲领导人还是大为惊慌。与中国对话的气氛越来越紧张。6月7日，马古富力无限期地暂停了巴加莫约的建设，拒绝了该项目的中方合作伙伴提出的99年租约以及禁止在坦桑尼亚其他地方开发港口的要求。他转换自如地从拉拉队队员瞬间变成了批评者，指责该公司提出了“只有疯子才能接受的苛刻条件”。去年，塞拉利昂取消了一个由中国资助建设的新国际机场项目，担心这会带来太多债务。

认为中国密谋将印度洋变成中国内湖的想法让中国在非洲积累的政治资本受到了威胁。自肯雅塔2013年上台以来，肯尼亚的公共债务几乎增加了两倍。去年，国际货币基金组织将该国的债务危机风险从低提升到中等。如果肯尼亚违约，中国可能面临指责。

中国的犹豫也反映出之前项目的表现不均衡。吉布提和亚的斯亚贝巴之间

的一条铁路于2017年完工，中国国有保险公司中国信保的首席经济学家去年表示，这条铁路给公司造成了10亿美元的亏损。腐败和管理不善抬高了成本。有时计划带有不切实际的乐观主义色彩。之前预计巴加莫约港的集装箱吞吐量会超过欧洲最大的货运港口鹿特丹。

肯尼亚的铁路从一开始就不乏批评声音。腐败让它成了一项极其昂贵的冒险，每公里轨道的成本是国际平均水平的两倍。铁路的货运能力计算有误，实际运量仅为预计的40%。本来用这条铁路运货应该比用公路便宜，结果却相反。尽管如此，肯雅塔政府强迫所有离港集装箱经由铁路运输。倒霉的蒙巴萨贸易商不得不为此买单，包括海运过来、发往内罗毕的货物以及原路返回的货物。中国似乎迟迟才意识到往糟糕的押注上砸钱是个错误。

所以中国转而采取谨慎的态度。总统的一位顾问表示，肯雅塔及其代表团5月抵达北京后的经历不同以往。肯尼亚人不仅被问到钱的问题，还被问到腐败问题。肯雅塔被问及如何负担人口普查和修宪公投的费用。中国人甚至想知道他是否打算再次参选（他应当在2022年卸任）。“就跟和世界银行对话似的。”另一位助手抱怨道。

肯雅塔并没有从北京空手而归。他同意向中国出口牛油果，并为一个数据中心和一条连接内罗毕的郊区和机场的公路赢得了资金。这样小规模的交易值得称道，可喜可贺。习近平可能无意倡导人权，但中国向西方贷款标准靠拢是朝着正确方向迈出的一步。 ■



Bartleby

The promotion curse

Updating the Peter principle

IS YOUR PROMOTION really necessary? Many workers focus their hopes on climbing the hierarchy of their organisations. The prospect of higher pay helps explain their ambition, but so does the greater status that comes with each successive title.

This scramble can often end in disappointment. The Peter principle, developed by Laurence Peter for a book published in 1969, states that workers get promoted until they reach their level of incompetence. It makes perfect sense. If you are good at your job, you rise up the career ladder. Eventually, there will be a job you are not good at and at that point your career will stall. The logical corollary is that any senior staff members who have been in their job for an extended period are incompetent.

There is another problem with chasing the promotion chimera. In a recent article for VoxEU, an online portal, the records of almost 40,000 salespeople across 131 firms were studied by Alan Benson, Danielle Li and Kelly Shue. They found that companies have a strong tendency to promote the best sales people. Convincing others to buy goods and services is a useful skill, requiring charisma and persistence. But, as the authors point out, these are not the same capabilities as the strategic planning and administrative competence needed to lead a sales team.

The research then looked at what happened after these super-salespeople were promoted. Their previous sales performance was actually a negative indicator of managerial success. The sales growth of workers assigned to the star sellers was 7.5 percentage points lower than for those whose managers

were previously weaker performers.

Scott Adams, the cartoonist, described this problem in his book, "The Dilbert Principle". In his world, the least competent people get promoted because these are the people you don't want to do the actual work. It is foolish to promote the best salesperson or computer programmer to a management role, since the company will then be deprived of unique skills. That is how the workers in the Dilbert cartoon strip end up being managed by the clueless "pointy-haired boss".

Bartleby is not an expert at climbing the greasy pole. When he was last promoted, Iraq had yet to be invaded. In part, that is because he has observed a variant on the Peter and Dilbert principles; what might be dubbed the Bartleby curse. People get promoted until they reach a level when they stop enjoying their jobs. At this point, it is not just their competence that is affected; it is their happiness as well.

The trick to avoiding this curse is to stick to what you like doing. If you enjoy teaching, don't be a headmaster or college principal. If you like writing articles and columns, editing other people's work (let alone conducting career reviews) may not give you the same degree of satisfaction.

Another problem with pursuing frequent promotions is that it turns you into a supplicant, endlessly in search of favourable feedback from the higher-ups. This can lead you to lose control of your work-life balance. In Charles Handy's new book, "21 Letters On Life And Its Challenges", the veteran management theorist recalls an epiphany when working for Royal Dutch Shell, an oil giant. "In exchange for the promise of financial security and guaranteed work, I had sold my time to complete strangers with my permission for them to use that time for their own purposes," he writes.

The higher up the ladder you go, the greater the demands are likely to be on

your time. The chief executive will expect you to be available at weekends; after all, that is why you get paid the big bucks. Subordinates will also feel that they are able to ask you tricky questions whenever they arise; they don't want to take decisions that are above their pay grade. If you are in charge of a geographical region, you may spend much of your time on planes, visiting the corporate troops. And when you are not travelling, your day will be filled with meetings. At the end of the day, you will have been extremely busy, but with a nagging feeling that you have achieved nothing of substance.

So that shiny promotion may not be for everyone. Beware the curse of overwork and dissatisfaction. Some people like to devote their whole lives to their job and be at the centre of events. It is best to let them get on with it.

* “Promotions and the Peter principle”, <https://voxeu.org/article/promotions-and-peter-principle> ■



巴托比

升职的诅咒

彼得原理升级版

你真的有必要升职吗？许多员工把自己的希望都寄托在沿着组织层级往上爬上。这种雄心壮志背后的动力既有更高的薪水，也有每登一级带来的更高地位。

向上爬的结果却可能常常叫人失望。劳伦斯·彼得（Laurence Peter）在他1969年出版的一本书中提出了“彼得原理”（Peter principle）：员工往往会一直晋升，直到抵达他不能胜任的位置。这很有道理。如果你擅长你的工作，你就会在职业阶梯上步步高升。最终，总会有一份工作是你不擅长的，到那时你的事业就会停滞不前。由此可以顺理成章地推论，任何在现任职务上干得太久的高级员工都是不称职的。

追逐“升职幻像”还有个问题。门户网站VoxEU上最近发表了一篇文章，艾伦·本森（Alan Benson）、丹妮尔·李（Danielle Li）和凯利·舒（Kelly Shue）研究了131家公司近四万名销售人员的升职记录。他们发现公司非常倾向于提拔最好的销售人员。说服他人购买商品和服务是一项有用的技能，需要个人魅力和毅力。但是，正如作者所指出的，这些能力与领导销售团队所需的战略规划和管理能力并不相同。

该研究进而观察这些超级销售员升职后的情况。他们之前的销售业绩实际上成了管理业绩的反向指标。与那些被提拔前销售业绩较差的经理相比，明星销售员领导的下属的销售增长低了7.5个百分点。

漫画家斯科特·亚当斯（Scott Adams）在他的《呆伯特职场定律》（The Dilbert Principle）里就描绘了这个问题。在他的世界里，最没能力的人得到提升，因为你不想那些人做实际工作。把最好的销售人员或电脑程序员提升到管理岗位是愚蠢的，因为这样公司就会损失掉独特的技能。结果，呆伯特连环画里的员工们最终被一个一无所知的老板管理着。这位老板是

个秃顶，但脑袋两边留有尖尖竖起的两撮头发，就像恶魔的双角。

本专栏作者自己并不擅长往上爬。他上次升职时，伊拉克还没被入侵。在某种程度上，这是因为他观察到了彼得原理和呆伯特法则的一种变体，或许可以称之为“巴托比诅咒”。人们会一直晋升到他们不再享受工作时为止。到了这个点上，受影响的不只是他们的能力，还有他们的幸福感。

避开这种诅咒的诀窍是坚持做你喜欢做的事。如果你喜欢教书，就不要当校长。如果你喜欢写文章和专栏，编辑别人写的东西（更不用说给作者提供职业评估和建议了）可能给不了你同样的满足感。

追求频繁升职的另一个问题是，它会把你变成一个乞求者，无休止地寻求上级的积极反馈。这会让你失去对保持工作和生活平衡的控制。在查尔斯·汉迪（Charles Handy）的新书《21封信谈人生及其挑战》（21 Letters On Life And Its Challenges）中，这位管理思想大师回忆了自己在为石油巨头荷兰皇家壳牌工作时的一次顿悟。他写道：“为了换取对经济保障和工作稳定的承诺，我把时间卖给了彻头彻尾的陌生人，允许他们为了自己的目的随心所欲地使用我的时间。”

你在梯子上爬得越高，对你的时间的索取通常就越多。首席执行官会希望你周末有空忙忙工作——毕竟这是你能拿高薪的原因。下属也会觉得无论何时出现棘手的问题，他们都能请示你——他们不想做出超出自己工资水平的决定。如果你是一个区域主管，你可能会花很多时间在飞机上，到处视察公司的队伍。不出差的时候，你在开各种会。你一刻不停地忙了一整天，到了晚上，那种不愉快的感觉又来了：你没有取得任何实质性成果。

所以，光鲜的晋升可能并不适合所有人。小心超负荷工作和心情不愉快的诅咒。有些人喜欢把自己的全部生活奉献给工作，喜欢待在各种会议、活动的中心区域。最好让他们接着干下去。

* 《升职和彼得原理》，<https://voxeu.org/article/promotions-and-peter-principle> ■



Blackstone

Alternative reality

The world's biggest buy-out firm is not done growing, says its boss. Can it keep doing so profitably?

WHEN BUY-OUT firms first came to prominence in the 1980s, they were seen as wolves in fine Italian wool. Private-equity (PE) companies won a reputation for devouring companies, which they loaded with debt, stripped of assets and rid of workers. All to make a killing for their millionaire investors—and themselves.

In the past 30 years the industry has softened its image while maintaining a red-bloodedly capitalist devotion to returns. PE firms have diversified into a wider array of assets, from commercial property to corporate debt; anything not traded in public markets is fair game. They have also grown a bit cuddlier, collaborating with their targets rather than consuming them—and considerably bigger.

None more so than Blackstone, the world's largest "alternative asset manager", as it now calls itself. It manages \$512bn in assets, as much as Apollo and Carlyle, its two nearest rivals, combined (see chart). Its funds have chalked up internal rates of return (a measure of performance) of 15% since the 1990s. Companies it controls employ around 400,000 workers, about as many as Kroger supermarkets and more than IBM. Since Blackstone listed its own shares in 2007 it has created around \$41bn in value for shareholders.

Blackstone's ambitions, as its top brass tell it, do not stop there. "The old model of buying a slow-growth company, adding leverage and selling assets is dead," says Stephen Schwarzman, its boss. The new vision that emerges

from a series of interviews with *The Economist* is of a firm that wants to dominate alternative investments much as publicly traded ones are dominated by BlackRock, whose \$6trn in assets under management make it the biggest asset manager ever (and which was spun out of Blackstone in 1994). In its quest to stand among the giants of Wall Street, Blackstone is also becoming a more normal company. Can it preserve its abnormal profits?

Blackstone was founded in 1985 by Mr Schwarzman and Peter Peterson (who died last year, aged 91). On July 1st Mr Schwarzman, a 72-year-old with a penchant for pinstripes and a knack for networking, oversaw the biggest change to its structure since it floated on the New York Stock Exchange a dozen years ago.

Like many buy-out groups, however, Blackstone has maintained a complicated partnership structure. The principal reason, predictably, is tax. Partnerships, in theory, pay the American taxman little or nothing. Their shareholders do: they are subject to a capital-gains levy of up to 23.8% on distributed earnings. This was of enormous value at a time when corporate profits were taxed at 35%. But then, last year, President Donald Trump's tax reform took effect, cutting the corporate rate to just 21%.

Just as the benefits of partnerships have diminished, their costs have grown. The biggest is exclusion from equity indices, which are confined to funds invested in corporations. This put PE companies out of bounds for many big mutual funds. Of the \$12trn deployed by American mutual and exchange-traded funds, just \$4.5trn could be invested in partnerships. Many managers of the remaining \$7.5trn would like a chance to do so: since Blackstone announced it would convert to a corporation in mid-April, its share price has risen by 24%, during which time the S&P 500 index has only risen 0.5%, adding \$11bn to its market capitalisation. Ares, a mid-sized PE firm, was the first to turn its partnership into a corporation in March last year. KKR did so last July. Mr Schwarzman confesses that Blackstone might have been better

off making the switch sooner.

Imminent incorporation has prompted investors to take a second look at Blackstone, says Michael Chae, the firm's chief financial officer. There is plenty to like. Blackstone has pushed into a wider range of asset types, starting with property in 1991. Today property accounts for one-third of its managed assets, as much as traditional PE. Most of the rest is spread across GSO, a private-credit business that the firm acquired in 2009, and a fund-of-funds operation that invests in a selection of hedge funds. Lastly, Blackstone has launched funds to invest in biotechnology firms and is offering insurers funds tailored to their desired return profile.

A greater number of funds has allowed Blackstone to finance bigger deals. In June two of its funds joined forces to buy 179m square feet (16.6m square metres) of warehouse space for e-commerce. A greater variety, meanwhile, means it can offer investors a bigger choice of time horizons. The lifetime of a typical PE fund is around a decade: the firm will deploy capital over five years and hold on to its investments roughly as long. Blackstone now offers property funds that invest over 20 or 30 years. In 2015 it paid \$5.3bn for an apartment complex in New York on the condition, demanded by City Hall, that it does not sell it for a few decades. Some Blackstone funds hold capital in perpetuity.

These innovations have served Blackstone rather well, reckons Craig Siegenthaler of Credit Suisse, a bank. So well, in fact, that others are apeing it. Apollo, Carlyle and KKR all now invest in more asset classes. Half the capital managed by Apollo is now held in perpetuity—meaning only the returns earned will be given back to investors, not their initial investment.

Blackstone's early-mover advantage positions it well for what analysts see as a period of growth for the industry as a whole. An analysis published in March by Morgan Stanley, an investment bank, and Oliver Wyman, a

consultancy, forecasts that alternative investments will rise from 7% of all assets in 2018 to 9% by 2023. Assume that the overall stock of assets will grow by 5% a year—possible if the world avoids a full-blown trade war or other economic shock—and total investments in private markets, like those offered by Blackstone, would rise from \$5.6trn to \$9.5trn.

In a world of low returns, where passive funds by definition do no better than the market and active managers do so less often than they like to think, alternatives look alluring. Mr Schwarzman boasts that Blackstone's best funds have historically recorded double the return of a typical index fund—as well they should given how, unlike liquid stockmarket funds, they lock up investors' money for a decade or more.

The analysis by Morgan Stanley and Oliver Wyman found that PE returned on average 6.2 percentage points a year more than a global public-equity index from 1997 to 2016. For the top half of funds the figure was 13.2 percentage points, even after factoring in the high fees. Private credit outperformed a high-yield credit index by a similar margin.

Whether it can keep this up is another matter. Academic studies find smaller differences, especially of late. Performance is down from the lofty heights at the turn of the century. Even buy-out advocates doubt double-digit returns can come back.

Retail investors, the super-rich and insurers, who currently keep just 1-5% of their portfolios in non-traditional assets, could nevertheless be persuaded to funnel more, given the opportunity. So could pension funds, which need returns of 7-8% to keep their promises to future pensioners, and have around 10% of their money stored in such investments, less than sovereign-wealth funds (15%) or endowments (25%).

But the competition for that money—and the assets it pays for—is heating

up. And not just among Blackstone's old rivals. In April BlackRock raised \$2.8bn for a new PE fund that charges a 1% management fee and a 10% performance fee. It hopes to raise \$12bn. On June 23rd the *Wall Street Journal* reported that Vanguard, the world's second-biggest asset manager, is in talks to launch something similar. Goldman Sachs, an investment bank, has recently consolidated its own alternatives arm.

Mr Schwarzman welcomes the competition. "Capital should be drawn to sources of higher performance," he declares. Blackstone's president, Jon Gray, points to traditional asset managers' mixed success in the PE realm. Despite its lower fees, BlackRock's PE venture did not manage to close its fund last year, as planned. Expertise in private markets takes time to build, Mr Gray says. So does firepower. Blackstone has managed to raise \$238bn over the past two years—almost doubling its assets under management. It has \$133bn in cash ready to spend. This much "dry powder" is useful when markets tumble—as sooner or later they will—and cheap assets abound but new money to buy them does not.

Whether Mr Schwarzman joins the likes of John Pierpont Morgan, Marcus Goldman or Samuel Sachs in the Wall Street pantheon will be determined by how he handles two transitions. The first is the imminent one from partnership to corporation. This will require the financier to relax his lockjaw on the company, now that the firm will be held by a wider range of shareholders—while maintaining the discipline that has prevented Blackstone from blowing its money at the top of the cycle.

The second transition will be from Mr Schwarzman to his successor, probably Mr Gray. Mr Schwarzman says he has no plans to retire anytime soon. But the longer he stays in charge, the louder the question of whether his firm's success can outlive him. Mr Gray says that Mr Schwarzman has built an investment firm that rivals Wall Street greats. When the time comes, Mr Schwarzman would be wise to let him prove it. ■ ■



黑石

另类现实

全球最大并购公司的老板说公司还在扩张。它能继续盈利吗？

当收购型企业在上世纪80年代崭露头角时，它们被视为披着最漂亮羊皮的狼。私募股权公司因为惯于吞噬其他公司而闻名，它们让对方负债累累，剥夺其资产，解雇其员工。所有这一切都是为了让它们腰缠万贯的投资者和自己大发其财。

过去30年里，这个行业在保持资本家疯狂逐利的本色的同时，已经柔化了自己的形象。私募股权公司的投资更加多元化，广泛涉足从商业地产到公司债等各类资产；只要不在上市交易范围之列的都是它们的目标。通过与目标公司合作，而不是榨干对方，它们也多了些亲和力——而且自身也壮大了很多。

其中最具代表性的莫过于全球最大的私募股权公司黑石（Blackstone）。自称“另类资产管理公司”的黑石目前管理的资产达5120亿美元，相当于规模仅次于它的两家竞争对手阿波罗（Apollo）和凯雷（Carlyle）的总和（见图表）。自上世纪90年代以来，黑石基金的内部回报率（一种业绩衡量指标）已达15%。它控股的公司共雇有约40万名员工，与克罗格超市（Kroger）差不多，超过了IBM。自2007年上市以来，黑石自己为其股东创造了约410亿美元的价值。

正如其高层所言，黑石的宏图不限于此。“收购增长缓慢的公司、加杠杆和出售资产这套旧模式已死。”老板苏世民（Stephen Schwarzman）表示。在本刊一系列采访中，黑石展现的新愿景是成为另类投资领域的主导者，就像贝莱德（BlackRock）主导上市交易投资那样。1994年脱胎于黑石的贝莱德如今管理着6万亿美元的资产，是全球最大的资产管理公司。为跻身华尔街巨头之列，黑石也在向着一家更常规的公司转型。它能保住不同寻常的高利润吗？

黑石于1985年由苏世民和彼得·彼得森（Peter Peterson，已于去年去世，享年91岁）创建。现年72岁的苏世民对细条纹衣服情有独钟，擅长人际交往。在他的管理下，黑石于7月1日改变公司结构，这是公司自12年前在纽交所上市以来最大的一次变革。

和许多并购型集团一样，黑石一直都采用复杂的合伙制结构。可想而知这主要是出于税收的原因。从理论上说，美国的合伙制企业缴税很少，甚至不缴税。缴税的是它们的股东：他们必须为分得的收益缴纳最高23.8%的资本利得税。在企业所得税为35%的时候，这省下了一大笔钱。但是，去年特朗普的税改生效后，企业所得税下降到仅为21%。

在合伙制企业的好处减少之时，代价却增加了。其中最大的代价就是被排除在股票指数之外，因为股票指数只包含投资公司制企业的基金。这使得私募股权公司被许多大型共同基金拒之门外。在美国共同基金和交易所交易基金配置的12万亿美元中，只有4.5万亿美元可以投资于合伙制企业。剩余7.5万亿美元的基金管理机构有许多都希望能有机会投资合伙制企业：自黑石在4月中旬宣布即将转为公司制以来，其股价已经上涨了24%，使其市值增加了110亿美元；而在此期间标普500指数仅上涨了0.5%。中等规模的私募公司锐盛（Ares）于去年3月率先从合伙制转变为公司制。KKR在去年7月改制。苏世民承认，黑石如果更早改制的话，情况可能还会更好。

黑石的首席财务官蔡洙贤（Michael Chae）表示，即将到来的改制已经促使投资者重新审视黑石。黑石有很多值得称道之处。从1991年进军房地产业开始，它已经涉足了更广泛的资产类型。如今，房地产已经占到其管理资产的三分之一，与传统的私募股权份额相当。剩余的资产大部分分布于GSO和“基金的基金”（FOF）业务上。前者是黑石在2009年收购的私人信贷公司，后者则有选择性地投资一些对冲基金。最后，黑石推出了投资生物技术公司的基金，并且正在向保险公司提供根据其期望回报率打造的基金。

更多的基金使黑石得以投资更大的交易。6月，它的两只基金联手购买了

1660万平方米的仓库用于电子商务。同时，更多样的资产让它可以向投资者提供更多投资期限的选择。一只私募基金的寿命通常为十年左右，用五年多的时间配置资本，用另外五年左右时间持有投资。黑石目前提供投资期限超过20或30年的房地产基金。2015年，它斥资53亿美元买下了纽约的一片公寓区，市政厅提出的条件是几十年内不得出售。一些黑石基金永久持有资本。

瑞士信贷银行的克雷格·西根塔勒（Craig Siegenthaler）认为，这些创新措施让黑石受益颇多。成效之佳引来其他公司纷纷仿效。阿波罗、凯雷和KKR现在都在投资更多的资产类别。目前阿波罗管理的资产中有一半是永久持有的，也就是说只有赚得的收益会被返还给投资者，他们最初的投资款不会返还。

黑石的先发优势使它能很好地利用分析师所说的整个行业的增长期。投资银行摩根士丹利和咨询公司奥纬咨询（Oliver Wyman）3月发布的一份分析报告预测，另类投资在总资产中的占比将从2018年的7%升至2023年的9%。如果世界能避免贸易战的全面爆发或其他经济冲击，就有可能实现总资产存量以每年5%的速度增长，这种情况下黑石等在私募市场的总投资将从5.6万亿美元升至9.5万亿美元。

被动型基金顾名思义表现不会好过大市，而主动型投资经理们又不像他们自己想的那样能经常跑赢市场——在这样低回报率的世界里，另类基金看起来很诱人。苏世民自豪地表示，黑石表现最好的基金的历史回报率是一般指数基金的两倍。它们也理应如此——不同于容易变现的股票型基金，这些基金将投资者的资金锁定十年或更久。

摩根士丹利和奥纬咨询的分析发现，从1997年到2016年，私募股权基金的平均年回报率比全球公开上市股票指数高出6.2个百分点。而对于回报率前50%的私募基金来说，即使把高额收费考虑进去，这一数字也达到了13.2个百分点。私募债权的回报超出高收益信贷指数的幅度也与此相当。

私募基金能否保持这一势头却是另一回事。学术研究发现差距在变小，特

别是在近期。私募基金的表现在世纪之交达到高峰后便开始下滑。就连全面收购的支持者也怀疑两位数的回报率能否重现。

尽管如此，一旦有机会，散户投资者、超级富豪和保险公司仍可能被说服把更多资金投入到非传统资产上。目前，非传统资产在他们投资组合中的占比只有1%到5%。养老基金可能也是如此。养老基金需要7%到8%的回报率才能兑现对未来养老金领取者的承诺。目前它们约有10%的资金放在这类投资中，低于主权财富基金15%或捐赠基金25%的比例。

但是，争夺这些资金以及可投资资产的竞争日益激烈。这不仅仅发生在黑石和它的老对手之间。4月，贝莱德为一只新的私募基金募集了28亿美元，该基金收取1%的管理费和10%的业绩提成。它希望募资120亿美元。6月23日，据《华尔街日报》报道，世界第二大资产管理公司Vanguard正在讨论推出类似的产品。投资银行高盛最近合并了旗下数个另类资产投资部门。

苏世民对竞争持欢迎态度。他宣称：“资本应该被吸引到业绩更好的地方。”黑石的总裁乔恩·格雷（Jon Gray）指出，传统资产管理公司在私募领域有输有赢。贝莱德的私募项目虽然收费较低，去年还是没能按计划完成基金募资。格雷表示，私募市场的专业技能需要时间来培养，资金的积累也一样。过去两年，黑石成功募集到2380亿美元，几乎是它所管理资产的一倍。它有1330亿美元的现金可供使用。当市场崩盘时——这迟早会发生——廉价资产会大量出现，却没那么多新资金来购买它们，此时这些“干火药”储备就派上了用场。

苏世民是否能跻身约翰·皮尔庞特·摩根（John Pierpont Morgan）、马库斯·戈德曼（Marcus Goldman）或塞缪尔·萨克斯（Samuel Sachs）等华尔街名流之列，将取决于他如何处理两次转型。首先是眼前从合伙制到公司制的转型。这将要求这位金融家放松对公司的管控——因为公司将由更广泛的股东持有，同时又保持让公司免于在周期顶峰时大肆挥霍的那种纪律。

然后是从苏世民到其继任者（很可能是格雷）的转换。苏世民说自己没有

在近期退休的打算。但是他掌权的时间越长，对于他退位后黑石能否依然成功的质疑声就越大。格雷说苏世民已经建立了一家可与华尔街巨擘抗衡的投资公司。当时机来临时，苏世民最好让格雷来证明这一点。 ■



Residential property

As safe as houses

Our model finds that prices are likely to keep rising in the short run

INVESTORS FOCUS on shares and bonds, but one asset class is bigger than the two combined. Put together, the world's homes are worth over \$200trn. House prices are crucial harbingers of economic trends: the last time they fell across the rich world, it set off the deepest downturn in decades.

Ten years have passed since the Great Recession, and home values have made back most of their losses. In Canada and New Zealand they are 40% above the pre-crisis peak. Does another crash loom?

None of the main international institutions, such as the IMF or OECD, includes residential property in its standard battery of economic forecasts. That may be because home values depend on local factors. However, *The Economist* has kept a database of house prices for decades, using figures from the OECD and national agencies. And even an inexact forecast provides more insight than no forecast at all. As a result, we have designed a model to predict changes in real home values at the national level.

Our system relies on three types of data. First come economic figures such as GDP growth and interest rates. Next are market fundamentals, like the ratios of home prices to rents and incomes. Last come historical prices, to take into account momentum and mean reversion.

The impact of each of these variables often depends on the others. To combine them, we used a machine-learning algorithm called a random forest. This method creates a “forest” of “decision trees”, each containing a series of yes/no choices such as “Has GDP been rising?” or “Are price-to-rent

ratios below the long-run average?", and averages the output of each tree.

The model fares well in back-testing. On average, its forecasts with 18 months' lead time came within three percentage points of actual yearly price changes. These errors are larger during booms or busts—but still small enough for the model to be useful.

For example, in the year to March 2006 American house prices rose by 8%. Our model expected growth would slow to 0.3% in the year to September 2007. That was too sanguine: prices actually fell by 4.7%. But it still would have served as an early warning.

According to our model, conditions today are not similar to those of 2006. Across ten countries, the average of its median estimates for the year to June 2020 is an appreciation of 2.3%. The model does not rule out a downturn: there is a one-in-seven chance that Italian prices will fall by at least 5%. But the most likely scenario is that the rally has room left to run. ■ ■



住宅地产

稳如房屋

我们的模型显示，短期内房价很可能继续上涨

投资者关注股票和债券，但有一类资产的规模比这两样加起来还大。全球的住房总价值超过200万亿美元。房价是经济走势至关重要的风向标：上一次富裕国家房价普遍下跌时，引发了几十年来最严重的衰退。

那一次大衰退已经过去十年了，房价已经收复了大部分的失地。在加拿大和新西兰，目前房价比危机前的高峰高出40%。又一次崩盘正在逼近吗？

在国际货币基金组织和经合组织等主要国际组织中，没有一家把住宅地产列作常规经济预测指标。这可能是因为住房价值依赖本地因素。不过本刊几十年来一直更新着一个住房价格数据库，它使用来自经合组织和各国政府机构的数据。即使不那么精确的预测也能比完全不做预测提供更多洞见。因此，我们设计出了一个预测国家层面住房价格变化的模型。

我们的系统依赖三类数据。首先是GDP增速和利率等经济数据。然后是房价租金比和房价收入比等市场基本面数据。最后是房价历史数据，把趋势和均值回归考虑在内。

这些变量各自的影响往往取决于其他变量。为了把它们综合起来，我们使用了一个名为随机森林的机器学习算法。这个算法创造了一个“决策树”的“森林”。每棵决策树包含一系列是或否的选择，例如，“GDP是否一直增长？”或“房价租金比是否低于长期平均值？”，然后取每棵决策树输出的平均值。

这个模型在回溯测试中表现良好。平均而言，它提前18个月做的预测与实际年度房价变动的误差在3个百分点以内。在房价高涨或崩盘时期偏差会变大，但仍不至于影响到模型的实用性。

例如，在截至2006年3月的一年里，美国房价上涨了8%。我们的模型预测出，在截至2007年9月的一年里房价增长将放慢到0.3%。这是乐观过头了：房价实际下降了4.7%。但预测结果仍可以提供一个早期预警。

我们的模型显示，目前的情况与2006年并不相似。在十个国家，截至2020年6月的一年里房价变化的中位数平均值为增长2.3%。模型并不排除下滑的可能性：意大利的房价有七分之一的概率下跌至少5%。但最可能的情况是房价仍有上涨空间。 ■



Electrifying flight

Hybrid vigour

Airliners that mix batteries and fossil fuel could come to dominate the skies

STEADY IMPROVEMENTS in battery technology, driven along by the electrification of road transport, are helping air taxis and other small electric aircraft get airborne. But even the best lithium-ion cells are still far from being able to power the workhorses of civil aviation: short-haul airliners carrying 150 or so passengers. An electric version would not be able to rise from the ground, because of the weight of the batteries required to drive its engines. Nevertheless, many aerospace experts continue to think that electric flight is the future, at least in hybrid form.

This could be achieved by starting with smaller hybrid airliners, such as those carrying 50 or so passengers on regional routes, and then scaling the technology up. Details of one such effort, called Project 804, illustrate how the airborne equivalent of a hybrid Toyota Prius might work.

As the crow flies, 804 is the distance in miles (1,294km) between a Pratt & Whitney facility in Montreal, Quebec, and a Collins Aerospace centre in Rockford, Illinois. That the two firms are both parts of United Technologies Corp (UTC), which hopes to merge with Raytheon to form America's second-biggest aerospace and defence company after Boeing, suggests that the idea is more than a flight of fantasy. Indeed, the experimental hybrid which Project 804 plans to fly in 2022 could slash fuel costs on regional routes.

As with cars, there are different ways to build a hybrid plane. Collins, which makes aircraft electrical systems, and Pratt & Whitney, which produces jet engines, have chosen a "parallel" hybrid. That means it will use a combustion engine augmented by a battery-powered electric motor, as

opposed to a “serial” hybrid in which propulsion is provided purely by an electric motor, but with the electricity for this motor either drawn from a battery or produced by a combustion engine running a generator, depending on the circumstances. Both sorts of hybrid limit use of the batteries, meaning the battery packs can be smaller and thus lighter.

For its flight tests, Project 804 is converting a Bombardier Dash 8-100, a 40-seat aircraft powered by a pair of turboprops. These are jet turbines that turn a propeller at the front of the engine via a gearbox.

Each turboprop produces two megawatts of power. Typically, the engines run at full power during the 20 minutes of take-off and climb, and are then throttled back for the cruise and descent. In the conversion, the jet turbine driving the propeller on one side of the aircraft will be replaced with a downsized version producing about 1MW. An electric motor attached to the turbine’s gearbox will provide another 1MW.

The idea, explains Paul Eremenko, UTC’s chief technology officer, is that during a full-power take-off and climb the combination of electric motor and jet turbine would produce the necessary 2MW. Then, during cruise, the electric motor would be switched off. As the aircraft descends, which can also take around 20 minutes, the electric motor would run in reverse to act as a generator, turned by the windmilling propeller. This would top up the battery for a subsequent full-power take-off, or an emergency “go-around” in case the landing had to be aborted.

Project 804’s flight trials will help work out both how such hybrid engines could replace turboprops on existing aircraft and how they might be used by entirely new models. As the downsized turbines would be optimised for cruising, they would themselves have better fuel economy. Working with the electric motor, the hybrid combination on a regional turboprop airliner, which typically flies routes of around one hour’s duration, would result in

fuel savings of at least 30%, says Mr Eremenko.

Other sorts of hybrid are in development. Last month Ampaire, an electric-aircraft firm in Los Angeles, undertook the virgin flight of a six-seat Cessna Skymaster converted into a hybrid. Skymasters have a propeller engine at the front and another engine driving a “pusher” prop at the rear. Ampaire replaced the rear engine with a battery-powered electric motor. On its own, this engine would be a series hybrid, except that as it works in conjunction with the combustion engine at the front, Ampaire calls it a parallel hybrid.

Zunum Aero, based near Seattle, is working on a 12-seat series hybrid which it hopes to deliver in 2022. This aircraft will be powered by two rear-mounted 500kW electric turbofans (which turn a fan inside a shroud and so look a bit like jet engines). The turbofans will be supplied with electricity by a small jet-powered generator in the rear of the fuselage, which will also top up batteries contained in the wings.

For larger aircraft, electric turbofans that are vastly more powerful—perhaps up 20MW—will be needed. Much will depend on what Boeing and Airbus decide to do with their future models, and how radical their designs will be. An alternative to large engines is lots of small ones. Giant flying wings with many electric thrusters are one idea. But these would require a number of technological leaps, not just in batteries but also in aerodynamics and electricity distribution.

More conventional-looking hybrid aircraft are possible. Airbus has teamed up with Rolls-Royce, a British jet-engine manufacturer, and Siemens, a German electricals giant, to electrify an example of a 100-seater regional aircraft called the BAe146. This plane is powered by four conventional jet turbofans, albeit small ones. To start with, one of the 146’s four engines will be replaced with a 2MW electric turbofan powered by a combination of battery and generator. If all goes well, a second engine will be replaced with

a similar unit. Again, the idea is that a combination of combustion engines and electrical power will produce a cleaner, more efficient aircraft. Spurred on by environmental concerns and stricter controls on emissions, for larger passenger aircraft going hybrid seems to be the most likely flight plan. ■ ■



飞行电气化

混合活力

兼用电池和化石燃料的客机可能将主宰天空

陆路运输的电气化驱动了电池技术稳步改进，继而推动空中的士和其他小型电动飞行器飞上天空。但哪怕是最好的锂离子电池也仍然远不能为民用航空的主力——搭载150人左右的短途客机——提供动力。这是因为驱动它的发动机所需的电池太重了，令飞机无法起飞。然而，许多航空航天专家仍然认为，电动飞行——至少混合动力飞行——是未来的方向。

这可以从较小的混合动力客机入手，例如搭载50名左右乘客的支线客机，然后再扩大这项技术的规模。这方面的一个尝试名为“804项目”，它的细节说明了航空版混合动力丰田普锐斯可能如何运转。

如果算直线距离的话，位于魁北克蒙特利尔的一家普惠（Pratt & Whitney）工厂与位于伊利诺伊州罗克福德的柯林斯航空航天中心之间相距804英里（1294公里），项目由此得名。这两家公司同属于联合技术公司（以下简称UTC），该公司希望与雷神（Raytheon）公司合并，成为排在波音之后的美国第二大航空航天和国防公司。这表明这个想法不会是空想。实际上，804项目计划在2022年试飞的实验性混合动力飞机可以削减支线客机的燃油成本。

与制造汽车一样，可以用不同的方式来建造混合动力飞机。生产飞机电气系统的柯林斯和生产喷气发动机的普惠选择了“并联”混合模式。这意味着它将使用内燃机，由电池电动机加以辅助增强，而不是使用“串联”混合动力，即完全由电动机提供推力，视不同情况由电池或由内燃机驱动的发电机供电。两种混合模式都限制了电池的使用，使得电池组可以更小、更轻。

为了飞行测试，804项目正在改装一架庞巴迪冲八-100型40座飞机，由一对涡轮螺旋桨发动机驱动。这种喷气涡轮机通过变速箱转动发动机前部的

螺旋桨。

每台涡轮螺旋桨发动机可产生两兆瓦的功率。通常情况下，发动机在起飞和爬升的20分钟内以全功率运行，在巡航和降落时减速运转。改装时，在飞机一侧驱动螺旋桨的涡轮发动机将被替换成产生大约1兆瓦功率的缩小版。安装在发动机变速箱上的电动机将提供另外1兆瓦功率。

UTC的首席技术官保罗·叶廖缅科（Paul Eremenko）解释说，其思路是在全功率起飞和爬升阶段，电动机和涡轮发动机的组合将产生必要的2兆瓦功率。然后在巡航阶段关闭电动机。当飞机下降时（这一阶段可能也需要20分钟左右），电动机将反向运行，充当发电机，由风车螺旋桨驱动。这将为电池充电，准备后续的全功率起飞，或者是在必须中止着陆时紧急“复飞”。

804项目的飞行试验将有助于确定这种混合动力发动机如何能取代现有飞机上的涡轮螺旋桨发动机，以及如何用于全新的机型。由于缩小版涡轮发动机将针对巡航进行优化，因此它们本身的油耗就更低。叶廖缅科表示，加上电动机后，对于通常飞行约1小时的支线涡轮螺旋桨客机，混合动力组合可节省至少30%的燃油。

其他类型的混合动力飞机也在研发中。上个月，洛杉矶的电动飞机公司Ampaire完成了由一架六座塞斯纳天空大师改装而来的混合动力飞机的处女航。天空大师的前部装有一个螺旋桨发动机，后方装有另一台发动机来驱动一个推进式螺旋桨。Ampaire用由电池供电的电动机取代了这个后置发动机。这个电动机本身算是串联混合动力，不过因为它与前部的内燃机搭配使用，Ampaire称其为并联式混合动力飞机。

位于西雅图附近的Zunum Aero正在研发一款12座系列混合动力飞机，希望在2022年推出。这架飞机将由两个后置式500千瓦电动涡扇发动机（在导风罩内部转动涡扇，因此看起来有点像喷气发动机）提供动力。涡扇将由机身后部的小型喷气动力发电机供电，这台发电机也将为机翼内的电池充电。

对于更大的飞机，将需要功率大得多（可能高达20兆瓦）的电动涡扇发动机。这很大程度上取决于波音和空客未来的机型要怎么做，以及设计将激进到什么程度。大型发动机的一种替代品是多个小型发动机。带有许多电动推进器的巨型飞翼是一个思路。但它们需要一系列技术飞跃——不仅电池，空气动力学和电力配送也要取得重大进步。

外观更传统的混合动力飞机也是可能的。空客与英国喷气发动机制造商罗尔斯·罗伊斯和德国电气巨头西门子合作，对一架100座BAe146型支线样机做电动化改造。这架飞机由四个传统的喷气涡扇驱动，不过是小型的。首先，BAe146的四个发动机中的一个将被替换为由电池和发电机组合驱动的2兆瓦电动涡扇发动机。如果一切顺利，第二台发动机将被替换为类似的单元。同样，其构想是内燃机和电力的结合将带来更清洁、高效的飞机。受环境问题和更严格的排放控制的刺激，对于大型客机来说，转向混合动力似乎是最有可能的飞行计划。 ■



China v America

Counter-flow

America and China are at each other's throats, but also in each other's pockets. Good

TRADE WAR, tech war, new cold war or just plain decoupling: call it what you will, the confrontation between America and China has been bruising. Tariffs are up, exports down. Even as they resume trade negotiations, they talk of blacklisting each other's firms. In the words of Henry Paulson, a former American treasury secretary, the danger is that an “economic iron curtain” will soon divide the world. All the more remarkable, then, that one crucial sector—finance—is bucking the trend. Financial links between China and the West have grown tighter since the trade war broke out. They are set to grow tighter still.

For years Western insurance firms, asset managers and brokerages have been allowed to own only minority stakes in local firms. Now China is giving foreign financial firms more leeway on the mainland. Since mid-2018 they have been able to apply for 51% control. On July 2nd Li Keqiang, China’s prime minister, said that financial firms would be allowed full control by 2020.

That is not the only sense in which financiers and trade negotiators exist in parallel universes. China is also making it easier for foreigners to buy into its markets. Since the start of 2018 they have ploughed \$75bn into Chinese shares. In the same period they have pulled \$8bn out of all other big emerging markets. In the next decade, Goldman Sachs estimates, \$1trn will enter China’s bond market from abroad, putting it among the world’s top investment destinations. All this is possible because China has not stopped foreigners from cashing out, despite the strict capital controls it imposes on its own citizens. As the rules have eased, stock and bond indices that

investors mirror in their portfolios, such as MSCI's equities benchmark, have added Chinese securities.

Helping Wall Street and the City of London do more business in China is not a popular cause there or in the West, but the implications for finance are profound. Firms like Morgan Stanley, BlackRock and Schroders which have long dabbled on the mainland must now decide whether to go for it. Some worry that they lack clout and connections. Few insurers, for example, relish a brawl with China Life, a state-run behemoth with 1.7m sales agents. Foreign banks' assets in China have soared to \$650bn, but still amount to less than 2% of the country's total.

Nonetheless a few global firms have a good chance of building large Chinese businesses. HSBC, a London-based firm with roots in Asia, already makes three-quarters of its profits from Hong Kong and China. AIA, which was spun out of AIG, an American firm, is the leader among foreign life-insurers. Western asset managers have long records and global expertise that local firms do not. Over time, as Chinese savers seek to diversify, this could help them win market share.

China needs to make this opening count. Many Wall Street bosses have gone from Sinophiles to hawks in the past few years. So, tactically, China has a chance to win brownie points with America's business lobby. That gain could be dwarfed by the benefits within the country itself. Western firms will push up standards in its immature but giant capital markets, a priority if it is to allocate capital more efficiently and get more out of its savings. And China needs foreign funding more than in the past—its current-account surplus has dropped from 10% of GDP in 2007 to less than 1% last year. Without a steady flow of capital into the country, there could be a destabilising fall in the yuan.

Some political figures in the West argue that financial links with China count as a betrayal. Steve Bannon, who was once President Donald Trump's adviser, talks of removing Chinese companies from American stock exchanges. Marco Rubio, a hawkish Republican senator, has accused MSCI of channelling American cash to the Chinese Communist Party by including state-owned companies in its benchmarks.

In fact closer financial links could have a beneficial effect, which is why longtime China-watchers like Mr Paulson back them so strongly. When Chinese firms have foreign shareholders or underwriters, their calculations change. They face tougher questions, as Alibaba, a Chinese e-commerce giant, is reminded on every earnings call. None of this will suddenly transform China into a free market but it will encourage its firms to be more open, to respond to market signals and to respect intellectual property. Chinese firms that use Western banks when they go abroad, as Huawei used HSBC, are less able to circumvent global rules on corruption and sanctions.

If America excludes China from the global financial system, China will eventually build an alternative to the dollar-based order that has dominated markets since 1945—which would then feed into a wider strategic rivalry. For the time being, despite the hostilities over trade and tech, China welcomes foreign investors and firms. That is to be celebrated. There is more to be gained from building connections than cutting them off. ■ ■



中国对阵美国

逆流

美国和中国相互争斗，但也相互制约。很好

贸易战、科技战、新冷战，或者干脆叫脱钩。不管你叫它什么，中美之间的对抗都造成了损害。关税上升，出口下降。贸易谈判重启后，他们还在说着把对方的企业列入黑名单。用美国前财政部长亨利•保尔森（Henry Paulson）的话说，一道“经济铁幕”恐怕很快将分裂世界。这使得一个现象显得尤其不同寻常：金融这个关键行业正在逆势而行。自贸易战爆发以来，中国与西方之间的金融联系日益紧密。未来势必还会更密切。

多年来，西方的保险公司、资产管理公司和证券公司在中国只能持有当地企业的少数股权。现在，中国正在给予外国金融企业更大的自由度。2018年中以来，外国金融企业已经能够申请持股51%。7月2日，中国总理李克强表示，到2020年外国金融公司将可以百分之百持股。

金融家和贸易谈判代表仿佛身在两个平行宇宙，原因还不止于此。中国也在放宽对外国人投资国内金融市场的限制。2018年初以来，外国人已向中国股市投入了750亿美元。而同期他们从其他所有大型新兴市场中撤出了80亿美元。高盛估计，未来十年将有一万亿美元从国外进入中国债券市场，令中国成为全球首选投资目的地之一。所有这一切之所以成为可能，是因为中国并没有禁止外国人撤出资本，尽管它对自己的公民实行严格的资本管制。随着相关规则放宽，投资者用来对照其投资组合的股票和债券指数（如MSCI的股票指数）开始纳入中国的证券。

帮助华尔街和伦敦金融城在中国开展更多业务在中国或西方都不是特别受待见，但对金融业影响深远。像摩根士丹利、贝莱德和施罗德这样长期涉足中国市场的外国企业现在必须决定是否要全力竞争。有些外国企业担心自己缺乏影响力和关系网。例如，没有保险公司想要和中国人寿竞争——这家国有保险巨头有170万名保险代理人。外资银行在中国的资产已飙升

至6500亿美元，但仍不到中国银行业总资产的2%。

尽管如此，一些跨国企业有很好的机会在中国发展庞大的业务。总部位于伦敦的汇丰银行扎根亚洲，四分之三的利润来自香港和中国。从美国国际集团（AIG）拆分出来的友邦保险是外国寿险企业中的领军者。西方资产管理公司拥有本地企业不具备的长期经验和全球技能。随着中国储户开始寻求多元化，这有助于它们赢得市场份额。

中国需要尽可能地让这轮金融开放的举措发挥其积极影响。过去几年里，许多华尔街老板从亲中派变成了鹰派。因此从战术上讲，中国有机会凭借美国商界的游说赢得好感。而金融开放带给国内的好处会更大。西方企业将在中国不成熟但庞大的资本市场上推动标准的提高；如果中国想要更高效地配置资本并从其储蓄中更多获益的话，提高标准是当务之急。而且中国现在比过去更需要外国资金——它的经常账户盈余占GDP比例已经从2007年的10%下降到去年的不到1%。如果没有稳定的资本流入，人民币可能大跌，造成市场不稳定。

西方一些政治人物认为，与中国加强金融联系简直是一种背叛。曾担任特朗普顾问的史蒂夫·班农（Steve Bannon）提议将中国企业驱逐出美国股市。鹰派共和党参议员马可·卢比奥（Marco Rubio）指责摩根士丹利资本国际（MSCI）将中国国有企业纳入其基准指数是把美国的资金输送给中国共产党。

而事实上，更紧密的金融联系可以带来有益的影响，所以像保尔森这样长期关注中国的人会如此强烈地支持这种联系。当中国企业有外国股东或承销商时，它们的考量会发生变化。它们会面临更严苛的质疑，比如电子商务巨头阿里巴巴在每次财报会议上都会碰到这类提问。这些都不会一下子就把中国转变为自由市场，但会鼓励中国企业变得更加开放、响应市场信号和尊重知识产权。在走出去的过程中借助西方银行的中国企业不太能够规避全球反腐败和制裁规则，华为对汇丰的使用就是一例。

如果美国将中国排除在全球金融体系之外，那么中国最终将建立另一个体

系来取代自1945年以来主导市场的以美元为基础的金融秩序，而这将会引发更广泛的战略对抗。目前，尽管两国在贸易和科技领域充满敌意，但中国仍欢迎外国投资者和企业。这一点值得赞赏。建立联系比切断联系更有益。 ■



Art-secured lending

Cash in on your Picasso

Behind the world's most beautiful paintings lies a borrowing binge

FEW ART collectors are as liquid as Patrick Drahi, a French telecoms magnate, who purchased Sotheby's, an auction house, for \$3.7bn in cash last month. Selling art can take months, even years. The only way to unlock its value quickly is to borrow against it. And indeed the number of owners doing so is rising. Deloitte, an accounting firm, estimates that the outstanding value of loans against art in America reached \$17bn-20bn in 2017, up 13% from the previous year. Industry insiders say such lending has continued to grow at double-digit rates since then.

“Ten or 20 years ago it never crossed your mind to leverage your art collection. But the word is out now,” says Evan Beard of Bank of America Private Bank, the institution with the highest outstanding value of art-secured loans. As interest rates have fallen, borrowing has become more attractive. Open public registers make it easy to check if art is encumbered. Price estimates and auction results available online since the early 2000s have made underwriting easier. In America collectors can even keep encumbered art on their wall.

Large banks’ private-banking arms have been lending against art since the 1970s. Now the strong market is attracting specialist lenders. For a private bank, though a loan may be secured against a piece of art, it will almost always be backed in the last resort by a client’s entire balance-sheet. Boutique lenders, by contrast, will accept a piece of art as sole collateral.

Athena, America’s largest boutique lender, requires art worth about \$2m to secure its minimum loan of \$1m. At Bank of America and other private

banks, the minimum loan is closer to \$5m. Both accept only works by well-known artists as collateral, since they are the only ones with reliable longevity. Thus art-secured loans are less risky than many believe, says Arturo Cifuentes of Columbia Business School.

"We can lend millions of dollars in three or four weeks," says Cynthia Sachs, chief investment officer at Athena. But boutiques' greater speed and flexibility come at a price: interest rates that outstrip those at private banks by several percentage points. That may hobble their growth. Rachel Pownall, a professor of art finance at Maastricht University, thinks the market for specialist lenders may be limited, since most art by famous names belongs to super-rich clients of private banks. Among dealers and gallerists, only the smaller ones have to turn to boutique lenders.

The best prospect for growth in the sector may be Europe. None of the continent's banks has an art-lending programme on the scale of those in America, where 90% of art-secured lending takes place. Art financiers such as the Fine Art Group in London and WestendArtBank in Berlin have moved in. Lenders say inquiries from wealthy clients about leveraging their art collection are rising. Though Europeans are in general reluctant to borrow against their possessions, those who buy art for reasons beyond the aesthetic may prove willing to make an exception. ■ ■



艺术品抵押贷款

用你的毕加索大借一笔

世界上最美妙的画作背后，是一场借贷狂欢

少有艺术品收藏家能像帕特里克·德拉西（Patrick Drahi）那样把藏品轻松变卖，这位法国电信大亨上个月以37亿美元现金收购了苏富比拍卖行。出售艺术品可能要花几个月甚至几年。快速释放艺术品价值的唯一办法是用它们来抵押贷款。而实际上这么做的收藏者正在增加。会计师事务所德勤估计，美国的未偿还艺术品抵押贷款在2017年达到170亿至200亿美元，比前一年增加13%。业内人士称，自那以后这类贷款仍以两位数的速度增加。

“一二十年前，你从不会想到用收藏的艺术品来借钱。而现在人人都知道这件事了。”美国银行下属私人银行（Bank of America Private Bank）的埃文·比尔德（Evan Beard）说。这家银行的未偿艺术品抵押贷款最多。随着利率降低，贷款变得更有吸引力。通过公开的公共登记很容易查到艺术品是否已经被抵押。从本世纪初开始，估价和拍卖结果可以在网上查询，这让贷款审核變得更容易了。在美国，收藏家甚至可以继续把抵押的艺术品挂在自家墙上。

大银行的私人银行部门从上世纪70年代起就提供艺术品抵押贷款。现在，走强的市场正在吸引专门的贷款机构。尽管私人银行可以就一件艺术品发放抵押贷款，但最终几乎都有客户的整个资产负债表做支撑。而专门贷款机构却可以接受仅用一件艺术品做担保物。

美国最大的专门贷款机构Athena要求用价值200万美元左右的艺术品来担保最低100万美元的贷款。在美国银行和其他私人银行，最低贷款额接近500万美元。所有这些机构都只接受知名艺术家的作品作为抵押物，因为只有这些作品才具有长期稳定的价值。因此艺术品抵押贷款的风险比许多人认为的要低，哥伦比亚大学商学院的阿图罗·西丰特斯（Arturo

Cifuentes) 说。

“我们可以在三四周里借出几百万美元。”Athena的首席投资官辛西娅·萨克斯 (Cynthia Sachs) 说。但要享受这些专门机构在速度和灵活性上的优势要付出代价：它们收取的利息要比私人银行高出几个百分点。这可能会阻碍它们的发展。马斯特里赫特大学 (Maastricht University) 的艺术金融教授蕾切尔·波纳尔 (Rachel Pownall) 认为，专门贷款机构的市场可能有限，因为大多数知名作品都在私人银行的超级富人客户手里。在交易商和画廊老板中，只有实力较小的那些才不得不找专门贷款机构借钱。

这一行里增长前景最好的地方可能是欧洲。在那里，还没有哪家银行开展像美国那类大规模的艺术品抵押贷款——目前90%的此类贷款都发生在美国。伦敦的Fine Art Group和柏林的WestendArtBank等艺术品融资机构已经进入这一领域。贷款机构称，富裕客户有关艺术藏品抵押贷款的问询越来越多。尽管欧洲人总体而言不喜欢抵押自己的财产来借钱，但那些并非出于审美需求购买艺术品的人可能愿意破个例。 ■



Bartleby

The American exception

Workaholism is a recent development

AMERICANS LIKE to work hard whereas Europeans prefer a more leisurely life. That is the widely held perception of the continental divide in business culture. But it has not always been the case; 40 years ago, there was precious little difference between the two.

In his new book, “Spending Time: The Most Valuable Resource”, Daniel Hamermesh, an economist, examines how work and leisure patterns in America differ from those in the rest of the developed world. In the first half of the 20th century the American working week fell sharply from nearly 60 hours to around 40. By 1979 the average worker in America put in around 38.2 hours a week, similar to the number in Europe.

That is where the figures started to diverge. For a while, the American workweek got longer, reaching 39.4 hours in 2000, before falling back to 38.6 in 2016. The main difference, however, is holidays. In the 1980s Europeans began to take more annual leave but Americans did not. Over the year as a whole, Americans average 34 hours a week, six more than the French and eight more than the Germans.

What explains this gap? Some point to cultural factors but, as Mr Hamermesh points out, it is hard to see why American culture suddenly diverged from that of the rest of the world in the past 40 years. Others point to lower taxes, which raise the value of putting in the extra hour. Yet American taxes were lower than European rates back in the 1960s, when working hours were similar. Another potential explanation is that a decline in trade union membership has weakened American workers’ bargaining

power—except that unionisation rates in France and America are not far apart.

A more plausible reason is policy. There is no legal requirement to offer paid holiday in America, whereas France mandates a minimum of 25 days, and Germany, 24. Famously, France also limits the working week to 35 hours. Mr Hamermesh finds similar examples in Asia. In the 1980s and 1990s Japan passed laws reducing the standard working week from 48 hours to 40. Beyond that, workers were entitled to overtime pay. A similar process occurred in South Korea between 2004 and 2008. Employers responded by cutting hours; workers earned less as a result but surveys found they were happier.

In America, by contrast, champions of workers' rights have recently focused on raising the minimum wage (so far to little avail at the federal level, though some states have enacted more generous wage floors). Wage gains have certainly skewed toward the better-off. The median American worker makes about \$20 an hour while the worker at the 95th percentile makes \$62. That is a ratio of 3.1. Back in 1979, the ratio was 2.2.

These higher wages do seem to have had an incentive effect. High-paid employees work eight or nine more hours a week than the lowest-paid. In part, this may reflect the low earnings of part-time workers, who have grown as a share of the workforce. Either way, the gap has widened since the late 1970s.

But don't shed too many tears for the wealthy. They may work more hours, but the poor often work more inconvenient ones. It is a myth that well-paid workers put in more hours at the weekends or at night, Mr Hamermesh says. Cleaners and food-delivery people tend to work when it is dark, not bankers.

So what is going on? John Maynard Keynes, an economist, dreamed that his

grandchildren would be working only 15 hours a week. But the decline in hours he predicted slowed after the 1970s. This may hint that 35-40 hours is close to the most efficient working period. Any more and workers become too stressed; any less and companies lose too much production. But it is also a sign that Keynes was wrong to think that society would place a high value on extra leisure.

In the developed world most workers have more than enough to feed themselves and their families. But they still want “positional” goods—homes in a nice part of town, holidays in sun-drenched resorts and possessions that demonstrate their social status. Prices of these goods will be pushed higher, driving status-seeking employees to work more hours to earn them.

So whatever labour-saving gadgets Silicon Valley dreams up, future generations will probably still have to put in a long shift. But Americans could enjoy a bit more holiday. Those who agree ought to ask their politicians why those pesky Europeans deserve more rest. ■ ■



巴托比

美国例外

美国人工作狂倾向是近几十年才出现的

美国人喜欢努力工作，而欧洲人喜欢更悠闲的生活。这是对欧美商业文化差异的普遍看法。但这种差异并非一直存在。40年前，两地在这方面几乎没有差别。

经济学家丹尼尔·哈默梅什（Daniel Hamermesh）在他的新书《花费时间：最宝贵的资源》（Spending Time: The Most Valuable Resource）中，探讨了美国的工作和休闲模式与其他发达国家的差别。20世纪上半叶，美国人的每周工作时长从近60小时大跌到40小时左右。到1979年，美国普通工人每周工作时长约38.2小时，与欧洲相近。

但自那时起，欧美工作时长开始朝着不同的方向发展。有一段时间，美国人的每周工作时间拉长，在2000年达到39.4小时，但在2016年又回落到38.6小时。然而，主要的差异是假期的长短。上世纪80年代欧洲人开始休更多年假，美国人却没有。一整年算下来，美国人每周平均工作34小时，比法国人多6个小时，比德国人多8个小时。

造成这个差距的原因是什么？有些人认为是文化，但正如哈默梅什指出的那样，很难理解为什么美国文化在过去40年里突然偏离了世界其他国家。还有人指出美国税率更低，这提高了加班的价值。但美国的税率在上世纪60年代就曾低于欧洲，而那时欧美的工作时长相近。另一个可能的原因是工会人数下降削弱了美国工人的议价能力——但法国和美国工人加入工会的比例又相差不多。

一个更合理的解释是政策。美国没有法定的带薪假期，而法国规定至少25天，德国是24天。法国更出名的是每周35小时的工作时长限制。哈默梅什在亚洲找到了类似的例子。上世纪八九十年代，日本通过立法将每周标准工作时长从48小时减少到40小时。超出40小时后工人有权获得加班费。

韩国在2004年至2008年期间也做了类似的调整。之后雇主纷纷缩短工时，工人的收入下降了，但调查发现他们的幸福感提升了。

但在美国，工人权利的倡导者近年一直把注意力放在提高最低工资标准上（到目前为止在联邦层面成果寥寥，尽管一些州已经立法提高了标准）。工资增长明显向更富裕的人群倾斜。目前美国工人的时薪中位数约为20美元，而在第95百分位的工人为62美元。两者的比值为3.1，而在1979年为2.2。

看起来更高的工资确实产生了激励作用。相比工资最低的员工，高薪员工每周多工作八到九小时。在某种程度上，这或许可以解释兼职工人收入低的原因，而他们在总劳动人口中所占的比例越来越大。不管怎么看，自上世纪70年代末以来收入差距都已扩大。

不过不用太同情富人。他们可能工作时间更长，但穷人往往工作的时段更糟糕。哈默梅什说，很多人认为高薪人士周末或晚上比别人花更多时间工作，这是一种误区。清洁工和送餐员往往本来就在天黑后工作，银行家不是。

那么到底是怎么回事？经济学家凯恩斯曾梦想他的孙辈每周只需工作15个小时。但他预测的工作时长下降的趋势在上世纪70年代后就放缓了。这可能说明35至40小时接近最高效的周工作时长。再长一些工人压力会过大，再短一些则企业会损失太多产量。但也表明，凯恩斯认为社会将非常看重多一点休闲的看法是错误的。

在发达国家，大多数劳动者要养家糊口已经绰绰有余。但他们仍然希望获得“地位性”商品——好地段的住房、在阳光普照的度假圣地休假，以及其他能彰显自己社会地位的东西。这些商品的价格将被推高，让希望提升社会地位的劳动者为获得它们而工作更久。

因此，无论硅谷构想出什么节省劳动力的新玩意，未来的世代可能仍需要长时间工作。但美国人应该享受更多一点的假期。认同这一点的人应该问问他们的政客，凭什么那些讨厌的欧洲人就可以休息更长时间。■



The Economist film

The hunt for oceans in space

Water is vital for life on earth, and probably to life elsewhere.



经济学人视频

太空寻洋

水对地球生物至关重要，对其他地方的生物可能也是如此。



America's economy

Riding high

America's expansion will soon be the longest on record. What could bring it to an end?

AROUND THE world investors, businesses and central bankers are grappling with a startling fact: at the end of July America's economy will have been growing for 121 months, the longest run since records began in 1854, according to the NBER, a research body. History suggests there will be a recession soon. And plenty of people are gloomy. Bond markets have been sounding the alarm, as long-term interest rates sink below short-term ones, often a harbinger of a downturn. Manufacturing firms are wary; indices of business confidence are tumbling. Yet equity investors are still buoyant. The stockmarket is going gangbusters, rising by 19% so far this year. And in June America's economy created a whopping 224,000 new jobs, more than twice as many as needed to keep up with the growth of the workforce. The result is a puzzle that matters a great deal. America's economy accounts for a quarter of global output, so if it stumbles the world will, too. But if it proves able to extend the cycle a lot longer, it may be time to rewrite the rules for how all rich economies behave.

The conflicting signals reflect an unusually sluggish and stretched expansion. Some of that is to be expected after the worst financial crisis in 80 years, but it is also owing to deeper changes in America's \$21trn economy. Growth is slow but more stable as activity has shifted to services and intangible assets. Thanks to new regulations and the recent memory of the bust, there are few signs of wild mortgage lending, over-investment or reckless financial firms. Inflation is remarkably subdued. These forces mean that a placid expansion can continue well beyond historical norms, but also suggest that the way it will eventually end will be different. Recessions used to be triggered by housing bubbles, price surges or

industrial busts. Now you should worry about globally interconnected firms, a financial system addicted to cheap money and a political system that is toying with extreme policies because living standards are not rising fast enough.

Average GDP growth during this expansion has been a mere 2.3%, much lower than the 3.6% that was seen in America's three previous expansions. That reflects some deep malaises. The workforce is ageing. Big firms hoard profits and invest less. Productivity growth has been slow. Robert Gordon, an economist, worries that America's genius for innovation is flagging. Emojis and bitcoins are no substitute for breakthroughs such as jet engines or the internet.

That is the bad news. The good news is that the economy may be less volatile. A third of America's 20th-century recessions were caused by industrial slumps or oil-price shocks, according to Goldman Sachs. Today manufacturing is just 11% of GDP and each dollar of output requires a quarter less energy than in 1999. Services have become even more vital, at 70% of output. Instead of fickle factories and Florida condos, investment has shifted to intellectual property, which now accounts for more than a quarter of the total. After the searing experience of 2008, the value of the housing stock is 143% of GDP, well below the peak of 188%. Banks are rammed full of capital.

Most remarkable of all is very low inflation, which has averaged 1.6% over the course of the expansion. In many past downturns the jobs market overheated, causing inflation and leading the Federal Reserve to hit the brakes. Today the dynamics are different. The unemployment rate has fallen to 3.7%, close to the lowest in half a century, but wage growth is only a tepid 3%. Workers have less bargaining power in a globalised economy. The Fed's credibility helps, too—most people believe that it can keep long-run inflation at about 2%. Given that racing prices are less of a worry and that

it lacks the ammunition to deal with a serious downturn, the Fed is being more active at signalling that it will ease policy when growth dips. Last week the Fed signalled it would soon nudge rates down from today's 2.25-2.5%, to keep growth going.

All this supports the idea that the familiar triggers for recession are still absent and that the moderately good times can roll on for years yet. The trouble with this logic is that, just as the economy has changed, so have the risks. Inevitably it is hard to identify exactly what might go wrong, but three new kinds of problems loom large.

First, America's glossy corporate champions have unfamiliar vulnerabilities. Although fewer make physical goods, most rely on global production chains that are being shaken by the trade war. This is depressing investment and could yet produce a shock—imagine if Apple was cut off from its factories in China. Tech firms, meanwhile, now account for a third of all investment by listed firms, including intellectual property. Other businesses outsource their need for IT services to a few giants. One of them, Alphabet, spent \$45bn in the past year, five times more than Ford. But 85% of its sales come from advertising, which has been cyclical in the past. It and other tech firms also face a regulatory storm.

The second risk is financial. Although house prices and the banks have been tamed, total private debts remain high by historical standards, at 250% of GDP. An edifice of asset prices and borrowing rests on the assumption of permanently low and stable interest rates, making it more fragile than it looks. If rates rise there will be distress among some firms, and trouble in debt markets—there was a sell-off in late 2018. If, by contrast, the Fed has to cut rates to near zero for a prolonged period to sustain growth, it could weaken the banks, as Europe has found.

The last danger is politics. As the economy has trodden a narrow path, the

boundaries of economic policy have been blown wide apart, partly out of frustration at a decade of sluggish wages. President Donald Trump has tried to gin up growth, by cutting taxes and attacking the Fed. Most Democrats are keen to let rip on government spending. More extreme policies hover in the wings. On the left, modern monetary theory (a kind of money printing) and massive state intervention are popular. One of Mr Trump's new nominees to the Fed board supports a gold standard. The greatest threat to America's long and placid expansion is that a new era of wild policy may be just beginning.





美国经济

越飞越高

美国的经济扩张很快将成为有记录以来持续最久的一次。什么会让它结束？

世界各地的投资者、企业和央行官员都在纠结一个令人震惊的事实：根据研究机构美国国家经济研究局（NBER）的数据，到7月底，美国经济将连续增长121个月，是自1854年有记录以来最长的一次增长。历史表明经济衰退即将来临。很多人都很悲观。债券市场一直在拉响警报，因为长期利率跌至低于短期利率，而这往往是衰退的先兆。制造业企业小心谨慎；商业信心指数大跌。不过股票投资者仍然乐观。股市势头强劲，今年截至目前为止已经上涨了19%。6月美国经济足足创造了22.4万个新工作岗位，是满足劳动力增长所需的两倍多。最终结果仍是个迷，但事关重大。美国经济占全球产出的四分之一，如果它跌倒，全世界都会跟着一起摔跟斗。但如果事实证明它能够将周期大大延长，那或许是时候改写所有富裕经济体的行为规则了。

这些相互矛盾的信号体现了这轮经济扩张的异常缓慢与旷日持久。在经历了80年来最严重的金融危机之后，其中有一部分是可预见的，但它也要归因于美国21万亿美元的经济发生的更深层次变化。随着经济活动转向服务业和无形资产，增长虽缓慢，却也更稳定。受益于新法规的出台以及对泡沫破裂记忆犹新，几乎没有迹象显示存在疯狂的抵押贷款、过度投资或不计后果的金融公司。通货膨胀明显受到抑制。这些力量意味着温和的扩张能够持续，远远超出历史常态，但也暗示它最终结束的方式将会不同。过去，经济衰退是由房地产泡沫、价格飙升或工业萧条引发的。现在，你应该担心的是全球互联的公司、沉迷于廉价资金的金融体系，以及因为生活水平提高得不够快而玩弄极端政策的政治体系。

这次经济扩张中平均GDP增长率仅为2.3%，远低于美国前三次经济扩张中3.6%的增长率。这反映出一些深层次的弊病。劳动力正在老化。大公司囤积利润，减少投资。生产率增长缓慢。经济学家罗伯特·戈登（Robert

Gordon) 担心美国的创新天赋正在衰退。表情符号和比特币无法取代喷气发动机或互联网等突破性创新。

这是坏消息。好消息是经济可能不会那么动荡。高盛称，20世纪美国的经济衰退有三分之一由工业衰退或油价冲击造成。今天，制造业仅占GDP的11%，每一美元的产出所需耗费的能源比1999年减少了四分之一。服务业变得更重要了，占到产出的70%。投资不再集中在变化无常的工厂和佛罗里达的公寓，而是转移到了知识产权领域——目前占总投资的四分之一以上。在2008年的惨痛经历后，住房存量价值目前占GDP的143%，远低于高峰时期的188%。银行里充斥着资本。

最引人注目的是极低的通胀，在这轮经济扩张中平均只有1.6%。在过去许多次衰退中，就业市场过热，导致通胀，继而由美联储踩下刹车。今天的情况有所不同。失业率已降至3.7%，接近半个世纪以来的最低水平，但工资增幅仅为不温不火的3%。在全球化的经济中，工人的议价能力减弱。美联储的信誉也有帮助，大多数人相信它可以将长期通胀保持在2%左右。既然不用太过担心价格上涨，而且美联储缺乏应对严重衰退的弹药，它正在更积极地释放信号：当经济增长放缓时它将放松政策。上周美联储暗示会很快将利率从目前2.25%到2.5%的水平小幅下调，以保持经济增长。

所有这些都支持这样一种观点，即人们熟悉的那些衰退诱因仍然未显现，适度的经济繁荣还能持续数年。这种逻辑的问题在于，随着经济的变化，风险也在变化。不可避免地，我们很难确定哪里可能出问题。但有三种新的问题凸显出来。

首先，美国光鲜亮丽的领军企业有着人们不熟悉的弱点。虽然生产实物商品的企业变少，但多数依赖受贸易战冲击的全球生产链。这正在压制投资，可能会发生震撼性的冲击，试想一下如果苹果被切断在华工厂的供应。与此同时，包括知识产权在内，科技公司目前占上市公司总投资的三分之一。其他企业将它们对IT服务的需求外包给少数巨头。巨头之一的Alphabet在过去一年里支出450亿美元，是福特的五倍。但它85%的销售

额来自广告，而广告支出在过去是周期性的。它和其他科技公司还面临一场监管风暴。

第二个风险在金融领域。尽管房价和银行都得到了控制，但以历史标准衡量，私人债务总额仍然很高，达到GDP的250%。资产价格和借贷的宏伟大厦建基于利率会长期稳定在低位的假定之上，这令它实际比表面看起来更脆弱。如果利率上升，一些公司将陷入困境，债务市场也会出现问题——它在2018年末出现了抛售潮。相反，如果美联储不得不在较长时期内将利率降至接近于零的水平以维持增长，就有可能削弱银行，就像欧洲已发生的那样。

最后一个危险是政治。随着经济走上了一条狭窄的道路，经济政策的边界被炸得四分五裂，部分起因是对10年来工资增长低迷的沮丧。特朗普试图通过减税和攻击美联储来刺激增长。大多数民主党人热衷于大肆挥霍政府开支。更多极端政策蠢蠢欲动。在左翼当中，现代货币理论（一种支持印钱的理论）和大规模国家干预很受欢迎。特朗普提名的美联储新理事中有一位支持金本位制。美国长期而温和的经济扩张面临一个最大的威胁：一个实行疯狂政策的新时代可能才刚刚开始。 ■



Women's football

Net gains

Another female sport is becoming a big business

"IS THIS HOW we should show up before you come to our games?" read the frustrated slogan of the French national team, posing nude during the women's football World Cup in 2011. At this year's tournament in France figures smashed records without such desperate measures. FIFA, the game's governing body, estimates that it drew a total of 1bn viewers, up from 750m four years ago in Canada. The semi-final featuring England was the most watched television programme of the year so far in Britain. Some 14m Americans saw their team beat the Dutch 2-0 to win their fourth title on July 7th, more than tuned in to most basketball and baseball league finals.

Sponsors have taken note. Visa, a payment-card network with a taste for supporting high-profile sports events, spent as much promoting it as it did on the men's competition. Earlier this year Barclays, a bank, became the first ever title sponsor of the English Women's Super League (WSL) in a deal said to be worth over £10m (\$12.6m). On July 5th Alipay, China's electronic-payments giant, announced a 1bn yuan (\$145m) ten-year deal with the Chinese women's football team.

The women's game is luring brands which have previously been shut out of the sport because of the way sponsorships of women's teams were bundled with those of men's sides. Avon, a beauty and cosmetics company, became the first to sponsor a women's professional football club, signing an exclusive deal with Liverpool FC Women in 2017. In April Boots, a pharmacy chain, struck partnerships with the national teams of England, Scotland, Wales and Northern Ireland, as well as the Irish Republic. Arkema, a chemicals firm, recently bought the naming rights to the top French

women's league in a deal worth €1m (\$1.1m) a year over three years—peanuts compared with the €15m a year the men's league receives from its main sponsor, but a start.

Sixty percent of women's football teams in the biggest leagues now sport front-of-shirt patrons different to those for the men's team at the same club, according to Deloitte. The consultancy reckons this could approach 100% by the next World Cup in 2023. The number of European national associations with dedicated women's football sponsors rose from nine in 2013 to 17 in 2017.

Kelly Simmons, director of the professional women's game at England's football association, says that these multi-million-pound deals have been transformative. The big bucks, though, will come with broadcasting rights. Men's English Premier League games bring in more than £3bn a year from broadcasters. France's top female league sold five-year rights to Canal+, a pay-TV firm, for €6m—a trifle but six times more than two years ago. TF1, the most popular French TV station, raised ad prices twice in a week for France matches, earning an estimated €9m as the home team reached the knockout stages. In Britain women's-football rights were handed over to BT, a telecoms company, and the BBC, the public broadcaster, at virtually no cost. Expect negotiations for new contracts, set to begin now that the tournament is over, to be much more of a contest. ■ ■



女子足球

稳赚

又一项女子运动变成大生意

“我们非得这样，你们才会来看比赛吗？”这是法国国家队在2011年女足世界杯期间的全裸宣传写真上的辛酸口号。今年在法国的女足世界杯上，无需这样的“苦肉计”观众人数也破了纪录。运营女足世界杯的国际足联估计，本届赛事共吸引了10亿观众，较之四年前加拿大那一届的7.5亿观众显著提升。有英格兰队参加的半决赛是今年迄今为止英国收视率最高的电视节目。7月7日，约1400万美国人观看了美国队以2比0击败荷兰队、第四次捧杯的决赛，比大多数篮球和棒球联赛决赛的观众人数都多。

赞助商们注意到了这种变化。一向热衷赞助重大体育赛事的支付卡网络Visa已经将对女足世界杯的赞助投入提高到和男足世界杯不相上下。今年早些时候，巴克莱银行成为英格兰女足超级联赛（WSL）的首位冠名赞助商，据称赞助协议价值超过1000万英镑（1260万美元）。7月5日，中国电子支付巨头支付宝宣布与中国女子足球队达成价值10亿元人民币的十年合约。

女足赛事正在吸引新的赞助商。过去因为女足与男足赛事的赞助权捆绑销售，一些品牌无法参与。美妆公司雅芳2017年与利物浦女子足球俱乐部签订独家协议，成为第一家赞助女子职业足球俱乐部的公司。4月，药店连锁Boots与英格兰、苏格兰、威尔士、北爱尔兰及爱尔兰的女足国家队建立了合作伙伴关系。化学品公司阿科玛（Arkema）最近与法甲女足联赛签订了每年价值100万欧元（110万美元）、为期三年的冠名赞助协议。这与法甲男足联赛每年从其主赞助商那里获得的1500万欧元赞助相比是小巫见大巫，但总归是个开始。

根据咨询公司德勤的数据，在最大的那些足球联赛里，现在60%的女子足球队的球衣胸前广告赞助商和同一个俱乐部里男队的赞助商都不是同一

家。德勤估计，到2023年下一届世界杯时，这一比例可能达到近100%。欧洲各国足协里，有专门的女足赞助商的足协数量从2013年的9个增加到了2017年的17个。

英格兰足总的女足联赛主管凯莉·西蒙斯（Kelly Simmons）说，这些价值数百万英镑的协议带来了变革性影响。不过，收入的大头将是转播权。男足英超联赛每年可从各家广播公司获得超过30亿英镑的转播收入。法甲女足联赛以600万欧元的价格向付费电视公司Canal+出售了五年的转播权，虽说比起来只是毛毛雨，但已是两年前价格的六倍。法国收视率最高的电视频道法国电视一台（TF1）在本国女足队挺进淘汰赛之后，一周之内两次提高了法国队比赛的广告价格，估计大赚900万欧元。在英国，女足转播权几乎免费给了英国电信（BT）和公共广播公司BBC。现在世界杯已经结束，新合同的谈判即将开始，等着看一场激烈竞争上演吧。■



Schumpeter

Ben van Beurden's balancing act

Royal Dutch Shell's boss serves up some hard truths on oil and climate change

WHEN BEN VAN BEURDEN was a boy in the Netherlands, one of his chores was to fill the coal scuttle. It was a hateful task—especially in the cold weather when he had to traipse out to a shed in the back garden. “I can still feel the wet, freezing cold creeping up my legs,” he told a Dutch audience last year. He hated the coal furnace because he had to wash himself next to it. He hated the washcloth because it did not stay hot for long enough. But it gave him a cold, hard lesson in the importance of energy.

Mr van Beurden, boss of Royal Dutch Shell, the world’s second-biggest publicly traded oil company, is not the first well-paid executive to dwell on the hardships of his youth. But his story is poignant because of what came next. In the 1960s the vast Groningen field in the Netherlands brought natural gas to the country for the first time. The coal scuttle and cold washcloth gave way to a hot shower—and progress for his whole family.

In these days of worry about global warming, another energy transition is under way: from fossil fuels to clean energy. Of all the oil majors, Shell’s attempts to navigate it under Mr van Beurden are the most intriguing. In 2016 it splurged \$52bn on BG Group, becoming the biggest listed gas producer. The importance of oil in its business has diminished; measured in years of production, its reserves are lower than those of its Western peers—ExxonMobil, BP, Total, and Chevron. Shell is bolder than its rivals in forecasting huge global demand for clean power over the next 30 years. And it is the only firm to link its executive’s pay to progress in reducing emissions across its operations, including sales of products such as petrol—the source of most of the industry’s emissions.

In other words, for all the cynicism that oil firms are “greenwashing” their way through the energy transition, Shell’s efforts should be taken seriously. But how seriously? Despite the urgency to tackle climate change, Mr van Beurden has no intention of going all in on a post-carbon future, and warns against Shell sticking its neck out too far. To explain why, he sets out a few hard truths.

The first is about business itself. Shell may justifiably fear being on the wrong side of history when it comes to climate change. But it needs shareholders’ support to move in the right direction. Though some investors put global warming as their highest priority, most still relish the juicy 10%-plus returns that Shell generates on capital employed in big, risky projects such as oil wells and refineries. They are wary of cleaner-energy ventures such as electricity, where Shell has taken its first steps; returns are steadier, but puny (say 4%). New-energy businesses such as hydrogen and biofuels are seen as financial black holes. So Shell has to coax investors along with a mix of hard cash and prudent investments.

The cash comes from Shell’s legacy businesses, upstream oil and gas, and downstream chemicals and oil products. Last month it laid out a plan to return \$125bn—a whopping half of its current market value—to investors, through dividends and share buy-backs from 2021 to 2025. Some analysts worry that it might be planning to drain its hydrocarbon reserves to keep the cash machine running. Shell insists that is not the case; it has sought to reassure critics by earmarking most of its \$30bn annual capital-expenditure budget over the five-year period for fossil-fuel related projects. As for the prudence, it will only ramp up spending on its nascent power business if it can show that returns come close to those of oil and gas. Investors wanting more ambitious climate strategies can put their cash into clean-tech companies instead.

The next tough subject is the market for energy. Demand for coal and oil

may have peaked in the West. But, like the young Mr van Beurden, many poor countries still lack readily available fuel supplies, and hanker for the modernisation energy brings. Shell sees plenty of scope to substitute biomass and coal with gas and cleaner energy sources in the developing world. Thanks to rising populations and incomes there, global energy demand is likely to stay high for decades to come. Less reassuringly, this also explains why Shell sets itself unit, rather than aggregate, targets for reducing its carbon footprint: it aims to halve the emissions per unit of energy it produces by 2050, rather than slashing emissions outright. So if energy demand continues to soar, the commitment will constrain Shell's business much less than it appears—with less benefit to the planet.

Mr van Beurden justifies this with a third hard lesson: the world has a shared responsibility to tackle climate change. Even if all the Western oil majors decided to stop pumping oil and gas to reduce carbon emissions, global production would shrink by only 10%; state-owned oil companies from China, Russia, the Gulf and elsewhere could pick up the slack. There are overlapping sources of carbon emissions, too. Shell, for instance, sells far more oil products through its 44,000 petrol stations than it refines. Who bears responsibility for reducing the carbon footprint of those products? Shell, the companies that pumped the oil, the carmakers whose engines burn the fuel, or the people who drive the vehicles? The answer is probably a combination of all of them.

To heap the blame for global warming on the oil industry alone would be to oversimplify the emissions problem. True, companies like Shell could have been more open about evidence of the risks from climate change, and they sometimes lobby against steps to reduce emissions. But everyone bears responsibility. That includes other fuel-guzzling industries; governments for failing to explain the need for carbon taxes, and find ways to capture and store carbon; and society at large for its utter dependence on fossil fuels. Mr van Beurden's plain speaking will earn him little credit from those

determined to paint the firm as a pantomime villain. But everyone should take a long, hard look in the mirror to appreciate how much they too need to change their habits to reduce demand for fossil fuels. A cold, wet washcloth may come in handy. ■ ■



熊彼特

平衡术

荷兰皇家壳牌的老板就石油和气候变化摆出了一些严峻的事实

当本·范伯登（Ben van Beurden）还是荷兰的一个小男孩时，他要做的家务活之一就是把煤斗装满。这活儿很让人讨厌，尤其是在寒冷的天气里，他不得不到后花园的一个棚子里去取煤块。“我到现在还能感觉到那种湿漉漉的、冻死人的冰冷往我腿上窜。”去年他在荷兰演讲时说到。他讨厌煤炉，因为不得不在它旁边洗澡。他讨厌那块毛巾，因为它总是一下子就凉了。但这给他上了冷酷无情的一课，让他明白了能源的重要性。

作为全球第二大上市石油公司荷兰皇家壳牌的老板，范伯登并不是那些拿高薪的高管当中第一个唠叨自己年少时生活如何艰辛的人。接下来发生的事才让他的故事显得辛酸。上世纪60年代，广阔的格罗宁根（Groningen）气田首次为荷兰带来了天然气。煤斗和冷毛巾让位给了热水淋浴，也改善了他一家人的生活。

在如今人们担心全球变暖之际，另一种能源转型正在发生：从化石燃料转向清洁能源。在所有石油巨头中，壳牌在范伯登领导下的这种转型尝试最值得探究。2016年，该公司豪掷520亿美元收购了英国天然气集团（BG Group），成为全球最大的上市天然气生产商。石油在其业务中的重要性已经降低：以已探明储量使用年限衡量，其储量低于西方同行埃克森美孚、BP、道达尔和雪佛龙。对于未来30年全球对清洁能源的巨大需求，壳牌所作的预测比其竞争对手更大胆。此外，它是唯一一家将高管的薪酬与整个业务中的减排进展挂钩的公司，包括汽油等产品的销售，而汽油是这一行业最大的排放源。

换句话说，虽然有各种冷嘲热讽说石油公司的能源转型是在“洗绿自己”，我们还是应该把壳牌的努力当回事。但是该多当真呢？尽管应对气候变化迫在眉睫，范伯登并无意全身心投入后碳时代的未来，而是警告自己的公

司不要过于冒险。为了解释原因，他列举了几个残酷的事实。

首先是商业操作本身。在气候变化问题上，壳牌或许有理由担心自己站在历史上错误的一边，但它需要股东的支持才能朝着正确的方向前进。尽管有些投资者把全球变暖作为他们要考虑的头等大事，但大多数人仍然乐享壳牌在油井和炼油厂等高风险大型项目上投注的资本所创造的超过10%的丰厚回报。他们对像电力这样的清洁能源企业谨慎观望，而壳牌已经在这个领域迈出了第一步，所获得的回报更稳定，但也很微薄（约4%）。氢和生物燃料等新能源企业被视为财务黑洞。因此，壳牌必须用现金和谨慎投资相结合的方式来吸引投资者。

现金来自壳牌的传统业务、上游的石油和天然气，以及下游的化工和石油产品。壳牌上个月制定了一项计划，从2021年至2025年，通过股息和股票回购向投资者返还1250亿美元（相当于目前市值的一半）。一些分析人士担心壳牌可能正计划耗尽其油气储备，以维持这台提款机的运转。壳牌坚称情况并非如此；为了安抚批评人士，它将五年内每年300亿美元的资本支出预算的大头都留给化石燃料相关项目。至于谨慎，它只在能够证明回报接近石油和天然气的情况下，才会加大对新兴电力业务的投资。寻求更激进气候战略的投资者可以把钱投到清洁技术公司上。

另一个棘手的问题是能源市场。西方对煤炭和石油的需求可能已经见顶。但是，和幼年的范伯登一样，许多贫穷国家仍然缺乏现成的燃料供应，并渴望能源带来的现代化。壳牌认为，在发展中国家用天然气和更清洁的能源替代生物质燃料和煤炭有很大的空间。那里的人口和收入不断增长，因此全球能源需求可能在未来几十年保持在高位。让人不那么放心的是，这也解释了为什么壳牌为自己设定的碳足迹减少目标是单位量，而非总量：它的目标是到2050年将单位能源的排放量减半，而不是直接削减总排放量。因此，如果能源需求继续飙升，这一承诺对壳牌业务的约束要比表面看来小得多，对地球的好处也更少。

对于自己这种选择，范伯登给出了第三个坚实的理由：应对气候变化的责任是全球共担的。即使所有西方石油巨头决定停止开采石油和天然气以减

少碳排放，全球石油产量也只会减少10%，而中国、俄罗斯、海湾和其他地区的国有石油公司可能又会把这一块补上。碳排放的源头也相互交叠。例如，壳牌通过其44,000个加油站销售的石油产品远远超过它自己的炼油产量。谁对减少这些产品的碳足迹负有责任？是壳牌吗？是开采这些石油的公司？燃烧这些燃料的汽车的制造商？还是开车的人？答案可能是各方都有份。

把全球变暖都怪到石油行业头上，是把排放的问题简单化了。诚然，像壳牌这样的公司本可以对气候变化造成风险的证据更开诚布公，而且它们有时会游说反对采取措施减少排放。但每个人都负有责任，比如其他行业也在消耗燃油；政府未能解释征收碳税的必要性，也未能找到捕获和储存碳的办法；整个社会都极度依赖化石燃料。有些人铁了心要把壳牌描绘成大反派，范伯登平实的解说没法赢得这些人的信任。但每个人都应该好好照照镜子，看看自己需要改变哪些习惯，以减少对化石燃料的需求。一块冷冰冰的湿毛巾可能会派上用场。 ■



The International Monetary Fund

Changing of Lagarde

A coronation for the IMF's next boss will not prevent a fight over its future

FOR THE purposes of decision-making, the IMF's 189 member countries are divided into 24 constituencies of peculiar shapes and sizes. Ghana, for example, belongs to the same group as Afghanistan. Ecuador sits with East Timor. But in choosing the next boss after Christine Lagarde moves to the European Central Bank in October, the most decisive constituency may be a different group entirely: the “New Hanseatic League”. This includes eight small, northern members of the European Union (EU) with bad weather and good credit ratings. They lost out in the fight for big EU jobs earlier this month. In compensation they may have a large say in Europe's pick to lead the fund.

That could be good news for Mark Carney, the charismatic and credentialled boss of the Bank of England. As well as Canadian and British citizenship, he holds a passport from Ireland, one of the new Hanseatics. If Ireland champions his cause in the league, and the league backs him within the union, he would be hard to resist within the fund. By convention the IMF is led by whichever European candidate the Americans can live with. And the Americans are unlikely to object to him, especially after the Europeans dutifully supported Washington's choice to run the World Bank earlier this year.

What about an Asian rival? One obvious candidate is Tharman Shanmugaratnam, a former finance minister and deputy prime minister of Singapore, who also chairs its monetary authority. As well as a background in economics, he has the virtue of hailing from a small country that is neither improvident nor imperious—the kind of country that would be a

member of Asia's Hanseatic league if it had one.

But even in a fair race he would struggle to beat Mr Carney, who has run two of the world's biggest central banks. And given the horse-trading between Europe and America, the IMF race will not be entirely fair. Why, then, bother entering? Candidates from outside Europe face a Catch-22: anyone credible enough to win an unrigged race will not be crazy enough to enter a rigged one. That is a pity, because a contest might force the fund's members to think harder about the institution's future.

In 2004 Mr Shanmugaratnam revealed that he kept four canes in his cupboard, one for each of his children. But he never had to use them. That is many people's ideal for how the IMF should work. Borrowing countries would live up to its standards of economic behaviour, fearing that otherwise it would refuse further lending. And speculators would be intimidated by the "flexible credit lines" and other tools in its cupboard, meaning that they would never test the currencies and creditworthiness those tools are designed to defend.

In practice the fund rarely operates that way. It is reluctant to cut its members off, especially if they have powerful friends. This month, for example, it approved a \$6bn loan to Pakistan, which has often flouted its prescriptions in the past. And even its biggest-ever loan, over \$50bn approved for Argentina last year, was not enough to stop capital fleeing and the peso slumping in subsequent months. Rather than rely on the uncertain protection of the fund, many members have chosen to look after themselves, accumulating over \$11trn-worth of reserves between them.

Its next boss will find its cupboard a little bare. America is opposed to increasing members' "quotas": their permanent financial commitments to the fund (which now come to \$660bn). Instead the IMF is trying to shore up alternative sources of financing, including \$250bn it has borrowed for five

years from 40 richer members.

Limited firepower also threatens its legitimacy. A country's financial contribution to the IMF determines its share of votes in the institution. So without an overall increase in quotas, the fund will struggle to redistribute voting power from over-represented countries in Europe to faster-growing members elsewhere. To do so would require cutting some members' stakes in absolute terms, rather than merely freezing them as others expand. China, according to the IMF'S independent evaluation office, is now more under-represented than it was before the voting reform of 2008, because its share of global GDP has grown faster than its share of IMF votes.

The fund's response to this impasse has been innovative. Just as it has sought alternative sources of financing, it has also sought alternative wells of legitimacy. Ms Lagarde has energetically broadened its concerns to include inequality, gender and climate change.

Critics worry that the IMF is now spreading itself too thinly, taking on new tasks when it has yet to master its customary responsibilities. It does not seem sure how to stop prices from rising in Argentina or those in Japan from threatening to fall. Should it wage an additional crusade against rising temperatures worldwide? But its new preoccupations may also help it meet some of its core duties. Its traditional advice to tighten belts, for example, carries more weight in many parts of the world because it has shown that it is sensitive to broader social ills. Good parents know that showing the cane is no substitute for showing that you care. ■ ■



国际货币基金组织

拉加德交班

新总裁的上任不会平息关于IMF未来走向的争斗

为便于决策，国际货币基金组织（以下简称IMF）的189个成员国被划分成24个构成和规模怪异的选区。例如，加纳与阿富汗同属一区，厄瓜多尔与东帝汶又属一区。不过，IMF在遴选下一任总裁以接替将于10月赴任欧洲央行的克里斯蒂娜·拉加德（Christine Lagarde）时，最关键的选区可能又是一个完全不同的组合——“新汉萨同盟”。它由欧盟北部八个气候恶劣而信用级别良好的小成员国组成。本月早些时候，它们在争夺欧盟重要职位的竞争中落败。作为补偿，它们可能在欧洲选择IMF的领导人时拥有很大的发言权。

这对马克·卡尼（Mark Carney）来说可能是好消息。这位魅力十足、资历深厚的英国央行行长除了拥有加拿大和英国双重国籍，还持有新汉萨同盟的成员国之一爱尔兰的护照。如果爱尔兰在同盟中支持卡尼，该同盟进而再欧盟中支持他，那么IMF就很难拒绝他。按照惯例，IMF总裁从欧洲候选人中产生，只要美国人不排斥就好。而美国人不太可能反对卡尼，尤其是今年早些时候欧洲人在世界银行掌门人的选举上遂了美国的意。

那么，亚洲的竞争对手有希望吗？新加坡前财政部长兼副总理、现任新加坡金融管理局主席的尚达曼（Tharman Shanmugaratnam）是显而易见的人选。除了拥有经济学背景，尚达曼的优势还在于他来自一个既不短视又不专横的小国——如果亚洲有汉萨同盟的话，新加坡是会加入的。

但是，即使公平竞争，尚达曼也很难击败卡尼。卡尼有着执掌世界最大的两家央行的经历。而鉴于欧洲和美国之间的精明交易，IMF的总裁之争也不会完全公平。既如此，何必还费力争取呢？欧洲以外的候选人面临一个困局：任何有望赢得一场不受操纵的竞选的人，都不会傻到去参加一场受操纵的竞选。这很遗憾，因为竞争可能迫使IMF的成员国更认真地思考该

机构的未来。

尚达曼曾在2004年透露，他在橱柜里给自己的四个孩子每人准备了一根棍棒。但他从来不需要动用它们。这正是很多人理想中IMF的运作方式。借款国会践行IMF对其经济行为的要求，因为担心如果不达标的话，IMF就不会再放贷。而投机者会被IMF橱柜中的“灵活信贷额度”和其他工具所震慑，这让它们绝不会想要挑战这些工具所维护的货币和信誉。

而实际上，IMF很少如此运作。它不愿意中断给成员国的贷款，尤其是有强大盟友的成员国。例如，尽管巴基斯坦过去常常无视IMF的忠告，本月IMF还是向它批准了一笔60亿美元的贷款。而即使是去年向阿根廷发放的IMF有史以来最大一笔贷款——逾500亿美元，也不足以阻止阿根廷在随后几个月里发生资本外逃和比索暴跌。许多成员国不再依赖IMF不确定的保护，而是选择自保，各国外汇储备价值总计超过11万亿美元。

IMF的下一任总裁会发现它的橱柜有点空。美国反对增加成员国的“定额”，也就是它们向IMF缴纳的固定会费（目前已达6600亿美元）。因此，IMF正在强化其他融资渠道，比如它已向40个较富裕成员国借款2500亿美元，期限为5年。

有限的财力也威胁到了IMF的合法性。一国向IMF缴纳费用的多少决定了它在IMF中的投票权份额。因此，如果不全面提高定额，IMF将难以将投票权从占比过多的欧洲国家重新分配给欧洲以外经济增长更快的成员国。要做到这一点，就需要在提高其他成员国份额的同时，削减一些成员国的绝对份额，而不仅仅是维持不变。根据IMF的独立评估办公室的信息，相比于2008年投票权改革之前，中国目前的投票权占比更加偏低了，因为它在全球GDP中占比的增速超过了在IMF中投票权占比的增长。

为打破这一僵局，IMF进行了革新。正如寻求其他融资渠道一样，它也在寻求巩固其合法性的其他渠道。拉加德积极拓展IMF的关注范围，覆盖不平等、性别和气候变化等议题。

批评人士担心，IMF在没有做好本职工作的情况下就扛起新任务，会让力

量更加分散。IMF似乎并不清楚该如何阻止阿根廷物价上涨或防范日本物价下跌。那么，它是否应该再发起一场对抗全球气温升高的运动？但是，IMF的新关注点也可能帮助它履行一些核心职责。比如，由于它展现出对更广泛社会弊病的关心，它“勒紧裤腰带”的老式忠告在世界许多地方受到了更多重视。称职的父母知道，向孩子亮出棍棒并不能替代表达关爱。■



China's development finance

Hey, big lender

Nearly half of China's credit to poor countries is hidden

LOAN TALKS with Belarus; funding for bridges in Liberia; a possible gas project in Timor-Leste; accusations of exploitation in Tanzania; a corporate dispute in India; pledges to support the Rwandan private sector. And that was just the past few weeks. Such is the frenetic pace of China's overseas lending that its outstanding loans have risen from almost nothing in 2000 to more than \$700bn today. It is the world's largest official creditor, more than twice as big as the World Bank and IMF combined. Yet tracking the money is hard because of limited transparency in its disclosures.

A new study by Sebastian Horn and Christoph Trebesch of the Kiel Institute for the World Economy and Carmen Reinhart of Harvard University offers the most comprehensive picture yet of China's official credit flows (including state-owned banks). It adds to concern about whether China has sowed the seeds for debt problems abroad. They find that nearly half of China's lending to developing countries is "hidden", in that neither the World Bank nor the IMF has data on it.

The problem is most severe for the most vulnerable borrowers: the authors conclude that in its reporting to the Bank for International Settlements, an organisation of central banks, China has disclosed no loans to Iran, Venezuela or Zimbabwe, despite giving them plenty in the past 15 years. They speculate that China avoids cross-border claims by disbursing loans directly to Chinese contractors, so that recipient governments will not misuse funds.

According to the authors, the 50 biggest recipients now have debts with

China worth about 17% of their GDP on average (see map), up from 1% in 2005. Strikingly, many were granted debt relief by wealthy creditors in the early 2000s after a wave of defaults. But thanks to China's largesse they are now on track to reach the same level of debt that they had before the crisis.

Whereas the norm for other official creditors is to lend at concessional terms, about 60% of Chinese loans are extended at higher interest rates and shorter maturities. They often have commodity revenues as collateral. China has started to talk about making its loans more sustainable, but there is little evidence of that so far.

Though China is often depicted as an unforgiving lender, the study finds that it has engaged in at least 140 restructurings and write-offs of external debt since 2000. Moreover, the boom could soon tail off. Chinese economic growth and capital outflows are closely correlated. As China slows its lending floodwaters might recede. ■ ■



中国的发展融资

嗨，大债主

中国对贫困国家近一半的贷款都是隐秘的

与白俄罗斯进行贷款谈判；为利比里亚的桥梁建设提供资金；在东帝汶可能资助一个天然气项目；在坦桑尼亚被指控剥削；在印度有一起企业纠纷；承诺支持卢旺达的私营部门。这些都发生在过去短短几周内。中国的海外贷款以如此疯狂的速度增长，其海外未偿还贷款余额在2000年时还几乎为零，如今已经增加到7000多亿美元。中国是世界上最大的官方债权人，债权规模是世界银行和国际货币基金组织总和的两倍多。然而，追踪这些资金的难度很大，因为其披露的透明度有限。

由基尔世界经济研究所（Kiel Institute for the World Economy）的塞巴斯蒂安·霍恩（Sebastian Horn）和克里斯托夫·特雷贝施（Christoph Trebesch）以及哈佛大学的卡门·莱因哈特（Carmen Reinhart）共同开展的一项新研究为中国的官方信贷流向（包括国有银行）提供了迄今最全面的信息。它加剧了有关中国是否在海外播撒债务问题的种子的担忧。研究发现，中国对发展中国家近一半的贷款是“隐秘的”，因为世界银行和国际货币基金组织都没有相关数据。

这一问题在最脆弱的债务国中最为严重。几位作者得出结论称，中国未曾在提交央行组织国际清算银行的报告中披露对伊朗、委内瑞拉或津巴布韦的贷款，尽管过去15年中它给了它们提供了巨额资金。他们推测中国通过直接向中国承包商发放贷款来避免跨境债权，这样贷款接受国政府将无法滥用资金。

报告作者称，目前接受中国贷款最多的50个国家的对华债务平均占其GDP的17%左右（见地图），而2005年仅为1%。引人注目的是，其中许多债务国在21世纪的头几年发生一波违约之后，获得了富有债权国的债务减免。但是，由于中国的大手笔，现在它们的债务水平可能将达到与那次危机前

相同的水平。

其他官方债权人一般以优惠条件提供贷款，而约60%的中国贷款利率较高，期限较短。中国的贷款通常以大宗商品收入作抵押。中国已经开始谈到要让其贷款更可持续，但到目前为止几乎没有这方面的证据。

虽然中国经常被描述为一个无情的债权国，但该研究发现，自2000年以来，中国至少进行了140次外债重组和减计。此外，中国的海外贷款高峰可能很快就会过去。中国的经济增长与资本外流密切相关。随着中国经济放缓，它的放贷大潮可能会消退。 ■



Free exchange

Yellen's unlikeliest student

How a victim of the Cultural Revolution mastered economics

THE STUDENTS embarking on an economics doctorate at the University of California, Berkeley, this autumn face a daunting obstacle: Econ 201A, a course in microeconomic theory inflicted on all new recruits. Over 16 weeks they must acquaint themselves with some of the most formalised parts of economics, including Houthakker's Axiom, the Slutsky matrix and Afriat's Theorem. According to one instructor, between five and seven class members (out of 20 to 25) usually receive a grade of B- or worse.

But anyone losing heart should take inspiration from a past student, Weijian Shan. He tried the course in 1982 after becoming one of America's first PhD students from communist China. As he recounts in "Out of the Gobi", his memoir published earlier this year, he had not taken a mathematics class beyond the age of 12. His faculty adviser, Janet Yellen, who would later chair the Federal Reserve, and George Akerlof, who would later win a Nobel prize, worried that the difficulties of Econ 201A would be "insurmountable".

Mr Shan, however, had already surmounted more than most. After his schooling was cut short in 1966 by the Cultural Revolution, he was "sent down" to the countryside, like millions of other city kids. He joined a Construction Army corps in the Gobi desert, trying to create farms out of salty clay in a "place that birds don't care to shit". They dug ditches, made bricks and harvested wheat, three of the four most tiring things in the world, according to one squad member. (The fourth was sex, which they were spared.)

His march to Berkeley was long. He arrived in the Gobi knowing only a few

sayings and slogans in English (“Long live Chairman Mao”). But in 1975 he was chosen by his peers and bosses to study the language in Beijing. He won nomination only after first ingratiating himself with his company by memorising the official rules and referee signals of volleyball, which made him a respected referee of platoon matches. The English he learnt in Beijing helped him win an Asia Foundation scholarship to study in America after it restored formal diplomatic ties with China in 1979. Having earned an MBA in a year at the University of San Francisco, he embarked on his PhD at Berkeley’s business school.

In his study of economics Mr Shan had one or two things going for him. Economics is the science of scarcity, a subject with which he had intimate acquaintance. Deep in the Gobi, a day’s walk from their settlement, half a box of matches could cost 50kg of potatoes. When Americans dismiss something as “bullshit”, Mr Shan recalls the patties of cow dung they used to treasure as fuel.

The construction corps taught him other economic concepts, such as “value-added” and its opposite: their company turned 750,000kg of seeds into just 70,000kg of grain. He experienced the power of the division of labour. Even with the utmost industry his team could make only 200 bricks per person in a day if they each mixed, moulded and moved the materials. But by dividing those tasks between them they could make two-thirds more. He also learnt the value of capital. His platoon could have made 20,000 bricks per day with a simple mixing machine, but no one would provide the 3,000 yuan (about \$1,300 at the official exchange rate) to buy it. Mr Shan wonders if he was the first hard labourer with “such a burning desire to be exploited by capital”.

Mr Shan’s educational resurgence was nonetheless remarkable. Even by 1990 just 0.4% of Chinese born in 1951-55 held a university degree (see chart). The Cultural Revolution was like a mad natural experiment,

depriving some people of a university education for reasons unrelated to their ability. Their loss has thus helped economists calculate the worth of a college education, which is otherwise difficult to estimate because college-goers are often more able than other people, even before they get there. According to a study in 2015 by John Giles of the World Bank, Albert Park of the Hong Kong University of Science and Technology, and Meiyang Wang of the Chinese Academy of Social Sciences, about three-quarters of the returns to college in China reflect the skills and credentials that universities confer. But a quarter reflects the intrinsic abilities of the people they admit. Mr Shan's education yielded a rich harvest. But he was also an unusually good seed.

One benefit of university is guidance. Mr Shan's efforts to educate himself in the desert lacked system or direction. He retreated to a pigs' kitchen, where vegetable roots, skins and leaves were boiled, to read whatever he could find: an aviation magazine, Mao's speeches, a pesticide manual. For this reason, he feels his "little house of knowledge is built on sand". (The vastly more privileged students of today can also struggle to study systematically, because of the surfeit of claims on their attention. Their houses can be dangerously top-heavy.)

Mr Shan enjoyed Econ 201A, eventually. But he had to abandon his first attempt, returning only after taking the mathematics class that Ms Yellen and Mr Akerlof had recommended. The maths textbook was over 400 pages long. He read it seven times. "I would have enjoyed studying in a more leisurely manner," he writes, but "I had so much ground to make up."

He followed his PhD with a brief stint at the World Bank and a longer one as a professor at Wharton Business School. He founded the *China Economic Review* (which in 1990 published an article by a 32-year-old Yi Gang, now head of China's central bank), then entered finance, becoming a big shot

in private equity at Newbridge Capital. During long negotiations in hotel conference rooms he would marvel at the luxury of round-the-clock room service. His colleagues would tell him to shut up and gain some weight.

After the Cultural Revolution ended in 1976 and reforms began, Mr Shan, like his country, had a lot of potential—and a lot of ground to make up. Since then they have both been compelling examples of convergence. When capital, of the human or physical variety, is scarce, the returns to investment can be high. And after the rigours of the past both were accustomed to the deferred gratification that heavy investment requires. The man who eventually mastered Econ 201A is an economics lesson in himself. ■ ■



自由交流

耶伦最不可思议的学生

一名文革受害者如何掌握了经济学

今年秋天，在加州大学伯克利分校开始攻读经济学博士的新生们都面对一道令人生畏的坎——所有新生必修的微观经济学理论课程“Econ 201A”。他们必须在16周的时间里熟悉霍撒克公理（Houthakker's Axiom）、斯勒茨基矩阵（Slutsky matrix）和阿弗雷特定理（Afriat's Theorem）等经济学中一些最形式化的内容。一位教师说，在20到25人的班级中，通常有五到七人这门课的成绩为B-或以下。

但是，每一名丧失信心的学生都应该从他们的学长单伟建那里得到鼓舞。1982年，作为首批从新中国来到美国的博士生之一，单伟建试着修了这门课。他在今年早些时候出版的回忆录《走出戈壁》（Out of the Gobi）中叙述到，12岁以后自己就没再上过数学课。他当年的导师们担心，Econ 201A的难度对单伟建来说是“无法战胜的”。这两位导师包括后来担任美联储主席的珍妮特·耶伦（Janet Yellen）和后来拿到诺贝尔奖的乔治·阿克洛夫（George Akerlof）。

但单伟建在那会儿已经比大多数人都战胜了更多困难。1966年，他因文化大革命而中断学业，像上百万其他城市孩子一样被“下放”到农村。他加入了戈壁滩上的一个生产建设兵团，试图在一个“鸟不拉屎的地方”把盐碱地变成农场。同班组的一个人说，世上最累人的四桩活计他们包揽了三桩——挖沟、制砖和割麦（他们被豁免了第四桩：性爱）。

单伟建前往伯克利的路很漫长。初到戈壁时，他只会几句英语的语录和口号（如“毛主席万岁”）。但在1975年，他被同伴和领导推选去北京学英语。他之所以会得到这个名额，靠的是先熟记排球的比赛规则和裁判手势，成为连队比赛时受人敬重的裁判员，受到大家的欢迎。1979年中美正式恢复外交关系后，他在北京学到的英语让他获得了亚洲基金会的奖学

金，前往美国深造。在旧金山大学学习一年并获得MBA学位后，他开始在伯克利的商学院攻读博士学位。

单伟建学习经济学有一两个有利条件。经济学是研究稀缺性的科学，而单伟建对稀缺是有切身体会的。在距离他们住所步行一天路程的戈壁深处，可能要用50公斤土豆才能换到半盒火柴。当听到美国人将不屑一顾的东西斥为“牛粪”时，单伟建就会想起那些能做燃料而被他们当作宝贝的牛粪团。

生产建设兵团还教给了单伟建“增值”、“减值”等其他一些经济学概念。比如，他们连队曾经播种了75万公斤种子，只收获了7万公斤粮食。他感受到了分工的重要性。如果每个人既要搅拌、浇铸，又要搬运材料的话，即使尽最大的努力，他们组每人每天也只能生产200块砖。但是通过分工协作，他们可以将产量提高三分之二。他还了解到了资本的价值。如果有一台简易搅拌机，他所在的排每天就能生产2万块砖，但没有人会拿出3000元人民币来买机器。单伟建寻思自己是不是第一个“如此强烈渴望受资本剥削”的苦工。

尽管如此，单伟建重续学业的经历仍然非同寻常。即使到1990年，1951到1955年间出生的中国人中也只有0.4%拥有大学学历（见图表）。文化大革命就像一场疯狂的自然实验，剥夺了一些人上大学的机会，不管他们有没有这个能力。这些人遭受的损失帮助了经济学家计算大学教育的价值。这种价值原本很难估算，因为能上大学的人往往比其他人更能干，甚至在上大学之前就已经是这样。2015年世界银行的约翰·贾尔斯（John Giles）、香港科技大学的阿尔伯特·帕克（Albert Park）和中国社会科学院的王美艳所做的研究显示，在中国，大学教育的回报中有四分之三来自所学的技能和获得的资历，另外四分之一来自入学前就固有的能力。单伟建所受的教育取得了丰硕的成果，但他本身也是棵不可多得的好苗子。

大学的好处之一是提供指导。单伟建在戈壁中的自学缺乏系统性或目标性。他躲到煮猪食（菜根、菜皮和菜叶等）的厨房里阅读能找到的任何东

西：一本航空杂志、毛主席语录和杀虫剂手册。因此，他觉得他的“知识小屋是在沙子上建立起来的”。（如今那些条件优越得多的学生也可能难以系统地学习，因为分散他们注意力的东西太多了。他们的“知识小屋”头重脚轻，很是危险。）

单伟建最终掌握了“Econ 201A”。不过他在第一次尝试时不得不中途放弃，在上了耶伦和阿克洛夫推荐的数学课之后才又开始重学这门课。那本厚达400多页的数学课本他读了七遍。“我本可以享受一种更从容的学习方式，”他写道，但是“我要补的东西太多了。”

获得博士学位后，他曾短暂地在世界银行工作，之后在沃顿商学院担任教授的时间更久些。他创办了《中国经济评论》（China Economic Review。1990年该刊物曾发表现任中国人民银行行长、时年32岁的易纲的文章），然后进入金融界，供职于新桥资本（Newbridge Capital），成了私募股权大腕。在酒店会议室展开长时间谈判时，他曾为24小时客房服务的奢侈惊叹，他的同事则叫他少说多吃，长胖些。

1976年文化大革命结束、中国开始实行改革开放后，单伟建和他的祖国一样，既有巨大的潜力，又有很大的差距要追赶。从那以后，两者都成了“收敛”现象的有力例证。当人力资本或各种物质资本稀缺时，投资回报会很高。而在经历了过去的艰辛后，两者都习惯了高投资所需的延迟满足。单伟建这个最终精通了“Econ 201A”的人本身就是一门经济学课程。■



Space exploration

The next 50 years in space

A new age of space exploration is beginning. It will need the rule of law and a system of arms control to thrive

THE MOMENT when, 50 years ago, Neil Armstrong planted his foot on the surface of the Moon inspired awe, pride and wonder around the world. This newspaper argued that “man, from this day on, can go wheresoever in the universe his mind wills and his ingenuity contrives...to the planets, sooner rather than later, man is now certain to go.” But no. The Moon landing was an aberration, a goal achieved not as an end in itself but as a means of signalling America’s extraordinary capabilities. That point, once made, required no remaking. Only 571 people have been into orbit; and since 1972 no one has ventured much farther into space than Des Moines is from Chicago.

The next 50 years will look very different. Falling costs, new technologies, Chinese and Indian ambitions, and a new generation of entrepreneurs promise a bold era of space development. It will almost certainly involve tourism for the rich and better communications networks for all; in the long run it might involve mineral exploitation and even mass transportation. Space will become ever more like an extension of Earth—an arena for firms and private individuals, not just governments. But for this promise to be fulfilled the world needs to create a system of laws to govern the heavens—both in peacetime and, should it come to that, in war.

The development of space thus far has been focused on facilitating activity down below—mainly satellite communications for broadcasting and navigation. Now two things are changing. First, geopolitics is stoking a new push to send humans beyond the shallows of low-Earth orbit. China

plans to land people on the Moon by 2035. President Donald Trump's administration wants Americans to be back there by 2024. Falling costs make this showing off more affordable than before. Apollo cost hundreds of billions of dollars (in today's money). Now tens of billions are the ticket price.

Second, the private sector has come of age. Between 1958 and 2009 almost all of the spending in space was by state agencies, mainly NASA and the Pentagon. In the past decade private investment has risen to an annual average of \$2bn a year, or 15% of the total, and it is set to increase further. SpaceX, Elon Musk's rocket firm, made 21 successful satellite launches last year and is valued at \$33bn. Jeff Bezos, the founder of Amazon, sells off \$1bn-worth of his shares in the company each year to pay for Blue Origin, a space venture. Virgin Galactic plans to go public this year at a valuation of \$1.5bn. As well as capital and ideas, the private sector provides much greater efficiency. According to NASA, developing SpaceX's Falcon rockets would have cost the agency \$4bn; it cost SpaceX a tenth of that.

Two new commercial models exist or are within reach: the big business of launching and maintaining swarms of communications satellites in low orbits and the niche one of tourism for the rich. The coming year will almost certainly see Virgin and Blue Origin flying passengers on sub-orbital excursions that offer the thrill of weightlessness and a view of the curved edge of Earth against the black sky of space. Virgin claims it might carry almost 1,000 wealthy adventurers a year by 2022. SpaceX is developing a reusable "Starship" larger and much more capable than its Falcons. Yusaku Maezawa, a Japanese fashion mogul, has made a down-payment for a Starship trip around the Moon; he intends to go with a crew of artists as early as 2023.

Such possibilities could see the annual revenues of the space industry double to \$800bn by 2030, according to UBS, a bank. Still further in the

future, space development could remake how humanity lives. Mr Musk hopes to send settlers to Mars. Mr Bezos, the richest man in the world, wants to see millions of people making a living on space stations, perhaps before Armstrong's footprint marks its centenary.

At a time when Earth faces grim news on climate change, slow growth and fraught politics, space might seem to offer a surprising reason for optimism. But it is neither a panacea nor a bolthole. And to realise its promise, a big problem has to be resolved and a dangerous risk avoided. The big problem is developing the rule of law. The Outer Space Treaty of 1967 declares space to be "the province of all mankind" and forbids claims of sovereignty. That leaves lots of room for interpretation. America says private firms can develop space-based resources; international law is ambiguous.

Who would have the best claim to use the ice at the poles of the Moon for life support? Should Martian settlers be allowed to do what they like to the environment? Who is liable for satellite collisions? Space is already crowded—over 2,000 satellites are in orbit and NASA tracks over 500,000 individual pieces of debris hurtling at velocities of over 27,000km an hour.

Such uncertainties magnify the dangerous risk: the use of force in space. America's unparalleled ability to project force on Earth depends on its extensive array of satellites. Other nations, knowing this, have built anti-satellite weapons, as America has itself. And military activity in space has no well-tested protocols or rules of engagement.

America, China and India are rapidly increasing their destructive capabilities: blinding military satellites with lasers, jamming their signals to Earth or even blowing them up, causing debris to scatter across the cosmos. They are also turning their armed forces spaceward. Mr Trump plans to set up a Space Force, the first new branch of the armed forces since the air force was created in 1947. On the eve of the annual Bastille

Day military parade on July 14th Emmanuel Macron, France's president, also announced the formation of a new space command.

It is a mistake to promote space as a romanticised Wild West, an anarchic frontier where humanity can throw off its fetters and rediscover its destiny. For space to fulfil its promise governance is required. At a time when the world cannot agree on rules for the terrestrial trade of steel bars and soyabeans that may seem like a big ask. But without it the potential of all that lies beyond Earth will at best wait another 50 years to be fulfilled. At worst space could add to Earth's problems. ■



太空探索

太空未来50年

太空探索开启新时代，需要法治与军控系统才能繁荣发展

五十年前尼尔·阿姆斯特朗（Neil Armstrong）在月球上留下脚印的那一刻引发了全世界的敬畏、骄傲和惊叹。本报曾撰文道：“从今天开始，人类可以依自己的心愿、凭自己的才智，走进宇宙的任意角落……人类必然能登上各个星球，今天看来无需长久等待。”但事实并非如此。那次登月是非常规行动，目标并非登月本身，而是要彰显美国的强大实力。这一点一旦表明，便无需再重复。迄今为止，全球只有571人进入过轨道；自1972年以来，人类深入太空的距离不比从得梅因到芝加哥远多少。

未来50年的情况看起来将大不一样。成本下降，新技术出现，中国和印度雄心勃勃，新一代企业家涌现，都预示着一个太空开发大胆开拓的新时代。几乎可以肯定的是，这将让富人实现太空旅游，为大众带来更好的通信网络；长远而言，还可能涉及矿产开采甚至大众运输。太空将变得更像是地球的延伸——不仅仅是政府的竞技场，也有企业和私人力量的较量。但要实现这些美好愿景，世界需要建立一套法律体系来管理太空，无论是在和平时期，还是在万一发生战争时。

迄今为止，人类向太空的拓展一直侧重于服务地球上的活动——主要是用于广播和导航的卫星通信。如今，两个方面正在发生变化。首先，地缘政治正助力推动人类的太空探索超越近地轨道的“浅滩”，向深空进发。中国计划在2035年前实现载人登月。特朗普政府希望美国人能在2024年再次踏上月球。因为成本下降，这类耀武扬威的代价较以往更能承受。按现值计算，当年的阿波罗计划耗资数千亿美元，现在只要几百亿美元。

其次，私营部门已经有能力参与进来。从1958年至2009年，几乎所有太空项目的支出都来自国家机构，主要是美国国家航空航天局（以下简称NASA）和五角大楼。过去十年里，私人投资已经增至平均每年20亿美

元，占总投资的15%，并且还将进一步上升。去年，伊隆·马斯克的火箭公司SpaceX成功完成了21次卫星发射，市值达330亿美元。亚马逊的创始人杰夫·贝佐斯每年出售自己持有的10亿美元公司股票，用于支持太空探索公司蓝色起源（Blue Origin）。维珍银河（Virgin Galactic）计划今年上市，估值为15亿美元。除了资本和创意，私营部门在效率方面高出一大截。NASA表示，它开发SpaceX那样的猎鹰火箭要花40亿美元，但SpaceX只花了十分之一。

目前有两种新商业模式已经建立或即将实现：向低轨道上发射并维护大量通信卫星的庞大业务，以及富人太空游的利基市场。几乎可以肯定，未来的一年里我们会看到维珍银河和蓝色起源开展亚轨道载客旅行，让旅客体验失重的刺激，以及看到黑暗太空衬托下的地球弧形边缘。维珍银河声称到2022年每年或可运送近1000名富有探险者。SpaceX正在开发一种可重复使用的“星际飞船”，体积比其猎鹰火箭更大，性能强得多。日本时尚大亨前泽友作已经为一艘绕月星际飞船支付了定金，计划最早于2023年和一群艺术家一起飞行。

根据瑞银的数据，这样的前景有望让航天业的年收入在2030年翻一番，达到8000亿美元。在更长远的未来，太空开发可能重塑人类的生活方式。马斯克希望往火星移民。世界首富贝佐斯希望日后有数百万人在太空站生活，也许在阿姆斯特朗登月百年纪念日之前就能做到。

在地球面对气候变化、经济增长放缓和政治令人不安等各种坏消息之际，太空似乎成了一种出人意料的乐观的理由。但它既非万能药，也非避难所。而要实现期望，必须解决一个大问题，避免一个大风险。这个大问题是建立法治。1967年生效的《外层空间条约》宣布太空为“全人类的领地”，禁止提出主权要求。该条约的解释余地很大。美国称私营企业可以开发太空资源，国际法也模棱两可。

谁最有资格使用月球两极的水冰用于生命支持？应该允许火星移民者按自己的意愿改造火星环境吗？谁该对卫星碰撞负责？太空已经拥挤——超过2000颗卫星在轨道上运行，此外NASA发现有超过50万块空间碎片正以超

过每小时27,000公里的速度绕地飞行。

这些不确定性强化了一大风险：太空动武。在地球上，美国无可比拟的军事投送能力依赖其广泛的卫星网络。其他国家了解到这一点，已经部署了反卫星武器，美国自己也一样。而太空军事活动并没有经验证的协议或交战规则。

美国、中国和印度都在迅速加强毁灭能力：用激光致盲军事卫星，干扰其发往地球的信号，甚至将其炸毁，导致碎片散布在宇宙中。这些国家还在发展太空武装。特朗普计划建立一支太空部队，这是自1947年空军成立以来美军的第一个新分支。7月14日法国国庆日阅兵的前一天，法国总统马克龙也宣布成立新的太空司令部。

把太空浪漫推崇为又一个“狂野西部”是错误的。太空并非什么供人类摆脱束缚、改天换命的无政府主义前沿世界。要实现人们对太空的美好愿景需要治理规则。在地球上连钢筋和大豆的贸易规则都难达成一致的时候，这似乎要打上一个巨大的问号。但如果失去规则，对地球之外所有探索的潜力至少要再等50年才能实现。而最坏的情况则是，太空会加剧地球的问题。 ■



Lunar exploration

Apollo's sister

There is renewed interest in returning people to the Moon. This time it might actually happen

ON MARCH 26TH Mike Pence, America's vice-president, gave a speech at the US Space & Rocket Centre in Huntsville, Alabama, in which he told his audience that he was bringing forward, "by any means necessary", the target date for America to send astronauts back to the Moon. The previous deadline had been 2028. It was now 2024. Then, on May 13th, NASA's administrator Jim Bridenstine gave the reinvigorated project a name. It will be called "Artemis", after Apollo's twin sister, the ancient Greek goddess of the Moon. Following this, on July 10th, Mr Bridenstine moved two long-standing managers of NASA's human space flight programme to other duties, writing in his memo, "In an effort to meet this challenge, I have decided to make leadership changes to the Human Exploration and Operations (HEO) Mission Directorate."

The timing of all this is surely no coincidence. On July 21st it was exactly 50 years since Neil Armstrong fluffed his lines at the culmination of the original Moon programme—his "small step" off Apollo 11's lunar module, *Eagle*, onto the regolith of the Sea of Tranquillity. America abandoned Moon shots 41 months later, and attempts to revive them have never appeared convincing. But Artemis looks not unlike the real deal. For one thing, its arrival on the Moon will now fall conveniently within the second term of office of Mr Pence and his boss, Donald Trump, should they be re-elected in 2020. It also helps that Artemis is recycling ideas salvaged from those previous attempts, notably the Constellation programme, unveiled in 2005 by George W. Bush and cancelled five years later by Barack Obama.

Nor will Artemis be alone. In matters lunar, something is stirring. China's space agency, though in less of a hurry than Mr Pence, also plans to land people on the Moon. Its target date is 2035. Other agencies, European, Indian, Japanese and Russian, intend to bombard the place with robot probes. And private enterprise is also seeking a share of the glory. In the mind of Johann-Dietrich Wörner, head of the European Space Agency, there is a sense of community among these ventures, giving rise to what he calls a "Moon village".

Some, indeed, would go further, and convert this village from a metaphor into a reality. People like Robert Zubrin, a prominent American evangelist for manned space flight, think that this time around there should be no namby-pamby messing about with tip-and-run missions like Apollo. A Moon base should be the objective from the beginning.

It could be built quickly, according to a blueprint Dr Zubrin, an aerospace engineer, published in a book called "The Case for Space". It would be at one of the lunar poles, where mountain tops in near-perpetual sunlight could house solar-energy farms, and craters in everlasting shadow contain ice from billions of years of comet impacts. This ice could supply drinking water. It could also, if its molecules were split by electricity from the mountain tops, provide oxygen for breathing, and hydrogen and further oxygen for rocket fuel.

Dr Zubrin's back-of-the-envelope calculations suggest his base would cost about \$7bn, and take seven years to develop and build. Thereafter, it would need \$250m a year to sustain it. NASA, however, has other plans. Though Artemis does require a base of sorts, that base will not be on the Moon. Instead, it will be an intermittently crewed space station, the *Lunar Orbital Platform—Gateway* (depicted, about to dock with a supply vessel, in an artist's impression below) that is in orbit around the Moon.

Artemis will work like this. Its crewed vehicle, Orion, is a version of a craft originally designed for the now-abandoned Constellation project. Similarly, the rocket which will lift Orion, the Space Launch System (SLS), is a cut-down version of Constellation's heavy lifter, Ares V. Orion's destination will be *Gateway*. Two of its four crew will stay on the station while the others descend to the surface in a special lunar shuttle, do their stuff, then return to *Gateway* and thence to Earth, leaving the station uncrewed until the next mission arrives.

If Congress approves the additional \$20bn-30bn for NASA's budget that Mr Bridenstine says the project will require over the next five years—a big “if”—Orion, the SLS and the lunar shuttle could all be ready and tested within Mr Pence's timetable. There is, however, the small matter of *Gateway* itself, for which existing plans involve all the partners of the International Space Station (ISS)—Europe, Russia, Japan and Canada, as well as America.

The first *Gateway* module is intended for launch in 2022 and subsequent components would go up in a series of missions using both commercial and SLS launches, until 2028. This means that, when Orion arrives at *Gateway* in 2024 with its Moon-bound astronauts, it will dock with a partially completed space station. There is no official cost for the *Gateway* project but, given the \$150bn price tag of the ISS, it would be a surprise if the lunar space station cost less than several tens of billions of dollars. In light of all this, Dr Zubrin's approach starts to look attractive.

As with the ISS, currently in orbit around Earth at an altitude of 400km, China is pointedly excluded from involvement in building *Gateway*. American law prevents NASA collaborating with the Chinese—something regretted by Wu Ji, a former director-general of China's National Space Science Centre who is now an adviser to the government.

In fact, says Dr Wu, China's main goal in space over the next decade is to

build a space station of its own in orbit around Earth. Development of a crewed Moon programme will probably begin in the mid-2020s. “By 2035, there will be a Chinese person landing on the Moon,” he says. But there is no rush. “We are not in competition with anybody. So we go step by step. So even if we land Chinese on the surface of the Moon by 2035, it’s still great.”

China has, however, already landed unmanned probes there. Its most recent mission, *Chang'e 4*, touched down on the lunar far side (the part never visible from Earth) in January. The next two probes in the series will be sample-return missions, and further craft will explore the Moon’s poles.

The launch of India’s second lunar mission, *Chandrayaan 2*, on July 22 will put a lander and a rover down near the south pole. India is also working with Japan’s space agency, JAXA, to develop a joint robotic mission. Russia, too, has plans. *Luna 25*, scheduled for 2021, will be another visitor to the south pole. And six more *Luna* missions—orbiters and landers—are intended to follow before the end of the decade.

From a scientific point of view, the Moon is not only of interest in its own right. It is also a museum of the solar system’s past. Its surface will probably be strewn with terrestrial rocks older than anything now preserved on Earth that were blasted into space aeons ago by asteroids colliding with that planet. It will also preserve clues about the sun’s history, the galactic environments that the solar system has encountered on its journey through space since its formation 4.6bn years ago, and the abundance in the early solar system of objects so large that their impact might have interfered with the emergence of life on Earth or elsewhere.

The Moon (or rather its far side) is also a good place to hide radio telescopes from the deluge of radio waves coming from Earth’s surface. There, they will be able to pick up signals that are otherwise swamped—particularly, radiation from the earliest days of the universe, which may encode details

of the origin of everything.

As to the Moon village's non-governmental members, these are led by the usual suspects of private space flight, Elon Musk (SpaceX) and Jeff Bezos (Blue Origin), both billionaires who hope that the Moon might one day be made to pay its way, but who would probably admit that the whole, giddy adventure of it, rather than the prospect of profit, is what truly drives them on.

SpaceX already has a contract for lunar tourism. Yusaku Maezawa, founder of Zozotown, Japan's largest online clothing retailer, wants to take a group of artists with him for a project he calls #dearMoon. This is a free-return-trajectory trip around the Moon (there and back again, passing behind the far side, but without going into orbit) that SpaceX says could happen as early as 2023 using the Starship spacecraft the firm is developing. If the SLS does not measure up, the Starship system might take on its job, too.

Blue Origin, meanwhile, recently unveiled a mock-up of its Blue Moon lunar lander. The company claims this would be able to deliver 3.6 tonnes of cargo to the Moon's surface. That is just the sort of thing Dr Zubrin would need to help construct his Moon base, but a more likely first mission for it would be as Artemis's lunar shuttle.

Besides the two behemoths, smaller fry are also involved in the Moon village's commercial side. One of these, Astrobotic, a firm in Pittsburgh, is developing an unmanned lunar lander it calls Peregrine. This will carry the Mexican Space Agency's first lunar payload.

Astrobotic is also one of three firms awarded contracts by NASA as part of its Commercial Lunar Payload Services programme. The other two are Intuitive Machines of Houston, Texas and OrbitBeyond of Edison, New Jersey. NASA wants these companies to help it survey various places on the Moon's

surface that might be suitable for building bases.

Even if Dr Zubrin does not get his way, then, there are likely, within decades, to be permanent human outposts on the Moon, frequented by scientists and tourists from many countries. The place will thus become something like Antarctica is today—hard to get to, but not impossible if you have the money or the right government backing. And, just as Antarctica is no longer enough in the eyes of those who look to explore new frontiers, so, in the minds of some, the residents of these actual Moon villages will be testing human endurance, psychology and technology with a view to constructing an even more remote hamlet: on Mars. ■



月球探索

阿波罗的姐姐

人们对载人登月兴趣重燃。这次可能成真

三月26日，美国副总统彭斯在阿拉巴马州亨茨维尔市的美国太空火箭中心（US Space & Rocket Centre）发表讲话，表示正“采取任何必要手段”，让美国宇航员重返月球的时间提前。此前定下的截止期限是2028年，现在则是2024年。之后，5月13日，美国国家航空航天局（以下简称NASA）局长吉姆·布里登斯廷（Jim Bridenstine）给这个重新注入活力的项目起了个名字——“阿耳忒弥斯”（阿波罗的孪生姐姐，古希腊神话中的月亮女神）。接下来，7月10日，布里登斯廷把长期管理载人航天项目的两名NASA官员调至其他岗位。他在内部备忘录中写道：“为迎接挑战，我决定调整‘人类探索和行动任务委员会（HEO）’的领导层。”

这一切发生的时间绝非机缘巧合。7月21日是尼尔·阿姆斯特朗（Neil Armstrong）登月50周年纪念日。当年此时，在最早的登月项目的最高潮时刻，他走出阿波罗11号的“鹰”号登月舱，迈出了人类的“一小步”，踏上了月球“宁静海”的表面，口齿不清地说出了那句名言。41个月后美国关闭了登月计划，此后重启该项目的努力都流于空谈。而这次“阿耳忒弥斯”却似乎是动了真格的。一方面，假如彭斯和他的上司特朗普在2020年再次当选，那么“阿耳忒弥斯”登月将如愿发生在他们的第二个任期内。另一个有利方面是，“阿耳忒弥斯”正重新利用从先前的项目中挽救回来的理念，特别是由小布什于2005年开启但五年后被奥巴马取消的“星座计划”（Constellation）。

“阿耳忒弥斯”并不孤独。在登月方面大有群情涌动之势。中国国家航天局虽不像彭斯那样急切，但也在计划载人登月，时间定在2035年。欧洲、印度、日本和俄罗斯等国的航天机构则纷纷计划向月球发射机器人探测器。私营企业也想分享荣光。在欧洲空间局局长约翰-迪特里希·沃纳（Johann-Dietrich Wörner）看来，这些探月行动带有一种社群感，形成了他所说的

“月球村”。

有些人甚至还会更进一步，把这个村落由比喻变为现实。美国著名的载人航天倡导者罗伯特·祖布林（Robert Zubrin）等人认为，这次的登月行动应该不会像“阿波罗”项目那样浅尝辄止却又煽情渲染。从一开始，目标就应该是建立一个月球基地。

航天工程师祖布林在《奔向太空》（The Case for Space）一书中勾画出了一幅蓝图，认为月球基地很快就可建成。基地将位于月球的一个极地，那里的山顶几乎一直受阳光照射，可以建造太阳能电厂，而永久黑暗的撞击坑内则有数十亿年来因彗星撞击形成的水冰，可用作饮用水源。若用山顶电厂的发电来电解这些水的分子，还可产生氧气供人类呼吸，并产生氢气和更多氧气作为火箭燃料。

祖布林粗略计算出，开发建造他设想的月球基地将耗资约70亿美元，耗时七年，此后每年还需2.5亿美元的维护费用。然而，NASA另有计划。虽然“阿耳忒弥斯”确实需要某种基地，但不会建在月球上。它将是一个间歇有人入驻的月球轨道空间站，叫做“月球轨道平台—门户”（Lunar Orbital Platform—Gateway，以下简称“门户”）。如一位画家在下图描绘的，空间站准备与补给船对接）。

“阿耳忒弥斯”就将这样运作。其载人舱“猎户座”（Orion）是已废弃的“星座计划”中设计的飞船的改版。同样，将运载“猎户座”升空的火箭“太空发射系统”（Space Launch System，以下简称SLS）也是“星座计划”中的重型运载火箭战神五号（Ares V）的缩减版。“猎户座”的目的地将是“门户”空间站。四名宇航员中的两人将留在空间站内，另外两人将乘坐专门的月球穿梭飞船降落到月球表面，执行任务，然后返回“门户”，再返回地球。之后空间站将无人值守，直至下一次宇航员到来。

布里登斯廷表示，未来五年NASA的这一项目还需要200到300亿美元的预算，如果国会批准（变数很大），“猎户座”、SLS和月球穿梭飞船都可以按彭斯的时间表准备就绪并进行测试。然而，“门户”存在一个小问题：其

现有计划涉及国际空间站（ISS）的所有合作伙伴，除了美国，还有欧洲、俄罗斯、日本和加拿大。

“门户”的首个模块计划于2022年发射，后续的部分将通过商业公司和SLS发射，直至2028年完成。也就是说，当“猎户座”在2024年载着登月宇航员到达“门户”时，对接的是仅部分完工的空间站。官方尚未公布“门户”项目的成本，但鉴于国际空间站1500亿美元的造价，月球空间站的成本应该不会低于数百亿美元。这么算来，祖布林的方案就显现出了吸引力。

与目前在400公里高空的绕地轨道上运行的国际空间站一样，“门户”的建造也明确地把中国排除在外。美国法律禁止NASA与中国合作，这令曾任中科院国家空间科学中心主任、现任政府顾问的吴季感到遗憾。

吴季表示，事实上，未来十年中国太空发展的主要目标是在地球轨道上建立自己的空间站。载人登月计划可能会在2020年代中期启动。“到2035年，将有一名中国人登陆月球。”他说。但这件事不急。“我们没在跟谁竞争，可以一步一步地走。所以，即便是到2035年才有中国人登月，也是很棒的。”

然而，中国的无人探测器已经登陆了月球。最近的一次是今年1月“嫦娥四号”于月球背面（从地球上永远看不到的部分）着陆。接下来，“嫦娥”系列的另外两个探测器将执行月面采样返回任务，之后还会有其他飞船探索月球两极。

印度登月项目的第二个任务“月船二号”（Chandrayaan 2）于本月22日成功发射，将在月球南极附近降落着陆器及探测器。印度还在与日本宇宙航空研究开发机构（JAXA）合作发展机器人登月项目。俄罗斯也有计划，其“月球25号”（Luna 25）计划于2021年成为另一登陆月球南极的访客。俄罗斯“月球”项目的另外六项探索任务（轨道飞行器及着陆器）将在2020年代陆续开展。

从科学角度来看，不只月球本身值得研究，它还是太阳系的一座历史博物馆。它的表面可能散布着数十亿年前小行星撞击地球后飞溅至太空的地表

岩块，比地球现存的都要古老。月球还保存了大量线索，有助人们了解太阳的历史，探究太阳系自46亿年前形成以来所经历的银河系环境，并揭示早期太阳系中存在的大量大型天体，它们的影响可能干扰了生命在地球或其他地方的出现。

月球（更确切地说是它的背面）也是安装射电望远镜的好地方，那里可免受地球表面大量无线电波的干扰。在那里，它们将可接收到通常会被淹没的信号，特别是来自宇宙最早期的辐射，这些辐射信号可能包含宇宙一切起源的细节。

至于“月球村”的非政府成员，诚如所料，领头的正是私人太空飞行的探索者——伊隆·马斯克（SpaceX）和杰夫·贝索斯（Blue Origin，蓝色起源）。这两位亿万富翁都希望探月飞行最终能成为盈利项目。但他们大概会承认，真正驱使他们投入其中的是太空探险的那份刺激，而非盈利。

SpaceX已经得到了一份月球旅游合同。日本最大的服饰电商Zozotown的创始人前泽友作希望带领一群艺术家参与他所谓的“#亲爱的月亮”（#dearMoon）的项目。这是一次“自由返回轨迹”的绕月旅行，即飞往月球然后返回，途中经过其背面，但不进入月球轨道。SpaceX表示他们最快在2023年便可搭乘公司正在开发的“星际飞船”（Starship）踏上这一旅程。假如美国的SLS系统未能如期建成，这一“星际飞船”系统也可能接过其任务。

与此同时，蓝色起源最近公开了其“蓝月”月球着陆器（Blue Moon）的模型。该公司声称此着陆器将能向月球表面运送3.6吨货物。这正是祖布林建造月球基地所需的那类工具，但它的首个任务更可能是为“阿耳忒弥斯”充当月球穿梭飞船。

除了这两家巨头外，一些较小的企业也参与了月球村的商业发展。其中一家是匹兹堡的航天机器人公司Astrobotic，它正在开发一款名为“游隼”（Peregrine）的无人月球登陆器，将运载墨西哥航天局的首个月球有效载荷。

Astrobotic也是获得NASA商业月球有效载荷服务（Commercial Lunar Payload Services）合同的三家公司之一。另两家是得克萨斯州休斯顿的Intuitive Machines和新泽西州爱迪生市的OrbitBeyond。NASA希望这些公司帮助它探寻月球表面可能适合建造基地的多个地点。

即使祖布林的方案未能如愿实现，几十年内，月球上也很可能会建成各国科学家和游客可频繁前往的永久性前哨站。因此，月球将变得像今天的南极洲一样——去一趟不容易，但如果有足够的资金或政府的恰当支持，也并非不可能。而正如南极洲已无法满足那些探索新疆域的人们那样，在一些人心中，这些月球上实体村落的居民将测试人类的耐力、心理以及技术，为的是在更遥远的地方建造村落：到火星去。■



Brain-machine interfaces

A scent of Musk

The boss of Tesla and SpaceX wants to link brains directly to machines

ELON MUSK, perhaps the world's most famous entrepreneur, is sometimes referred to as "the Trump of technology"—not for political reasons, but because of his habit of making, at short notice, spectacular pronouncements that stretch the bounds of credibility. On July 16th he was at it again, unveiling a new type of brain-machine interface (BMI). If human beings do not enter a symbiosis with artificial intelligence (AI), he declared, they are sure to be left behind. And he, the announcement implied, was going to be the man who stopped that happening.

Connecting brains directly to machines is a long-standing aspiration. And it is already happening, albeit in a crude way. In deep-brain stimulation, for example, neurosurgeons implant a few electrodes into a patient's brain in order to treat Parkinson's disease. Utah arrays, collections of 100 conductive silicon needles, are now employed experimentally to record brain waves. A team at the University of Washington has built a "brain-to-brain network" that allows people to play games with each other using just their thoughts. And researchers at the University of California, San Francisco, have captured neural signals from people as they talk, and have then turned that information, via a computer, into intelligible speech.

As with all things Musk-related, Neuralink is much more ambitious. The firm does not just want to develop a better BMI. Its aim is to create a "neural lace", a mesh of ultra-thin electrodes that capture as much information from the brain as possible. Unsurprisingly, hurdles abound. The electrodes needed to do this must be flexible, so that they do not damage brain tissue and will also last for a long time. They have to number at least in the

thousands, to provide sufficient bandwidth. And to make the implantation of so many electrodes safe, painless and effective, the process has to be automated, much like LASIK surgery, which uses lasers to correct eyesight.

Neuralink does indeed seem to have made progress towards these goals. Its presentation, at the California Academy of Sciences, in San Francisco, included videos of a neurosurgical robot that is best described as a sewing machine. This robot grabs “threads” (films, containing electrodes, that measure less than a quarter of the diameter of a human hair), and shoots them deep into the brain through a hole in the skull. It is capable of inserting six threads, each carrying 32 electrodes, per minute. The firm has also designed a chip that can handle signals from as many as 3,072 electrodes—30 times more than current systems—and transmit them wirelessly.

The real magic, however, kicks in only when the output is analysed—which happens in real time. Looked at superficially, neurons in the brain seem to fire at random. Software can, though, detect patterns when the individual those neurons are in does certain things. Stick enough electrodes into someone’s motor cortex, for instance, and it is possible to record what happens in the brain when he types on a keyboard or moves a mouse around. Those data can then be used to control a computer directly. Conversely, the electrodes can be employed to stimulate neurons, perhaps to give the person in question the feeling of touching something.

Neuralink has already tested its system successfully on rats and monkeys. These were, it says, able to move cursors on screens with it. The firm now hopes to work with human volunteers, perhaps as early as next year should America’s Food and Drug Administration play along.

The first goal is to use the technology to help people overcome such ailments as blindness and paralysis. Neuralink is, however, clearly aiming

for a bigger market than this. It has also designed a small device that would sit behind someone's ear, picking up signals from the implanted chip and passing them on as appropriate. In a few years, using a brain implant to control your devices may be as *de rigueur* among San Francisco's technochics as wearing wireless earbuds is today. Ultimately, Mr Musk predicts, neural lace will allow humans to merge with AI systems, thus enabling the species to survive.

Though, as this announcement shows, Mr Musk does have a habit of presenting himself as the saviour of the human race (his desire to settle Mars seems motivated partly by fear of what might, in the future, happen to Earth), the idea that some machines at least will come under the direct control of human brains seems plausible. The biggest obstruction to this happening will probably not be writing the software needed to interpret brainwaves, but rather persuading people that the necessary surgery, whether by sewing machine or otherwise, is actually a good idea. ■



脑机接口

马斯克风味

特斯拉和SpaceX的老板想将人脑与机器直接连接

也许是世界上最著名的企业家的伊隆·马斯克有时被称作“科技界的特朗普”。这倒不是因为什么政治原因，而是因为他经常突然发出匪夷所思的惊人声明。7月16日他再度发声，宣布推出一种新型脑机接口（BMI）。他宣称，如果人类不能与人工智能（AI）共生，就必定会被它超越。声明暗示，他将成为阻止这种情况发生的人。

将大脑与机器直接相连是很多人长久以来的愿望。现在这已在成为现实，尽管还很初级。例如在深部脑刺激中，神经外科医生将少量电极植入患者大脑以治疗帕金森病。现在，在实验中，研究人员用由100个针状硅电极组成的犹他电极阵列记录脑电波。华盛顿大学的一个团队建立了一个“脑对脑网络”，让人们仅通过意念沟通来合作打游戏。加州大学旧金山分校的研究人员在实验参与者谈话时捕获了他们的神经信号，然后通过计算机将这些信息转化为可理解的话语。

与和马斯克参与的所有事情一样，Neuralink公司的雄心绝不止于此。它要做的不仅是开发更好的BMI。它的目标是创造一个“神经蕾丝”，一个由超薄电极组成的网状结构，可以从大脑中捕获尽可能多的信息。前路自然障碍重重。所需的电极必须为柔性，才不会损伤脑组织，也能有较长的使用寿命。要提供足够的带宽需要至少成千上万个电极。为了确保这么多电极能够安全、无痛且有效地植入，整个过程必须像LASIK手术（用激光矫正视力）那样自动化。

Neuralink似乎确实在朝着这些目标迈进。它在位于旧金山的加州科学院（California Academy of Sciences）做展示时，播放了一台神经外科机器人的视频。用“缝纫机”来描述这台机器人最形象不过。它抓住“线”（由电极构成的薄膜，不到头发丝直径的四分之一），然后通过头骨上的一个洞

将它们插入大脑深处。缝纫机能够每分钟插入六根线，每根线携带32个电极。Neuralink还设计了一种芯片，可处理并无线传输多达3072个电极的信号（是现有系统的30倍）。

然而，真正的魔力只有在输出被分析后才能显现，而这种分析是实时发生的。从表面上看，大脑中的神经元似乎是随机活动的，但软件可以在人做某些事情时检测到这种神经元活动的模式。例如，将足够的电极粘在一个人的运动皮层上，就可以记录这个人在敲击键盘或移动鼠标时大脑中的活动。然后可以使用这些数据直接控制计算机。反之，也可以用电极去刺激神经元，比如让受试者产生摸到某样东西的感觉。

Neuralink已在老鼠和猴子身上成功测试了它的系统。它说老鼠和猴子能通过该系统移动屏幕上的光标。该公司现在希望与人类志愿者合作，一旦获得FDA批准，也许最早明年就能展开人体实验。

Neuralink的第一个目标是利用这项技术帮助人们战胜失明和瘫痪等疾病。然而，它显然还瞄准了更大的市场。它还设计了一种可以放在人耳后的微型设备，从植入的芯片中接受信号，再把它们恰当地传递出去。几年后，用大脑植入物来控制设备可能就像今天的无线耳塞那样，成为旧金山科技潮人的必备品。马斯克预测，最终神经蕾丝将让人类可与人工智能系统融合，确保人类的生存。

从这次声明可见，马斯克确实惯以人类救世主的形象示人（他殖民火星的渴望似乎在一定程度上源自对地球未来的遭遇的恐惧）。尽管如此，至少有些机器将受人脑直接控制的想法似乎是合理的。而要让这一点成为现实，最大的障碍可能不是编写能解释脑电波的软件，而是说服人们相信，为此接受必要的手术——无论是用“缝纫机”或其他方式——实则是个不错的主意。 ■



If antibiotics stop working

Attack of the superbugs: July 2041

How the world belatedly responded to antimicrobial resistance. An imagined scenario from 2041

AT THE CHAN ZUCKERBERG HOSPITAL in New York, Emma Jones beams a weak smile at her newborn son, cradled in her husband's arms. Ms Jones is recovering from a severe bacterial infection that she contracted during her Caesarean section. The infection had begun to shut down her organs; doctors put her in a coma and hooked her up to a breathing machine. "We didn't think she'd make it," says Rosa Velasquez, an infectious-disease specialist at the hospital. Ms Jones is lucky. She is one of a handful of people to have been treated with parvomycin, the first new antibiotic to become available since 2024. The few older antibiotics that are still in use today work only rarely. In 2040 antibiotic-resistant bacteria killed nearly 400,000 people in Europe and America—more than seven times as many as in 2015. In Africa and Asia, drug-resistant tuberculosis alone now kills nearly 2m people a year, ten times more than in the 2010s.

In Western countries the rise in deadly infections has been primarily in hospitals. Back when antibiotics still worked, they were used preventively in almost all operations. In 2015 surgical-wound infections occurred in less than 5% of cases for most types of operations in Europe; by 2040 the rate had leapt to nearly 30% for some operations. Caesarean sections, which at their peak made up one-third of births in America in 2019, are now carried out only when there is no other option.

Some hospitals no longer perform elective surgeries, such as hip and knee replacements, because so few patients are willing to take the risk of post-operative infection. But surgeons are busier with amputations, which have

nearly doubled in Europe in the past decade. The lack of effective antibiotics means that amputating a limb is sometimes the only way to treat an infected skin ulcer in a diabetic patient. At the Chan Zuckerberg Hospital, most heartbreaking are the paediatric wards. They are full of children recovering from amputations, many as a result of sepsis. “It often starts with just a scrape, a bug bite or a strep throat,” says Dr Velasquez, “things that take-home antibiotics easily cleared up 20 years ago.”

Parvomycin’s remit is to turn this tide. It works for a wide range of *Enterobacteriaceae*, a family of mostly gut-dwelling bacteria that are usually harmless in healthy people. But they can destroy the heart, lungs, bones and other organs when they invade the bloodstream—often through cuts or invasive hospital equipment such as catheters and drip lines. For decades this group of bugs has been the most common cause of infections contracted in hospitals, and it has developed resistance to multiple antibiotics.

The new antibiotic will also make a big difference for cancer treatments. They improved greatly in the early 2020s after a boom in cancer research at big pharma companies. Back then, it seemed all but certain that science would win the war on cancer. But chemotherapy, immunotherapy and stem-cell transplants—used in most courses of cancer treatment—weaken the immune system, making patients highly vulnerable to infections. As the effectiveness of antibiotics waned, so did survival rates for cancer, which are now lower than they were a decade ago.

The loss of antibiotics has been just as bad for organ transplants, which are in greater demand as the number of people with chronic diseases increases. Like cancer patients, transplant patients are easy prey for infections because their immunity is suppressed by the drugs that prevent organ rejection. Adjusted for the risk of deadly infection, the prognosis for most patients in America who are otherwise fit for a transplant is now too poor to justify

the operation. (The recent development of artificial kidneys and livers, 3D-printed from stem-cells, offers hope because such organs are not considered to be foreign tissues by recipients' bodies, but this technology is unfortunately still in its infancy.)

All this means demand for parvomycin will be huge. Doctors are calling it a "miracle drug"—as they did with penicillin a century ago. But there are concerns that parvomycin's useful lifespan may be shorter than that of older antibiotics, because it is replacing many of them at once. As early as the 1950s, when the first generation of antibiotics became widely available, it became evident that the more an antibiotic was used, the faster bacteria developed mutations that conferred resistance to it.

A decade after the use of penicillin became widespread, more than half of common *Staphylococcus* bacteria in big hospitals were resistant to it. Bacteria strains resistant to newer antibiotics were often found just a year or two after doctors started using them. In response, drug firms churned out new antibiotics at a steady pace to replace ineffective ones. But as the 20th century drew to a close this arms race in antibiotics became harder because of their rampant use worldwide—on humans, livestock and crops.

The peril of overusing antibiotics became apparent in the 1990s when MRSA (short for methicillin-resistant *Staphylococcus aureus*), a deadly superbug, began terrorising hospitals in Europe and America. In Britain a government commission found widespread overuse of antibiotics. They were often given "just in case" or to stop outbreaks caused by lax hospital hygiene and doctors not cleaning their hands routinely. In America 30% of the 260m outpatient antibiotic prescriptions written in 2010 were unnecessary, usually for colds or other infections caused by viruses (against which antibiotics are useless).

In poor countries, meanwhile, bacterial infections still killed millions of

people each year because they could not get hold of antibiotics. At the same time, particularly in big cities, many people's first port of call for an illness was a drug-seller with no pharmacy education, who often gave them whatever antibiotic was in stock, in whatever dose they could afford. Poor sanitation and filthy hospitals made perfect habitats for the spread of superbugs—especially bacteria with the alarming ability to pass their drug-resistant genes to other species of bacteria.

Agriculture was also awash with antibiotics. In the 2010s it was gobbling up 130,000 tonnes of antibiotics consumed each year, more than half of the total. Ailing orange-tree groves in America and Thailand were sprayed with antibiotics that, at the time, were used to treat tuberculosis and other infections in humans. Fish and livestock on industrial farms were fed antibiotics because they turned out to have a fattening effect and were a cheap way to prevent the spread of diseases in cramped, filthy cages and pens. Some were precious last-resort antibiotics used in humans.

By the early 2010s it was clear that a crisis was looming. In 2011 a survey of infectious-diseases specialists in America, for example, found that more than 60% had seen a pan-resistant, untreatable bacterial infection in the past year. Around that time researchers found more than 1,500 drug-resistant genes in the microbial soup of the sewage of 74 cities around the world.

"Antibiotics stewardship", the concept of judicious, sparing use of antibiotics, gained currency. National action plans were written, a G20 proclamation issued and a UN resolution approved. In Western countries use of antibiotics began to fall, both in humans and livestock. Developing countries slowly followed during the 2020s, though in many enforcement of the new rules was patchy at best. Bans on the use of antibiotics in healthy animals began to spread in the 2010s. Many big meat producers abandoned antibiotics because their customers became squeamish about eating

animals stuffed with drugs.

But all this came too late. In the late 2020s bacterial resistance to older drugs suddenly exploded in rich countries. Most antibiotics were no longer effective. And there were no replacements in sight. Big pharma companies had lost interest in antibiotics decades earlier because margins on them were low and doctors preferred to keep new ones on the shelf, for use when all else failed—which made the quest for antibiotics a poor business proposition. In 1980 there had been 25 large pharma companies working on new antibiotics; by 2020 there were just three. The handful of small biotech firms that stepped up to the task had gone out of business. The world faced a return to the pre-antibiotic era, when anyone could die from a tiny scratch or a simple infection, and even minor surgery could entail life-threatening risks.

The crisis prompted the creation of the Global Antibiotic Science Partnership (GASP), a public-private outfit launched in 2032. It was given the task of developing new antibiotics as a matter of urgency. Chinese and American tech philanthropists, rallied by Bill Gates, put up money, as did the G20, creating an unprecedented kitty of \$40bn for its first five years. The problem was finding scientists. When big pharma companies shut their antibiotics divisions, the scientists who specialised in the field had scattered, retired or switched to other specialities. In 2015 there were only about 500 of them left (few enough that they would be declared endangered species if they were wild animals, noted an article in *Nature*). “It’s highly specialised knowledge,” says Narita Baseravan, the head of GASP. “We couldn’t put a cancer researcher to work on antibiotics.”

GASP ended up hiring a team of investigative journalists to track down the antibiotics specialists, now mostly in their 50s and 60s. After almost two years, a small team began work on what would become parvomycin

at the GASP campus in Geneva built by Seth Resoz, an American augtech billionaire (whose third wife had died of a drug-resistant infection). Experts who were too frail to travel helped remotely using Mr Resoz's augmented-reality technology, passing on their experience to younger scientists and giving them a crash course in antibiotic research.

Normally, developing a new antibiotic would take 10-15 years. The GASP scientists managed to do it in just six, by taking advantage of artificial-intelligence techniques to scan drug companies' archives for candidate drugs that had been abandoned decades earlier. One of these candidates formed the basis for parvomycin. The new drug is now being distributed globally by GSKMerckPfizer under an innovative licence that sets differential pricing for countries depending on their ability to pay.

GASP plans to use the same model for the other antibiotics in its pipeline. They include a novel drug for tuberculosis—for which the last new drug was approved in 2012, the first new drug for the disease in more than 40 years. Research has also started on paediatric antibiotics, which were neglected even in the heyday of antibiotic development. “As far as antibiotics are concerned, children have always been treated as if they are small adults,” says Dr Baseravan.

It will probably be years before another new antibiotic reaches patients. But there are two reasons for optimism about the future of parvomycin and any new antibiotics that follow. The first is that the practices that promoted drug resistance in the past have finally been phased out, after decades of dithering. The second reason is that, thanks to the work of GASP, the pipeline of new antibiotics is starting to fill up again. It took a crisis in which millions lost their lives to prompt decisive action, and the fight is still far from over. But at least there is now cause for hope that an end to the post-antibiotic nightmare is in sight. ■ ■



如果抗生素失效

超级细菌侵袭：2041年7月

世界终于开始解决抗生素耐药性的问题了。2041年的想象场景【《世界猜想》系列之三】

在纽约的陈·扎克伯格医院（Chan Zuckerberg Hospital），艾玛·琼斯（Emma Jones）向丈夫怀里刚出生的儿子投去虚弱的微笑。琼斯在剖腹产期间发生了严重的细菌感染，目前还在康复中。感染已经开始引发器官衰竭，医生们给她上了麻醉并接上了呼吸机。“我们以为她挺不过来的。”医院的传染病专家罗莎·韦拉斯克斯（Rosa Velasquez）说。琼斯很幸运。她是少数几个接受过帕沃霉素（parvomycin）治疗的人之一，这是2024年推出的第一种新型抗生素。目前仍在使用的少数老抗生素已经很少见效了。2040年，抗药性细菌在欧美地区造成近40万人死亡，是2015年时的七倍多。在非洲和亚洲，仅抗药性结核病现在每年造成近200万人丧生，是2010年的十倍。

在西方国家，致命感染的增加主要发生在医院。过去抗生素仍然有效时，几乎所有手术都会预防性地使用它们。2015年，在欧洲大多数类型的手术中，伤口感染的发生率不到5%，到2040年这一比例在某些手术中已跃升至近30%。在2019年达到峰值的剖腹产——在美国产妇中占三分之一——现在只在别无选择的情况下才会采用。

一些医院不再做髋关节和膝关节置换这类择期手术，因为很少有病人愿意冒术后感染的风险。但外科医生要做更多截肢手术了。过去十年里截肢手术在欧洲几乎增加了一倍。缺乏有效的抗生素，意味着截肢有时是处理糖尿病患者皮肤溃疡感染的唯一办法。在陈·扎克伯格医院，儿科病房是最令人心碎的地方。那里都是刚截完肢的孩子，其中许多是因为患上了败血症。“通常都只不过是因为擦伤、虫咬或链球菌性咽喉炎而引发，”韦拉斯克斯说，“20年前，这些问题在家里用抗生素就能轻松解决。”

帕沃霉素的使命是扭转这一趋势。它适用于广泛的肠杆菌科细菌，这是一

类主要存在于肠道中的细菌，通常对健康人无害。但当它们侵入血液时会损坏心脏、肺、骨骼和其他器官，而这通常经由伤口或导管和输液管等侵入性医院设备发生。几十年来，这类细菌一直是院内感染的最常见原因，它们已对多种抗生素产生了抗药性。

新型抗生素也将对癌症治疗产生重大影响。本世纪20年代头几年，大型制药公司掀起了癌症研究的热潮，癌症治疗大为改善。当时，科学将赢得对癌症的战争似乎已是板上钉钉的事。但是，在大多数癌症治疗过程中使用的化疗、免疫疗法和干细胞移植削弱了免疫系统，使患者极易受感染。随着抗生素效力下降，癌症的存活率也下降了，现在已经低于十年前的水平。

失去抗生素对器官移植来说同样糟糕。随着慢性病患者的增加，这一需求越来越大。与癌症患者一样，器官移植病人很容易被感染，因为他们的免疫力被防范器官排异的药物所抑制。考虑到致命感染的风险后，美国原本适合做移植手术的患者如今大多因为预后太差而无法支撑手术的合理性。

（近年来由干细胞3D打印而来的人造肾脏和肝脏的发展带来了希望，因为这些器官不会被接受者的身体视为外来组织，遗憾的是这项技术仍处于起步阶段。）

所有这些意味着对帕沃霉素的需求将是巨大的。医生们称之为“神药”——一个世纪前他们也是这么称呼青霉素的。但有些人担心帕沃霉素的有效寿命可能比老抗生素更短，因为它正在同时取代众多老抗生素。早在上世纪50年代第一代抗生素被广泛使用时，有一件事就已经很明确：一种抗生素被用得越多，细菌发生突变以对其产生抗药性的速度就越快。

青霉素普及十年后，大医院里一半以上的常见葡萄球菌都已产生抗药性。通常在医生开始使用新抗生素后仅仅一两年，就会发现对它具有抗药性的菌株。为此，制药公司以稳定的速度生产新抗生素来取代失效的抗生素。但在上世纪末，这场抗生素的军备竞赛变得更加艰难，因为它们在世界各地被滥用，包括用于人类、牲畜和农作物。

过度使用抗生素的危险在上世纪90年代清楚显现出来：一种致命的超级细菌MRSA（耐甲氧西林金黄色葡萄球菌）开始侵袭欧美的医院。在英国，一个政府委员会发现抗生素被广泛滥用。医生开出这些药常常是“以防万一”，或是为了遏止医院因卫生懈怠、医生未能例行洗手而爆发的大规模感染。美国在2010年开出的2.6亿个门诊抗生素处方中有30%是不必要的，通常是针对感冒或其他病毒感染（抗生素对此无效）开出的。

然而在贫穷国家，由于人们无法获得抗生素，每年仍有数以百万计的人死于细菌感染。与此同时，特别是在大城市里，许多人在生病时首先会求助于未经药学教育的药商。这些商贩通常有什么抗生素就卖什么，买多少给多少。恶劣的卫生状况和肮脏的医院为超级细菌的传播提供了完美的栖息地，特别是那些可怕的、能把耐药基因传递给其他细菌的细菌。

农业中也充斥着抗生素。2010年代，农业每年消耗13万吨抗生素，占抗生素消耗总量的一半以上。美国和泰国生病的橘树林被喷洒抗生素，这些药当时被用于治疗人类的肺结核和其他感染。工业化农场的鱼和牲畜被喂食抗生素，因为它们被发现具有育肥效果，同时也是预防疾病在狭小肮脏的笼子和畜栏中传播的一种廉价方法。它们中有一些是人类珍贵的“最后一线抗生素”。

在2010年代初期，很显然一场危机已经迫在眉睫。例如，2011年对美国传染病专家的一项调查发现，他们中超过60%的人在过去一年中曾见过广泛耐药而无法治疗的细菌感染。大约在那个时候，研究人员在世界各地74个城市的污水微生物样本中发现了超过1500种抗药基因。

审慎、节制地使用抗生素的“抗生素管理”概念开始流行。各国制订行动计划，G20发布公告，联合国通过了一项决议。在西方国家，抗生素在人类和牲畜中的使用都开始下降。发展中国家在20年代慢慢跟上，尽管在许多国家，新规则的实施充其量只能算是有好有坏。禁止对健康动物使用抗生素的禁令在2010年代开始铺开。许多大型肉类生产商弃用抗生素，因为它们的顾客开始对食用塞满了药物的动物感到不适。

但所有这一切都来得太晚了。20世纪后期，富裕国家突然爆发了细菌对老药物的抗药性。多数抗生素都失效了，替代品却还没有出现。大型制药公司在几十年前就已对抗生素丧失兴趣，因为它们的利润率很低，而医生又倾向于把新抗生素搁置不用，以备其他方法都失败时才使用它们，这使得研发抗生素的商业前景太差了。1980年有25家大型制药公司在研发新的抗生素，到2020年只剩三家。少数几家接手任务的小型生物技术公司已经倒闭。世界面临回归前抗生素时代，那时任何人都可能死于一次微小的擦伤或简单的感染，即使小手术也可能危及生命。

这场危机促成了全球抗生素科学合作社（以下简称GASP）的成立。这是一个于2032年启动的公私合营组织，其任务是紧急研发新抗生素。由比尔·盖茨牵头的中美两国科技慈善家们和G20集团一道筹措资金，为该组织的头五年运营凑足了规模前所未有的400亿美元。难点是找到科学家。当大型制药公司关闭抗生素部门时，该专业领域里的科学家已经流散、退休或转到其他方向。到2015年全球大概只剩下500人（《自然》杂志的一篇文章指出，如果这些人是野生动物，会被宣布为濒临灭绝的物种）。“这是高度专业化的知识，”GASP的负责人纳里塔·巴塞拉万（Narita Baseravan）说，“我们不能让一名癌症研究员来研究抗生素。”

GASP最终聘请了一个调查记者团队来寻找抗生素专家，这些专家现在多数都已五六十岁。差不多两年后，一个小团队开始在日内瓦的GASP园区里研究新抗生素，帕沃霉素由此诞生。该园区由美国增强现实技术巨头、亿万富翁赛思·雷索兹（Seth Resoz）建造（他的第三任妻子死于抗药性感染）。那些身体状况无法胜任长途旅行的专家们通过雷索兹的增强现实技术来远程提供帮助，将自己的经验传授给年轻科学家，并为他们提供抗生素研究的速成班。

开发一种新抗生素通常需要10到15年时间。GASP的科学家用人工智能技术扫描制药公司的档案库，筛选几十年前被放弃的候选药物，成功地在六年内完成了这项工作。其中一种候选药物形成了帕沃霉素的基础。这种新药现在由葛兰素史克-默克-辉瑞集团（GSKMerckPfizer）用一种创新的许可协议在全球范围内分销，该许可根据各国的支付能力为它们差别定价。

GASP计划采用相同的模式来研发和销售其他抗生素。它们包括一种针对结核病的新药。上一次结核病抗生素被批准是在2012年，当时是40多年里出现的第一种结核病新抗生素。对儿科抗生素的研究也已启动，这是即使在抗生素发展的全盛时期都被忽视的一个领域。“就抗生素而言，儿童一直被当成小号成人处理。”巴塞拉万说。

可能还要经过多年才会有另一种新抗生素送到患者手中。但是，有两个理由让我们对帕沃霉素以及跟随其后的任何新抗生素的前景抱持乐观。首先，经过几十年的犹豫不决，过去种种加剧抗药性的做法终于被逐步淘汰了。其次，GASP的努力开始重新充实新抗生素的供应管道。经历了一场夺去数百万人性命的危机后，人们终于采取了果断行动，而这场斗争远未结束。但至少，现在我们有理由期盼这场后抗生素噩梦的终结。 ■■



If geoengineering goes rogue

Reaching for the sunshade: July 2030

Efforts to cut emissions may fall short. What if some countries try to fix things a different way? An imagined scenario from 2030

THE PARIS climate deal commits its signatories to cuts in climate-changing greenhouse-gas emissions over the coming decades. But even if countries stick to their promises (and some may not), that may not be enough to avert catastrophe. Imagine that by 2030 global temperatures are still creeping up, and sea levels are tens of centimetres higher—significantly worsening the impact of storm surges that push seawater over low-lying areas and corrode coastal infrastructures. In Europe and America, summer heatwaves and winter flooding have become more severe. In America's southern states, the Caribbean and South-East Asia, coastlines are battered by stronger tropical cyclones. The global South suffers worse droughts and more irregular monsoons, undermining fragile agricultural systems and causing famines and civil unrest. The reality of global climate change becomes apparent to rich and poor countries alike.

Under these conditions, it seems likely that some countries will propose the use of a technique called “solar geoengineering” to cool the planet or slow its warming. One way to do this involves injecting tiny reflective particles into the stratosphere, where they would act as a sunshade by bouncing part of the sun's energy back out into space. Something similar also happens naturally: big volcanic eruptions have, in the past, thrown large amounts of material into the atmosphere, cooling the planet for months or years. The eruption of Mount Pinatubo in the Philippines in 1991, for example, reduced temperatures in the northern hemisphere by as much as 0.5°C for four years. Solar geoengineering would, its advocates say, do the same thing in a more controlled manner.

Imagine that the idea starts to gain political support. The first detailed international discussions of the options, starting in the mid-2020s, are fraught. Developing countries, more exposed but less well equipped to cope with the impacts of climate change, call for discussions at the United Nations. A motion is proposed by a group of “least developed countries”, led by Bangladesh, a medium-sized economy with a strong voice in international climate talks. Eventually, the issue makes it onto the agenda in the General Assembly. But, as with negotiations to cut global emissions, years of discussions and resolutions lead to little concrete action. Few see a planetary sunshade as a desirable solution. Supporters observe that a sunshade would buy more time to reduce greenhouse-gas emissions, given that cuts are not happening fast enough. But opponents say it will reduce the urgency of cutting emissions.

A further objection is the risk of unintended consequences, given that the technique has never been tried before, and academic studies and small-scale field trials have been underfunded, for fear of giving countries an easy way to avoid the difficult choices emissions cuts require. There is also the danger of “termination shock”: if a geoengineering project is launched, and it successfully cools the planet, then any failure of the sunshade (due to technical problems, say, or sabotage) could cause a sudden increase in temperatures in just a few years. For all these reasons, there are calls for international rules to govern the use of the technology—because without them, there is nothing to stop one or more countries launching a “rogue geoengineering” scheme on their own.

But that is exactly what some countries might start to consider, perhaps in 2030, after the UN debate fails to reach any agreement. Fed up with yet more inaction, a small group of developing countries might choose to engage in “minilateral” discussions over whether to “go it alone” with a sunshade scheme that would, if it worked, both cool the planet and provide a proof of principle that might persuade other countries to back the idea.

The fastest way to do this would be to build a fleet of specialised planes. An analysis published in 2018 by Wake Smith, at Yale University, and Gernot Wagner, at New York University, maps out how to do it. The planes need to fly at altitudes of 20km (66,000ft) or higher, ruling out the possibility of using existing commercial aircraft for the purpose. Instead, a custom fleet of several dozen aircraft would be needed, with four jet engines mounted on two huge, glider-like wings, which would allow them to stay aloft in the thin air of the stratosphere. In the first year, eight aircraft could carry out 4,000 five-hour flights (four spent in ascent and descent and one in the stratosphere). By year five, this would be ramped up to 34 aircraft making 20,000 flights a year; by year ten, 71 aircraft would be making 44,000 flights a year. After 15 years the fleet would be 100 strong.

This first-generation sunshade would probably be made from dispersed sulphur dioxide (SO_2), which is one of the chemicals produced during volcanic eruptions. Dr Wagner suggests that the most efficient way to deliver it would be for geoengineering aircraft to be loaded with solid sulphur, which they would burn at altitude in their engines to produce SO_2 . All this would cost around \$3.5bn a year (at today's prices) to deploy. A parallel research programme would also be needed to monitor the dispersal of the particles, determine their interaction with other molecules in the atmosphere and model the climate impacts. This would cost about the same again. According to Janos Pasztor, executive director of the Carnegie Climate Governance Initiative, the only existing monitoring network capable of carrying this out at the required level of detail is the World Meteorological Organisation's satellite and ground-based global atmosphere monitoring system.

Bangladesh on its own seems unlikely to foot that bill. As well as financial help, it would almost certainly want safety in numbers, which is why a coalition of developing countries seems more likely. Such a coalition might also want the security provided by the support of a larger power, such as

India or China, both of which have large populations at risk from considerable climate impacts. Handily, China is also a big producer and exporter of sulphur.

It would be both smart and efficient to start such a programme slowly. Drs Smith and Wagner calculate that the fleet could scatter 200,000 tonnes of SO₂ in the stratosphere in the first year, causing an unremarkable 0.02°C of cooling. By the fifth year, those figures would rise to 1 megatonne of SO₂ and 0.1°C. The cooling would reach 0.2°C in year ten and 0.3°C in year 15. At these levels, there should be a real impact on the rate of warming.

But there is a catch. Regional geoengineering is impractical (stratospheric winds disperse particles across whatever hemisphere they are deposited in) so a solar sunshade would have to be either hemispheric or global. The former could be catastrophic, because models suggest it could shift the balance of energy in the upper atmosphere in a way that causes large-scale disruptions to tropical monsoons.

To avoid the disastrous geopolitical fallout of such a scenario, the coalition would therefore seek to deploy a global sunshade that would offer equal or comparable cooling to all regions. Some studies suggest that this may be possible, though research is still very much in its early days. Simone Tilmes at the US National Centre for Atmospheric Research calculates that injections of SO₂ at 15° and 30° north and south of the equator would produce a reasonably uniform global cooling.

Even so, a coalition of states acting unilaterally to cool the whole planet would still risk military reprisals. To avoid conflict, flights would have to remain within participating countries' own airspace, so a coalition would need to span those latitudes. China, India and Bangladesh could take care of the northern latitudes, but the southern hemisphere would require collaborators with the right capabilities in Africa, South America or

Australasia.

There is another possibility. America has the money to build a fleet, the research capacity to track its impact and military bases around the world from which to launch planes. As for motives, look no further than hurricanes. Modelling published earlier this year suggested that sunshades might reduce the intensity of hurricanes compared with a warmer world. And it is possible, if hard, to support solar geoengineering without taking a position on the causes of global warming. A sceptical American administration could still insist that climate change was not man-made; it need only concede that temperatures are rising.

It is difficult to predict what the international response to a unilateral American sunshade programme would be. It would, of course, depend on how the sunshade was deployed and how the climate responded. America, the Soviet Union, Britain, France and China were all rebuked for carrying out atmospheric nuclear testing in the 20th century, but suffered little actual diplomatic cost. Unilateral geoengineering might provoke condemnation, but not war.

Countries opposed to the idea might respond by developing counter-geoengineering programmes. They could either shoot down geoengineering planes or, more tactfully, build a second fleet to deliver a separate stratospheric payload to neutralise the sunshade (either by reacting with the SO₂ to break it down, or by making the sulphate particles clump together and rain out faster). The development of counter-geoengineering tools might provide a deterrent against the unilateral deployment of a sunshade.

With or without counter-geoengineering, the global climate blame-game would undoubtedly become even more heated if a sunshade were deployed. One problem would be distinguishing its cooling effect amid natural variability. The cooling would take effect gradually, and global average

temperatures would continue to rise in the early years of its deployment. Eventually, a slowdown in the rate of warming would become apparent in global data sets. But because temperatures vary naturally from one year to the next, reliably identifying a sunshade signal within the data would be tricky. And even before its effect became apparent, the sunshade would start to influence the weather, and the frequency of droughts, floods and tropical cyclones. Teasing apart the relative influences of global warming and natural variability on an extreme weather event is devilishly complicated today. Add a sunshade into the mix and fingers will be pointing in all directions, which will make international climate talks even more difficult.

But if a sulphate-based sunshade was successfully deployed and was shown to work, it might then be time for phase two. David Keith, who runs Harvard University's solar-geoengineering research programme, has suggested that it might be possible, perhaps even preferable, to design synthetic particles that are more efficient at reflecting the sun's radiation, or can stay suspended in the stratosphere for longer than sulphate particles can. And perhaps, having failed to reach international agreement on geoengineering in the 2020s, the United Nations might try again, with a new treaty being signed in Kyoto in 2047, 50 years after the original Kyoto Protocol. Kyoto 2 would concede that efforts to tackle climate change had fallen short, and would endorse the use of a sunshade as a way to give countries more time to reduce their emissions. In the worst case, the unilateral deployment of a sunshade could lead to conflict. But in the best case, it might provide a pathway to a lasting solution to the climate problem. ■ ■



如果地球工程胡作非为 打造遮阳篷：2030年7月

减排的努力可能还不够。要是一些国家想以另一种方式解决问题呢？2030年的想象场景【《世界猜想》系列之四】

《巴黎气候协议》要签署国承诺在未来几十年内减少引发气候变化的温室气体排放。但哪怕各国信守承诺（有些国家可能不会），这可能还不足以避免灾难。想象一下，到2030年，全球气温仍在攀升，海平面上升了数十厘米，显著加剧了风暴潮将海水推向低洼地区并腐蚀沿海基础设施的影响。在欧洲和美国，夏季热浪和冬季洪涝愈发严重。在美国南部各州、加勒比海地区和东南亚地区，更强烈的热带气旋不断冲击海岸线。南半球遭受更严重的干旱和更不规则的季风，破坏了脆弱的农业系统，造成饥荒和内乱。不论穷国富国，全球气候变化的现实都已显而易见。

在这种情况下，很可能有些国家会提议使用一种名为“太阳地球工程”的技术来冷却地球或减缓其变暖。具体方法之一是将微小的反射粒子注入平流层充当遮阳篷，将太阳的一部分能量反射回太空。类似的事情也会自然发生：过去，巨大的火山喷发将大量物质抛入大气层，使地球持续降温数月或数年。例如，1991年菲律宾皮纳图博火山爆发，使北半球的气温连续四年降低了多达0.5摄氏度。其倡导者说，太阳地球工程将以更加可控的方式达到同样的效果。

让我们想象这个想法开始获得政治支持。关于这些方案的详细的国际讨论从2020年代中期开始出现，充满了焦虑。发展中国家受气候变化的影响更大但缺乏应对的能力，要求在联合国展开讨论。孟加拉国是一个在国际气候谈判中态度坚定的中型经济体，由它领导的一些“最不发达国家”提出了一项动议。最终，这个问题进入了大会议程。但是，与减少全球排放量的谈判一样，多年的讨论和决议并没有带来多少具体行动。很少人觉得行星遮阳篷是个理想的解决方案。支持者认为，考虑到减排的速度不够快，遮阳篷会赢得更多时间来减少温室气体排放。但反对者表示，这将降低减排

的紧迫性。

另一个反对意见是它有可能产生意想不到的后果，因为该技术以前从未被尝试过，而且学术研究和小规模实地试验一向资金不足——因为担心这会给各国提供一种简单的方法来避开减排涉及的困难选择。此外还存在“终端激波”的危险：如果一个地球工程项目启动，并且成功地冷却了地球，那么遮阳篷的任何故障（比如技术问题或蓄意破坏）都可能导致温度在短短几年突然升高。鉴于上述所有原因，有人要求制定国际规则来管理这项技术的使用——因为如果没有规则的话，就没有什么能够阻止一个或多个国家自己发起“流氓地球工程”计划。

但这恰恰是联合国辩论未达成任何协议后，一些国家（可能在2030年）开始考虑的问题。一小部分发展中国家受够了长期的不作为，可能会选择就是否“自行”使用遮阳方案来展开“少边”讨论。如果该方案奏效了，它就能在给地球降温的同时验证其原理，也许就能说服其他国家支持这一方案。

最快的实施方法是建立一支专用机队。耶鲁大学的韦克·史密斯（Wake Smith）和纽约大学的格诺·瓦格纳（Gernot Wagner）于2018年发表的一项分析描绘了如何做到这一点。飞机需要在2万米或更高的高度飞行，这就排除了使用现有商用飞机的可能性。相反，它需要一个由几十架飞机组成的定制机队，四个喷气发动机安装在两个巨大的滑翔机式机翼上，让它们可以在平流层的稀薄空气中飞行。在第一年，八架飞机可以进行4000次每次持续五小时的飞行（四小时用于爬升和下降，一小时在平流层飞行）。到第五年将增加到34架飞机，每年飞行20,000次；到第十年，71架飞机每年飞行44,000次。15年后，飞机总数达到100架。

这种第一代遮阳篷可能用分散的二氧化硫（SO₂）制成，二氧化硫是火山爆发过程中产生的化学物质之一。瓦格纳认为，最有效的输送方式是由地球工程飞机装载固体硫，到达高空后在发动机中燃烧产生二氧化硫。所有这些将耗资约每年35亿美元（按当前价格计算）。还需要一个并行的研究计划来监测颗粒的扩散，确定它们与大气中其他分子的相互作用并对气候影响建模。这要再花掉差不多同样多的钱。据卡内基气候治理倡议执行主

任杰诺斯·帕兹托（Janos Pasztor）说，世界气象组织的卫星和地面全球大气监测系统是唯一能够以所需精度实现这一目标的现存监测网络。

孟加拉国本身似乎不太可能为此买单。除了经济上的帮助之外，它几乎肯定寻求“人多势众”，这就是发展中国家看起来更有可能结盟的原因。这样一个联盟还可能希望得到更强大的国家（如印度或中国）提供的安全感，这两个国家都有大量人口面对重大气候影响的威胁。中国恰好也是硫磺的主要生产国和出口国。

逐步缓慢地启动这样的项目既明智又高效。史密斯和瓦格纳计算出，第一年机队可能在平流层中散布20万吨二氧化硫，带来并不明显的 0.02°C 的冷却效果。到第五年，这些数字将升至100万吨和 0.1°C 。冷却幅度将在第10年达到 0.2°C ，在第15年达到 0.3°C 。到了这样的水平，就应该能对变暖的速度产生实际影响。

但这里还有个问题。区域性地球工程不切实际（粒子投在哪个半球，平流层风就会将它散布到整个半球上），因此遮阳篷要么是半球形，要么是全球形。前者可能是灾难性的，因为模型表明它可能改变高层大气中的能量平衡，导致热带季风的大规模失调。

为了避免这种情况造成灾难性的地缘政治后果，联盟将寻求部署一个全球遮阳篷，为所有地区提供相同或相当的降温。一些研究表明这或许可行，尽管研究还基本处于起步阶段。美国国家大气研究中心的西蒙妮·迪尔姆斯（Simone Tilmes）计算得出，在赤道北部和南部 15° 和 30° 注入二氧化硫将产生相当均匀的全球冷却。

即便如此，一个单方面行动冷却整个地球的国家联盟仍将面临军事报复的风险。为避免冲突，飞机必须保持在参与国自己的领空内，因此整个联盟就需要能覆盖上述纬度。中国、印度和孟加拉国可以顾到北纬地区，但南半球需要在非洲、南美洲或澳大拉西亚找到具有合适能力的合作者。

还有另一种可能性。美国有资金打造一支机队，有追踪其影响的研究能力，以及在世界各地起飞的军事基地。至于动机，只看飓风的影响就够

了。今年早些时候发布的模型表明，遮阳篷带来的降温可能会降低飓风的强度。而即便不就全球变暖的原因表明立场，支持太阳地球工程就算难也依然是可能的。持怀疑态度的美国政府仍然可以坚持认为气候变化不是人为造成的；它只需承认气温上升就行了。

如果美国单方面实施遮阳计划，很难预测国际反应会如何。当然，这取决于如何部署遮阳篷，以及给气候带来了什么变化。美国、前苏联、英国、法国和中国都因在20世纪进行大气层核试验而受到指责，但实际付出的外交成本却很低。单边地球工程可能会招致谴责，但不会引发战争。

反对这种方案的国家可能会发展反地球工程计划作为回应。它们可以击落地球工程飞机，或者更巧妙地做法是建造另一支机队，散步另一种平流层载荷来中和遮阳篷（要么是和SO₂反应而将其分解，或者让硫酸盐颗粒聚集在一起并更快地被雨水冲走）。反地球工程工具的研发可能会阻碍单方面部署遮阳篷。

无论有没有反地球工程，如果部署了遮阳篷，全球气候的相互指责游戏无疑会变得更加激烈。一个问题是如何在自然波动中辨别冷却效果。冷却将逐步生效，全球平均温度将在部署初期继续上升。最终，变暖速度的放缓将在全球数据集里变得明显起来。但由于温度年年都会自然变化，因此在数据中可靠地识别遮阳信号并非易事。甚至在其影响清晰显现之前，遮阳篷就会开始影响天气，以及干旱、洪水和热带气旋的频率。目前，对于极端天气事件，要将全球变暖和自然变化的相对影响区分开来是极度复杂的。再把遮阳篷掺和进来，矛头肯定指哪里的都有，这将使国际气候谈判更加困难。

但是，如果成功部署硫酸盐遮阳篷并且证明有效，也许就该开始第二阶段了。负责哈佛大学太阳地球工程研究项目的大卫·基思（David Keith）表示，设计出能够更高效地反射太阳辐射，或者可在平流层中比硫酸盐留存更久的合成粒子可能行得通，甚至更好。也许，由于未能在2020年代就地球工程问题达成国际协议，联合国可能会再次尝试，在最初的《京都议定书》问世50年后的2047年在京都签署了一项新条约。《京都议定书2》将

承认应对气候变化的努力不足，并认可使用遮阳篷作为让各国有更多时间减少排放的手段。在最坏的情况下，单方面部署遮阳篷可能导致冲突。但在最好的情况下，它可能给出了一条通往持久性解决气候问题的道路。





Space business

Orbital ecosystem

An in-orbit economy is taking shape

IN MAY 1999 a group of researchers from the Technical University of Berlin launched an unusual satellite. At a time when most of the machinery in orbit weighed thousands of kilograms, TUBSAT was a petite 45kg. A box that measured 32cm on each side, it carried three video cameras, the idea being to test whether such a titchy spacecraft could capture useful imagery of Earth. The researchers cited low mass, and the resultant low costs, as the benefits of such comparatively tiny satellites. They promised to open up “new market areas” for Earth observation.

It took around 15 years for them to be proved right. A few such “smallsats”, sometimes called nanosats or CubeSats, were launched every year in the decade up until 2014, when numbers spiked. Planet Labs, a Californian company founded by ex-Nasa engineers, launched 33 smallsats that year, each weighing just a few kilos. Planet’s satellites are spiritual successors of TUBSAT, designed to gather imagery of the Earth’s surface. The firm sells its customers images from around 150 active satellites it has in orbit.

Planet Labs is an industry leader. The cost of making and launching satellites has tumbled, enabling an array of new space-based businesses to emerge. In the past year smallsats have been launched that can use radar to peer through clouds or darkness. Others watch for illegal shipping activities and yet more are built to service or move around other satellites in orbit. Perhaps the most outlandish venture is a rescue satellite, designed to pull other satellites down to safety if something goes wrong, to avoid catastrophic collisions with neighbours.

Much of the recent attention has focused on the internet-connection constellations in low Earth orbit proposed by SpaceX and OneWeb. These have long been planned, and the billions of dollars required to install them are feeding the entire market.

Many of the capabilities of the new smallsats already existed, but mostly as government projects or as secretive intelligence operations. America has long sought to inhibit the commercial development of radar satellites, so powerful are their surveillance properties. Military radar satellites, which bounce radio waves off the surface of the Earth in order to build up a detailed picture of it, were said to be capable of detecting enemy submarines by measuring the tiny disturbances that their wakes left in the curvature of the surface of the ocean.

Payam Banazadeh, the boss of Capella Space, a startup based in San Francisco and founded in 2016, says his firm will use smallsats to work similar magic. Capella's satellites will use radio waves, rather than light, to create images of the surface of the Earth. Mr Banazadeh says that his smallsats will be able to measure the volume of oil-storage tanks, for example, which are often open-topped to avoid fire risks, simply by pinging a radar beam into them. The first operational satellite is intended to launch this year, one of a planned constellation of 36. A competitor, Finnish company ICEYE, already has satellites in orbit gathering data.

Capella relies on a host of new space businesses as suppliers. Blue Canyon Technologies, founded in 2008, will provide small thrusters that allow the satellites to be pointed at specific spots on Earth. A company called Phase Four, founded in 2015, will provide tiny ion drives that will allow Capella's satellites to adjust their altitude as needed. This will let the firm capture a wider variety of imagery.

Another new firm, Hawkeye360, takes a different approach. Instead of

pinging the surface of the Earth with radio waves, it listens for any that are being emitted by activity down below. This kind of orbital signal sniffing also used to be the domain of governments. But smallsats have advanced to the point where Hawkeye can deploy clusters of three radio-frequency sensing satellites to pick up weak signals from the ground. The company says its primary service will be maritime surveillance, looking for anomalous radio signals such as a fishing vessel turning off its automated identification tracker near a marine protected zone. The stated purpose is to stop illegal fishing and keep ports secure, but it is easy to see how the smallsats could be used to curb oceanic migration too. Hawkeye's first cluster of satellites has been in orbit since December 2018.

All of these new forms of imaging generate huge volumes of data—terabytes a day, enough that getting it down to the ground for processing becomes its own problem. Some companies want to reduce the amount of data they send back by processing some of it up in space. Barry Matsumori, a space-industry veteran, is boss of Bridgesat, a company that has developed a tiny, powerful laser, which can be embedded in spacecraft and which can beam data down to ground stations at extremely high bandwidths. ICEYE is one of its first customers. Bridgesat's first ground station, in California, is already in operation, and more in Italy and Sweden are on their way. The plan is to have ten around the world.

The firm has competition from Amazon, which just announced its own backbone service for data out of orbit and into its data centres, called AWS Ground Station. Capella is an early customer of the service, which uses radio waves rather than lasers to get data down from orbit. As with Amazon's cloud-computing business, the idea with Ground Station is to invest in plenty of expensive infrastructure and then charge startups only for what they use, making it easier and more affordable to run a business up in space.

Managing all those extra satellites gets tricky when the companies

launching them have to get their orbits perfect the first time. Currently, companies get only one shot. D-Orbit, an Italian company, has built a “carrier” satellite that is designed to boost already-launched smallsats to their correct configuration.

Perhaps the most futuristic new problem for the space business is the risk of debris. The concern is that, with so many new satellites in orbit operated by so many different companies, the chance of losing control of one goes up. A collision could be disastrous, producing a wave of debris with a high chance of wiping out other satellites, potentially crippling the whole commercial low-Earth orbit ecosystem at a stroke. Astroscale, a Japanese company, is tackling this problem by building a prototype craft capable of being launched at short notice in order to grab any malfunctioning satellite and pull it down into the atmosphere where it will burn up before it can collide with anything. The “rescue” craft will use computer vision to lock onto the out-of-control satellite and match velocity with it, then latch onto it magnetically. The company, which has raised \$132m in the past few years, is planning a demonstration of its technology next year.

Earth’s orbits suddenly look busier than ever before. Companies are going into space because it offers a different vantage point, allowing them to gather valuable new, previously-unaffordable information. TUBSAT’s “new market areas” are at last open for business. ■



太空商业

轨道生态系统

“在轨经济”正在成形

柏林工业大学的一个研究小组在1999年5月发射了一颗不同寻常的卫星。当时，在地球轨道上运行的航天器大多重达数千公斤，这颗名为TUBSAT的卫星却很娇小，仅重45公斤。它是一个边长32厘米的箱子，载有三台摄像机。研究人员想用它来测试如此微型的航天器能否捕捉到有用的地球影像。他们指出，这类相对微小的卫星的优势是质量轻，因而成本也低，有望为地球观测开辟“新的市场领域”。

他们的想法用了大约15年才得以证实。2014年之前的十年内，每年都有几颗这类“小型卫星”（也叫“微纳卫星”或“立方卫星”）被送入轨道，2014年的发射数量更是激增。由前美国宇航局工程师在加州创立的美国公司行星实验室（Planet Labs）在那一年就发射了33颗小型卫星，每颗只有几公斤重。这些卫星继承了TUBSAT的精神，专门用于收集地球表面影像。目前，该公司通过约150颗活跃的在轨卫星来收集图像，卖给客户。

行星实验室是行业领头羊。制造和发射卫星的成本已大幅下降，一系列太空新业务因而浮现。过去一年发射的小型卫星中，有些可利用雷达穿透云层或黑暗进行观测，也有些被用于监测非法航运活动，更多的是为了维护或移动其他在轨卫星。其中最稀奇的也许是一颗救援卫星，当其他卫星出现故障时可将它们拖至安全位置，避免与相邻卫星发生灾难性碰撞。

最近备受关注的是SpaceX和OneWeb计划建设的提供高速互联网服务的近地轨道卫星网络。这些项目计划已久，部署它们所需的数十亿美元资金正令整个市场受惠。

这些新式小卫星的许多功能早已存在，只不过以往主要被用于政府项目或秘密情报行动。美国早就在试图压制雷达卫星的商业开发，因为它们的侦察性能非常强大。军用雷达卫星接收从地球表面反射的无线电波，以此绘

制出详细图像，据说能通过测量潜艇尾迹对洋面曲率造成的微小干扰来探测敌方潜艇。

总部位于旧金山的创业公司卡佩拉空间（Capella Space）创建于2016年，老板帕亚姆·巴纳扎德赫（Payam Banazadeh）表示公司将运用小型卫星施展类似的魔法。卡佩拉的卫星将利用无线电波而非光线来创建地球表面图像。巴纳扎德赫举例说，为避免起火风险，储油罐的顶部通常是敞开的，卡佩拉的小型卫星可以向油罐中发射雷达波束来测量其体积。卡佩拉的首颗运营卫星计划于今年发射，计划总共发射36颗。其芬兰竞争对手ICEYE已经发射了轨道卫星用于收集数据。

卡佩拉依赖一系列新兴太空企业供货。成立于2008年的蓝峡科技公司（Blue Canyon Technologies）将提供能让卫星指向地球特定区域的小型推进器。成立于2015年的Phase Four将供应微型离子驱动器，让卡佩拉的卫星能根据需要调整运行高度。这样卡佩拉就能获得更多样化的影像。

另一家新公司鹰眼360（Hawkeye360）则另辟蹊径。它不是向地球表面发射无线电波，而是监听地面活动发出的无线电波。这种绕轨嗅探信号的活动以往也是政府的专属项目。但小型卫星技术的发展令鹰眼可部署三颗一组的射频感应卫星集群来接收来自地面的微弱信号。该公司表示自己的主要服务将是海事监控，探测异常的无线电信号，例如渔船在海洋保护区附近关闭自动识别跟踪器。虽然公开宣称的功能是阻止非法捕鱼和确保港口安全，但不难看出这种小型卫星也可用于遏制海上非法移民。鹰眼的第一批卫星群自2018年12月开始入轨运行。

所有这些新型成像技术每天都会产生数以TB计的海量数据，将这些数据下载到地面做分析就成了难题。一些公司希望能在太空中处理部分数据，从而减少发回地面的数据量。航天业资深人士巴里·松森（Barry Matsumori）是Bridgesat公司的老板，该公司开发出了一种强大的微型激光装置，可嵌入航天器中，以极高的带宽将数据传输到地面站。ICEYE是其首批客户之一。Bridgesat在加州的第一个地面站已投入运营，意大利和瑞典的地面站也在建设中。该公司计划在全球建立十个地面站。

Bridgesat面临来自亚马逊的竞争，后者刚宣布推出从轨道向它的地面数据中心（名为AWS地面站）传输数据的支柱型服务。该服务通过无线电波而非激光将数据从轨道传回地面，卡佩拉是它的早期客户。与亚马逊的云计算业务一样，AWS地面站的思路也是先投资打造大量昂贵的基础设施，然后向创业公司按服务使用量收费，让经营太空业务变得更便捷也更便宜。

管理所有这些新增的卫星成了棘手难题，因为这些太空企业必须在第一次发射时就把卫星完美送进轨道。目前它们只有一次机会。但意大利公司D-Orbit已成功制造了一颗“运载”卫星，用于将已发射的小型卫星推至正确的位置。

也许太空业务最具未来主义色彩的新问题是太空碎片。人们担心的是，有那么多公司的那么多新卫星在轨道中运行，令其中某颗卫星失控的风险加大。卫星碰撞的后果是灾难性的，所产生的碎片极有可能横扫其他卫星，可能一下子令整个商业近地轨道生态系统瘫痪。为解决这个问题，日本公司Astroscale正在建造一款航天器原型，它能在有需要时即刻发射入轨，捕获发生故障的卫星并将其拉入大气层，让它在与任何物体碰撞前燃烧殆尽。这款“救援”航天器将利用计算机视觉锁定失控的卫星并保持与之相同的速度，再利用磁力捕获它。该公司在过去几年已融资1.32亿美元，计划在明年演示这一技术。

地球轨道似乎突然变得空前繁忙。企业涌进太空，因为那里提供了与别处不同的有利位置，便于它们收集以往对它们而言太过昂贵却极具价值的新信息。当年TUBSAT昭示的“新市场领域”而今终于敞开了大门。 ■



Global supply chains

A slow unravelling

Supply chains are undergoing their most dramatic transformation in decades. This will be wrenching for many firms, argues Vijay Vaitheeswaran

TOM LINTON, chief procurement and supply-chain officer at Flex, an American contract-manufacturing giant, has his finger on The Pulse. That is the name of his firm's whizzy command centre in California, which is evocative of a Pentagon war room. The kit allows him to monitor Flex's 16,000 suppliers and 100-plus factories, producing everything from automotive systems to cloud-computing kit for over 1,000 customers worldwide. Mr Linton is one of the acknowledged kings of the supply chain—the mechanism at the heart of globalisation of the past few decades by which raw materials, parts and components are exchanged across multiple national boundaries before being incorporated into finished goods. Ask him about the future, however, and he answers ominously: “We’re heading into a post-global world.”

A few years ago that would have been a heretical thought. The combination of the information-technology revolution, which made communications affordable and reliable, and the entry of China into the world economy, which provided bountiful cheap labour, had transformed manufacturing into a global enterprise. In his book “The Great Convergence”, Richard Baldwin argues that the resulting blend of Western industrial know-how and Asian manufacturing muscle fuelled the hyper-globalisation of supply chains. From 1990 to 2010, trade boomed thanks to tariff cuts, cheaper communications and lower-cost transport.

The OECD, a think-tank for advanced economies, reckons that 70% of global trade now involves global value chains (GVCs). The increase in their

complexity is illustrated by the growth in the share of foreign value added to a country's exports. This shot up from below 20% in 1990 to nearly 30% in 2011.

Western retailers developed networks of inexpensive suppliers, especially in China, so that they in turn could deliver "everyday low prices" to consumers back home. Multinational corporations (MNCs) that once kept manufacturing close to home stretched supply chains thin as they chased cheap labour and economies of scale on the other side of the world. Assuming globalisation to be irreversible, firms embraced such practices as lean inventory management and just-in-time delivery that pursued efficiency and cost control while making little provision for risk.

But now there are signs that the golden age of globalisation may be over, and the great convergence is giving way to a slow unravelling of those supply chains. Global trade growth has fallen from 5.5% in 2017 to 2.1% this year, by the OECD's reckoning. Global regulatory harmonisation has given way to local approaches, such as Europe's data-privacy laws. Cross-border investment dropped by a fifth last year. Soaring wages and environmental costs are leading to a decline in the "cheap China" sourcing model.

The immediate threat comes from President Donald Trump's imposition of tariffs on America's trading partners and renegotiation of free-trade agreements, which have disrupted long-standing supply chains in North America and Asia. On June 29th, Mr Trump agreed a truce with Xi Jinping, China's president, that temporarily suspends his threatened imposition of duties of up to 25% on \$325bn-worth of Chinese imports, but leaves in place all previous tariffs imposed during the trade war. He threatened in May to impose tariffs on all imports from Mexico if it did not crack down on immigration, but reversed himself in June. He has delayed till November a decision on whether to impose tariffs on automobile imports, which would hit European manufacturers hard.

Look beyond politics, though, and you will find that supply chains were already undergoing the most rapid change in decades in response to deeper trends in business, technology and society. The rise of Amazon, Alibaba and other e-commerce giants has persuaded consumers that they can have an endless variety of products delivered instantly. This is putting enormous pressure on MNCs to modify and modernise their supply chains to keep pace with advancing innovations and evolving consumer preferences.

The biggest force for change is technology. Artificial intelligence (AI), predictive data analytics and robotics are already changing how factories, warehouses, distribution centres and delivery systems work. 3D printing, blockchain technologies and autonomous vehicles could have a big impact in future. Some even dream of autonomous supply chains requiring no human intervention.

However, technological advances also raise the spectre of an arms race in supply-chain security. Aggressive private hackers and state-sponsored cyber-warriors appear to have the upper hand over beleaguered corporations and governments. Recent headlines have focused on America's crackdown on Huawei, a Chinese telecoms giant. But the issues involved go far beyond one firm, given that much of the world's electronics-manufacturing and hardware innovation takes place in China.

If a technology cold war breaks out, it would smash today's highly integrated technology supply chains and force an expensive realignment. It may even lead to a bifurcation in the rollout of 5G, a new telecoms-network technology that is the essential enabler of coming marvels such as the internet of things (IOT). With the proliferation of inexpensive sensors, the IOT will allow homes, factories and cities to be digitally monitored and managed. A "splinternet of things" (in which America followed one standard and China another) would not only be costly and inefficient, it

would also fail to address legitimate security concerns about future cyber-threats in the age of 5G.

Even if Huawei is eventually spared, and the truce in America's trade war with China turns into a frosty peace, the era of frictionless supply lines flowing from Shenzhen to San Francisco and Stuttgart has ended. As globalisation is transformed into something messier, the consequences for MNCs and the world economy could be momentous.

This report will show that supply chains were already becoming shorter, smarter and faster before politicians started taking a hammer to the trading system. Given today's riskier world, supply chains will need to become safer too. This transformation threatens firms that have entrenched supply networks, but it also presents opportunities for those that adapt nimbly. ■ ■



全球供应链

缓慢解体

供应链正在经历几十年来最剧烈的转变。本专题作者范思杰认为，这对许多公司来说都非常痛苦【专题报道《全球供应链》之一】

美国合约制造巨头伟创力（Flex）的首席采购与供应链官蒂姆·林顿（Tom Linton）时刻都在“搭脉”——该公司设在加州的先进的指挥中心名叫“脉搏”（The Pulse），让人想起五角大楼的作战室。这套工具使他能够监控伟创力的16,000家供应商和100多家工厂，它们为全球1000多家客户生产从汽车系统到云计算套件的所有产品。林顿是供应链界公认的王者之一。过去几十年来，供应链是全球化的核心机制，原材料、零部件在被纳入成品之前通过它穿越多条国境线。然而，问问他对未来怎么看，他的回答让人感到不祥：“我们正在进入一个后全球化的世界。”

放在几年前，这种想法肯定是个异端。信息技术革命让通信变得廉价又可靠，加上中国进入世界经济带来了丰富的廉价劳动力，让制造业转变为一项全球性活动。理查德·鲍德温（Richard Baldwin）在他的《大融合》（The Great Convergence）一书中指出，西方的工业知识由此与亚洲的制造能力融合起来，推动了供应链的高度全球化。从1990年到2010年，关税削减、通信成本降低和廉价运输让贸易蓬勃发展。

发达经济体智库经合组织（OECD）认为，如今全球70%的贸易涉及全球价值链（GVC）。一国出口中外国增值部分的增长说明供应链正变得愈发复杂。这一占比从1990年的不到20%上升到2011年的近30%。

西方零售商开发了廉价供应商网络，特别是在中国，它们继而得以向自己国家的消费者提供“日常低价”。跨国公司（MNC）一度将制造放在离总部较近的地方，但随着它们在世界另一端追逐廉价劳动力和规模经济，供应链被越拉越长。企业以为全球化不可逆转，它们拥抱精益库存管理和即时交付等追求效率和成本控制的做法，却对风险准备不足。

但现在，有迹象表明全球化的黄金时代可能已经结束，而大融合正在让位于这些供应链的缓慢解体。经合组织估计，全球贸易增长已从2017年的5.5%降至今年的2.1%。全球监管协调已经让位于本地化手段，例如欧洲的数据隐私法。跨境投资去年下降了五分之一。飙升的工资和环境成本导致“廉价中国”采购模式的衰落。

直接的威胁来自特朗普总统对美国贸易伙伴征收关税以及重新谈判自由贸易协定，这扰乱了北美和亚洲建立已久的供应链。6月29日，特朗普与中国国家主席习近平达成休战协议，暂停了对从中国进口的价值3250亿美元的商品征收高达25%关税的威胁，但在贸易战期间已经开征的所有关税均被保留。他在5月份威胁称，如果墨西哥不打击移民，就要对所有从墨西哥进口的产品征收关税，但在6月份又作罢。他把是否对进口汽车产品征收关税的决定推迟至11月，这项关税将对欧洲制造商造成严重打击。

但是，抛开政治不谈，面对商业、技术和社会的更深层趋势，你会发现供应链本已在发生几十年来最迅速的变化。亚马逊、阿里巴巴和其他电子商务巨头的崛起使消费者相信他们可以立即拿到品类无限的各种产品。这给跨国公司带来了巨大的压力，迫使它们调整供应链并使其现代化，以跟上日新月异的创新和不断变化的消费者偏好。

变革的最大动力是技术。人工智能（AI）、预测性数据分析和机器人技术已经在改变工厂、仓库、配送中心和送货系统的工作方式。3D打印、区块链技术和无人驾驶汽车未来可能会产生重大影响。有些人甚至想象着不需要人为干预的自主供应链。

然而，技术进步也令人担忧一场供应链安全的军备竞赛正在逼近。好战的私人黑客和国家支持的网络部队似乎比腹背受敌的公司和政府更占上风。最近的头条新闻都在关注美国对中国电信巨头华为的打击，但既然世界上大部分电子制造和硬件创新都发生在中国，背后的问题远不止这一家公司。

如果技术冷战爆发，它将粉碎当今高度集成的技术供应链，并迫使企业做

出昂贵的调整。它甚至可能导致5G的推广一分为二。这种新的电信网络技术是物联网（IOT）等未来奇迹的重要驱动力。随着廉价传感器的普及，物联网将使得家庭、工厂和城市可被数字化监控和管理。“分裂物联网”（美国遵循一套标准，中国遵循另一套）不仅成本高，效率低，而且还无法解决对5G时代网络威胁的合理的安全担忧。

即使华为最终幸免于难，且中美贸易战的休战演变成冷淡的和平，从深圳流向旧金山和斯图加特的无摩擦供应线时代已经结束。随着全球化转变为某种更混乱的东西，可能对跨国公司和世界经济带来重大的影响。

本期专题报道将阐明，在政客们开始打砸贸易体系之前，供应链就已经变得更短、更智能、更快。鉴于当今世界的风险更高，供应链也需要变得更加安全。这种转变威胁到了已经建立起固定供应网络的公司，但也为那些能灵活调适的公司带来了机会。 ■ ■



Slowbalisation

Bumpy new world

After several decades of getting longer, global supply chains are contracting

IN THE BOOM years of globalisation from 1990, one of the ideas that became gospel, spread by authors such as Thomas Friedman, was that the world had become flat. National boundaries mattered very little in terms of sourcing and manufacturing, went the argument.

The idea was so pervasive, says Hau Lee of Stanford University, that “companies just built anywhere”. Now, as the outlook for globalisation grows cloudy, companies are starting to question the wisdom of the hyper-globalised supply chains thus created. Mr Lee reckons that managers at MNCs must now build new skills as they reconfigure supply chains for a “bumpy” new world.

A survey conducted in April of 600 MNCs around Asia by Baker McKenzie, an American law firm, found that nearly half of them are considering “major” changes to their supply chains, and over a tenth a complete overhaul. In many sectors this will mean a rethink of the role that China plays in sourcing. There are two main reasons to expect that, after several decades of hyperextension, some supply chains will get shorter. First, it is now clear that stretching supply chains thin to make goods ever cheaper carries risks. And second, global trade now includes not just things you can drop on your foot, but a large amount of services.

In terms of the risks, most MNCs do not know who supplies the supplier to their supplier, but they might be held hostage if that distant vendor cannot fulfil its obligations. The dangers are occasionally brought to light by external shocks. Sometimes these are delivered by natural disasters. In the

wake of the Japanese tsunami in 2011 a global semiconductor giant tried to map its vulnerabilities to third- and fourth-tier vendors; it took a team of 100 executives more than a year to work out which firms were in its extended supplier networks.

More recently, shocks have been political. Brexit, Britain's messy departure from the European Union now scheduled to take place at the end of October, could disrupt supply lines linking Britain and the continent. MNCs have warned that they may reduce operations in Britain if it does. A survey by the country's Chartered Institute of Procurement & Supply indicated that a fifth of continental businesses would demand a hefty discount from British suppliers for even a one-day delay at the border, while more than a tenth of British exporters expect contracts to be cancelled outright.

Americans will not have to wait till October to see the impact of their political shocks, as Mr Trump's tariffs on steel, aluminium and Chinese imports are already biting. A working paper by Mary Amiti and colleagues published in March by the National Bureau of Economic Research calculated that by the end of 2018 they had cost American consumers \$1.4bn a month. Retailers are being squeezed, with Walmart and Target warning of price rises to come. Caterpillar, a manufacturer of farm equipment, expects tariffs to cost it \$250m-350m this year. Cummins, an engine maker, expects a hit of \$150m.

Despite the truce agreed with Mr Xi, Mr Trump's tariffs on mainland imports remain in place and Huawei's future is still uncertain. China has imposed retaliatory tariffs, is threatening to punish "unreliable" foreign firms and to withhold exports of rare earths used to make electronics.

In short, a full-blown trade war may yet break out. How much would it hurt? Moody's, a ratings agency, estimates such a "conflagration" would cut growth in real GDP in America by 1.8% one year into the trade war, and

reduce growth rates across Asia by 1% or more. The OECD predicts that a trade war between America and China could take 0.7%, or about \$600bn, off global growth by 2021. The IMF warns that many countries, including those that benefit from trade diversion, will be net losers.

Even if such an outcome is avoided, Mr Trump's actions may already have made an impact on MNCs. A recent survey of European firms by Credit Suisse, an investment bank, shows an increased tendency to locate new investments in Europe, not outside it. The firm thinks that permanent damage has been done by the recent trade disputes. MNCs will "no longer plan and source their supply chains predominantly on the basis of cost", it argues.

The trade war has also led to a rethink at Apple, which has reportedly asked its biggest suppliers to see how much it would cost to shift 15- 30% of its supply base out of China to South-East Asia or India. Liu Young-way, the new chairman of Foxconn, a Taiwanese contract manufacturer that assembles most of Apple's devices, recently declared that his firm could supply all iPhones for the American market from plants outside China if necessary.

As for the rise in services, these are often intermediate inputs into manufacturing. In 2017 global trade in goods amounted to \$17.3trn and trade in services, such as transport and communications, had risen to \$5.1trn. The IMF believes that, when measured in value-added terms, the share of services exports in global exports is nearly twice as large as what official numbers suggest.

By the reckoning of the McKinsey Global Institute (MGI), a think-tank attached to a consultancy, services already create about a third of the value going into traded manufacturing goods. Trade in services grew more than 60% faster than trade in goods over the past decade, and two to three times faster in such fields as telecoms and information technology. As firms look

to boost the value of services and innovation, things that are often best done close to consumers, MGI's Susan Lund thinks they are less likely to chase the cheapest labour globally.

"The supply chain has been viewed as a necessary evil for a long time, trapping companies into incremental thinking," argues Pete Guarraia of Bain, a consultancy. MNC bosses typically left it to mid-level managers to squeeze out 1-2% a year in cost savings through sourcing. Such customer-centric dynamos as China's Alibaba and America's Amazon regularly push for 30% improvements in efficiency. By "weaponising logistics", argues Bain, they have shown how supply chains can serve as a basis for competitive advantage. Inspired and terrified in equal measure, bosses of leading MNCs are now re-examining how exactly their firms "plan, source, make and deliver"—the mantra of supply-chain managers across the world.

As they do so, they will discover that "slowbalisation" brings challenges of its own. Mark Millar, author of "Global Supply Chain Ecosystems", argues that just because supply chains shrink does not mean that they simplify. Quite the opposite. The point of getting closer to the consumer is to help companies expand customisation, accelerate innovation and speed up delivery.

Not everyone agrees that globalisation is slowing. Frank Appel, chief executive of Deutsche Post DHL Group, a German express-shipping and logistics giant, insists that longer-term fundamental forces, such as the rise of middle classes globally and productivity gains from digitisation, still favour global integration. A study published in February by his firm found that international flows of trade, information, capital and workers increased in 2017. However, that was before the full impact of Mr Trump's tariffs and immigration crackdowns hit the global economy.

A more recent analysis by *The Economist* of a dozen factors related to globalisation found that eight pointed to a decline in connectedness (see chart). Pankaj Ghemawat of NYU Stern School of Business, one of the authors of the DHL report, sees a “semi-globalised” world in which international threats and opportunities matter but most business activities take place domestically. For most firms, this will mean supply chains will need to become not just shorter, but also faster and smarter. ■ ■



慢球化

坎坷新世界

经过了几十年的延伸之后，全球供应链正在收缩【专题报道《全球供应链》之二】

在从1990年开始的全球化的繁荣时代，托马斯·弗里德曼（Thomas Friedman）等作家传播的一种思想成了真理：世界变得扁平了。这种观点认为，国界在采购和制造方面几乎无关紧要。

斯坦福大学的李效良（Hau Lee）说，这个想法是如此流行，以至于“公司开在哪儿都成”。现在，随着全球化的前景晴转多云，企业开始质疑超全球化供应链的想法。李效良认为，如今在为“坎坷”的新世界重新配置供应链时，跨国公司的管理人员必须打造新的技能。

美国贝克·麦坚时律师事务所在4月对亚洲地区600家跨国公司的一项调查发现，其中近一半的公司正在考虑对其供应链进行“重大”变革，超过十分之一说要推倒重来。在许多领域，这将意味着重新思考中国在采购中所扮演的角色。可以预期，在几十年的过度拉伸之后，一些供应链会变短，原因有二。首先，现在已经很清楚，把供应链拉得太长来让货物更便宜存在风险。其次，全球贸易现在不仅包括可以砸到你脚上的实物，还包括大量服务。

就风险而言，大多数跨国公司不知道谁在向自己的供应商的供应商供货，但如果遥远的供应商无法履行义务，自己可能就会被扣为人质。危险偶尔会因外部冲击而暴露，有时是自然灾害。2011年日本海啸之后，一家全球半导体巨头试图确定第三、四层供应商给自己带来的风险；100多名高管花了一年多的时间才弄清楚公司广大的供应商网络中到底有哪些公司。

最近的冲击源自政治。英国混乱的脱欧现在计划于10月底实施，可能会破坏连接英国和欧洲大陆的供应线。跨国公司警告称，如果确实如此，它们可能会减少在英国的业务。英国皇家采购与供应协会（Chartered Institute of Procurement & Supply）的一项调查显示，五分之一的欧洲大陆企业将

要求英国供应商为哪怕在边境延迟一天提供大幅折扣，而超过十分之一的英国出口商预计合同将被直接取消。

美国人不必等到10月就能看到自己国家政治冲击的影响，因为特朗普对钢铁、铝和中国进口产品征收的关税已经开始造成冲击。美国国家经济研究局3月份发表了玛丽·阿米蒂（Mary Amiti）及其同事合作的一份工作报告称，到2018年底关税已让美国消费者每月多花14亿美元。零售商受到挤压，沃尔玛和塔吉特警告价格将上涨。农用设备制造商卡特彼勒（Caterpillar）预计关税将让它在今年损失2.5亿至3.5亿美元。发动机制造商康明斯（Cummins）预计损失达1.5亿美元。

尽管与习近平达成了休战协议，但特朗普对从中国大陆进口产品的关税仍然存在，而华为的未来仍不明朗。中国实施了报复性关税，威胁要惩罚“不可靠”的外国公司，并拒绝出口用于制造电子产品的稀土。

简而言之，全面的贸易战仍可能爆发。它会造成多大伤害？评级机构穆迪估计，这种“滔天大火”将在贸易战发动一年后使美国实际GDP增长率减少1.8%，并将整个亚洲的增长率降低1%或更多。经合组织预测，到2021年，中美之间的贸易战可能会使全球经济增长减少0.7%，或约6000亿美元。国际货币基金组织警告说，许多国家，包括那些从贸易转移中受益的国家，将是净输家。

即使避免了这样的结果，特朗普的行动可能也已对跨国公司产生了影响。投资银行瑞士信贷最近对欧洲公司进行的一项调查显示，把新投资放在欧洲而不是欧洲之外的趋势越来越强。该公司认为最近的贸易纠纷造成了永久性损害。它认为，跨国公司将“不再主要根据成本来规划和寻找供应链”。

贸易战也促使苹果公司反思自身。该公司据称已经要求其最大的一批供应商了解将15%至30%的供应基地从中国转移到东南亚或印度要花多少钱。为苹果组装大部分设备的台湾合约制造商富士康的新任董事长刘扬伟最近宣称，如有必要，他的公司可以从中以外的工厂为美国市场供应所有

iPhone。

就服务业的增长而言，它往往是制造业的中间输入。2017年，全球货物贸易额达17.3万亿美元，运输和通讯等服务贸易额已上升至5.1万亿美元。国际货币基金组织认为，按增值计算，服务出口占全球出口的份额几乎是官方数据的两倍。

根据麦肯锡咨询公司下属智囊团麦肯锡全球研究所（MGI）的估算，服务已经创造了贸易工业品大约三分之一的价值。在过去十年中，服务贸易的增长比货物贸易快了60%以上，在电信和信息技术等领域则要快两到三倍。随着企业开始寻求提升服务和创新的价值，而这类工作常常要接近消费者才能做得好，MGI的苏珊·伦德（Susan Lund）认为它们现在追逐全球最廉价劳动力的可能性更小了。

“供应链长期以来一直被视为‘不得不做’，导致企业陷入渐进式思维。”贝恩咨询公司的皮特·瓜亚拉（Pete Guarraia）说。跨国公司的老板通常会让中层管理人员每年通过采购来节省1%到2%的成本。像中国的阿里巴巴和美国的亚马逊这样以客户为中心的巨头则定期推动效率提高30%。贝恩认为，通过“物流武器化”，它们已经展示了供应链如何成为竞争优势的基础。领先的跨国公司的老板们既得到启迪又倍感恐惧，正在重新审视他们的公司究竟如何“计划、采购、制造和交付”——全球供应链经理的魔咒。

当他们这样做时，他们将会发现“慢球化”带来了自身的挑战。《全球供应链生态系统》（Global Supply Chain Ecosystems）一书的作者马克·米勒（Mark Miller）认为，仅仅因为供应链收缩并不意味着它们会简化。恰恰相反。更接近消费者的目的是帮助公司扩大定制、加速创新并加快交付。

不是每个人都同意全球化正在放缓。德国邮政和物流业巨头DHL集团的首席执行官弗兰克·阿佩尔（Frank Appel）坚持认为，长期的基本力量，如全球中产阶级的崛起和数字化带来的生产率增长，仍然有利于全球一体化。他的公司在2月份发表的一项研究发现，2017年贸易、信息、资本和工人的国际流量增加。然而，那是在特朗普的关税和收紧移民政策对全球

经济产生全面影响之前。

《经济学人》最近对与全球化相关的十几个因素的分析发现，八个因素指向了连通性的下降（见图表）。DHL报告的作者之一、纽约大学斯特恩商学院的潘卡吉·盖马沃特（Pankaj Ghemawat）看到了一个“半全球化”的世界，其中国际威胁和机遇仍然重要，但大多数商业活动都在国内进行。对于大多数公司来说，这意味着供应链不仅要更短，还要更快、更智能。





Three industries

Loving China, leaving China

A look at where clothes, cars and computers are made reveals differing patterns of supply fragmentation

GLOBALISATION IS BECOMING regionalisation. Analysis by MGI finds that the global value chains (GVCs) in 16 of 17 big industries it studied have been contracting since the global financial crisis. Trade continued to grow in absolute terms from 2007 to 2017, but during that period exports in those same value chains declined from 28.1% to 22.5% of gross output. The biggest declines in trade intensity were observed in the most heavily traded and complex GVCs, such as those in clothing, cars and electronics. As MGI's Susan Lund explains, "more production is happening in proximity to major consumer markets".

China's role as the world's workshop is starting to fade, but surprisingly this may not sound the death knell for mainland manufacturing. Thanks to its skilled labour force and excellent infrastructure, China remains an outstanding place to make things, hence its continued strength in numerous sectors (see chart). Also, the rise of the Chinese middle class has led many firms to redirect production to serve the local market. So MNCs are clearly rethinking the old linear sourcing model for Western markets, but the path forward is unclear. Different industries will make different choices.

Corporate supply-chain data are often opaque and official trade statistics typically lag by years. Yet talking to many firms in three industries reveals different patterns of fragmentation. The clothing sector is globally footloose; the car industry is coalescing around regional hubs; and the electronics business remains rooted in China (though Mr Trump's attack on Huawei, its technology champion, will affect this).

Big parts of the clothing and footwear business involve labour-intensive tasks such as stitching, so cost-conscious bosses are always chasing low-cost markets. Many long ago left the mainland, where wages have soared, for South-East Asia and Bangladesh. Nike and Adidas make more training shoes in Vietnam than China.

Today's hot spot is Ethiopia, which has attracted investment by Calvin Klein and H&M. With labour costs of just \$26 a month, it might seem a dream destination for the frugal clothier. But a report released in May by the NYU Stern Centre for Business and Human Rights argues that these wages are too low to meet workers' basic needs, which is fuelling unrest. Productivity levels are low and attrition high. Paul Walsh of Newtimes Group, a clothing supply-chain firm, observes: "We've run out of magic countries."

Clothing bosses are increasingly preoccupied with speed more than cost, says Suresh Dalai, a supply-chain expert based in Asia. "In speed, China still has the edge," he says, pointing to its world-beating online retailers, "social-commerce" innovators and nimble manufacturers. He thinks that demanding local consumers force Chinese clothing factories to remain enterprising and flexible. In contrast, factory bosses elsewhere complain of unreliability and low productivity.

Unlike those cut-rate competitors, say experts, Chinese factories have the specialised machinery and experienced operators that are needed to make seamless fabrics and other higher-value textiles. Pravin Rangachari of Haggar, a leading manufacturer of men's trousers, has no plans to abandon China's highly automated fabric mills, which he finds "very competitive". He adds that compliance with child-labour laws is strong in China, which cannot always be said about other markets.

China's share in big clothes-importing markets such as Japan and Europe has declined since 2010 as they have been buying cheaper clothes made in

South-East Asia instead. However, China's share in every big textile-import market in Asia has soared because many of those workshops still bought fabrics from the mainland. Its export share into Vietnam, for example, more than doubled to 50% from 2005 to 2017. The upshot is that although China's once-dominant role in this industry has diminished, it remains strong in important niches.

As for the automobile industry, its supply chains have both local and global dimensions. "Except for the jack in the trunk, which everybody gets from China, we've had a distributed global supply chain for a long time," says Hau Thai-Tang, Ford's top supply-chain executive. He sees a trend towards greater regionalisation coming with three hub-and-spoke networks: Mexico as the low-cost spoke for America; eastern Europe and Morocco for western Europe; and South-East Asia and China for Asia.

One reason for regionalisation is that the American market is diverging from global trends, argues Kristin Dziczek of America's Centre for Automotive Research, an industry-research outfit. The Trump administration has rejected carbon regulation and rolled back Obama-era rules promoting more fuel-efficient vehicles. Americans are increasingly favouring pickup trucks and sports-utility vehicles, gas guzzlers eschewed by much of the rest of the world. This has big implications. Ford has decided to phase out saloons altogether in its home market, for example, while GM has left Europe and is consolidating its North American operations.

Car firms have invested heavily to turn Mexico into an export base. The value of its automobile exports has more than doubled since 2010, approaching \$50bn last year. The main reasons are not the nearly-defunct North American Free Trade Agreement or lower labour costs, but rather Mexico's four dozen free-trade agreements with other countries which allow it to export to almost half the world's market for new cars tariff-free. Carmakers have rejigged supply lines to take advantage. Mexico's car exports

to Germany have nearly 40% German components by value, while those crossing its northern border have over 70% American content.

Mr Trump's tariffs on China have pushed Big Auto's supply chains to become even more regional. "We're finally ready to leave China," says a senior supply-chain executive at a global car maker. His firm is looking seriously at shifting its sourcing for the global market from China to India, but finds Indian vendors "unreliable". It thought about dividing between India and Mexico, but saw that its supply base would lose economies of scale. The winner will be Mexico, he says.

A longer-term force that could turn automotive supply chains upside down is electrification. The Edison Electric Institute, a think-tank, estimates that the share of electric vehicles (EVs) in new car sales in America will rise from 2% in 2018 to over 20% in 2030. That could reduce trade in parts dramatically, since EVs have many fewer moving parts than conventional cars. Ford calculates that a shift to electric would reduce the value added by branded car manufacturers from 30% to 10%.

Dyson, a British engineering firm, is now designing and manufacturing its new EVs in Singapore to be close to China. This is not just because the mainland is the biggest market for such vehicles. It is also the beating heart of global electronics production.

Half the world's electronics-manufacturing capacity is based on the mainland. Its strengths go beyond sheer scale to diversity and sophistication of products. The pace of hardware innovation in China's Pearl river delta is unmatched even in Silicon Valley. So, too, is its unique blend of scale and agility. This is why most of the world's technology giants make their kit in China.

Rising costs led some electronics firms to consider moving out a few years

ago. Most notably, Samsung has built a huge smartphone-manufacturing complex in Vietnam. Now the political risks associated with sourcing from China, especially the Huawei crackdown, are causing others to consider leaving. GoPro, which makes rugged digital cameras, is shifting much of its production to Mexico. Stanley Black & Decker, a big toolmaker, is moving production of its Craftsman brand of tools back to America. Sweden's Ericsson is scaling up American manufacturing in anticipation of a boom in 5G telecoms-equipment sales.

Many firms are discovering that leaving China is not so easy. John Kern is the head of supply chains at America's Cisco, a telecoms-equipment company. Because of the concerns of customers in America and India who want non-China sourcing, it has upgraded its Mexican operations. But it still has many global customers without such concerns. He says China is a big manufacturing base for Cisco and "will remain so for many years to come".

George Yeo of Kerry Logistics, which has lorries and men all over Asia, has noticed an uptick in clients investing in South-East Asia. Vietnam and Cambodia are the biggest beneficiaries, he reports. But labour productivity is a big problem across the region and infrastructure can be ropey. Much of the investment he sees is going into labour-intensive industries like textiles. In electronics, Mr Yeo thinks the exodus is limited to low-end kit. "Thanks to automation and high value-add, Shenzhen is still king."

Scrutiny of these three sectors suggests a messy path forward from globalisation. Making this challenge more acute, MNC bosses are now faced with a double threat. Not only must they make supply chains shorter, they must make them faster. ■ ■



三大行业

爱着中国，离开中国

服装、汽车和电脑的生产地揭示出供应链细分的不同模式【专题报道《全球供应链》之三】

全球化正在变成区域化。麦肯锡全球研究院（MGI）的分析发现，自全球金融危机以来，它研究的17个大型行业中有16个的全球价值链（GVC）一直处于收缩状态。从2007年到2017年，贸易绝对值继续增长，但在此期间，这一批价值链的出口从总产出的28.1%下降到22.5%。贸易强度下降幅度最大的全球价值链是那些交易量最大且复杂的，如服装、汽车和电子产品。正如MGI的苏珊·伦德（Susan Lund）所解释的：“更多的生产正在靠近主要的消费市场。”

中国作为世界工厂的角色开始消退，但令人惊讶的是，这可能并未敲响大陆制造业的丧钟。凭借其熟练的劳动力和优良的基础设施，中国仍然是一个优秀的制造场所，因此它在众多领域仍保持优势（见图表）。此外，中国中产阶级的崛起让许多公司将生产转向服务于当地市场。因此，跨国公司显然正在重新考虑西方市场旧的线性采购模式，但未来的道路尚不清楚。不同的行业会做出不同的选择。

企业供应链数据一般不透明，而官方贸易统计数据则往往滞后数年。然而，与三个行业中许多公司的交谈揭示了不同的细分模式。服装业在全球范围内自由发展；汽车行业正在围绕区域中心进行合并；而电子行业依然植根于中国（尽管特朗普对其技术领导者华为的攻击会影响到这一点）。

服装和制鞋业中有很大一部分涉及缝纫等劳动密集型任务，因此注重成本的老板总会追逐低成本市场。许多公司在很久以前就离开了工资飙升的中国大陆，前往东南亚和孟加拉国。耐克和阿迪达斯在越南生产的运动鞋比中国更多。

如今的热点是埃塞俄比亚，它吸引了Calvin Klein和H&M的投资。其劳动力成本仅为每月26美元，似乎是节俭的服装制造商的梦想目的地。但纽约大学斯特恩商业与人权中心5月发布的一份报告认为，这样的工资低到无法满足工人的基本需求，会激起动荡。生产率水平低下，人员流失率高。服装供应链公司新时代集团（Newtimes Group）的保罗·沃尔什（Paul Walsh）观察到：“魔力之国已经没有了。”

亚洲的供应链专家苏雷什·达莱（Suresh Dalai）表示，服装老板越来越关注速度而非成本。“在速度方面，中国仍具有优势。”他说，指出这里有世界上首屈一指的在线零售商、“社交商务”创新者和灵活的制造商。他认为中国要求苛刻的本地消费者迫使中国的服装厂保持进取和灵活。相比之下，在其他地区，工厂老板们抱怨可靠性差、生产率低。

专家说，与那些低价竞争对手不同，中国工厂拥有制造无缝面料和其他高价值纺织品所需的专业机械和经验丰富的操作员。男裤的领先制造商哈革尔（Haggar）的普拉文·朗格查利（Pravin Rangachari）并不准备放弃中国高度自动化的面料工厂，他认为这种工厂“非常具有竞争力”。他补充说，中国对童工法遵守得很好，而其他市场并不总是如此。

自2010年以来，中国在日本和欧洲等大型服装进口市场所占的份额有所下降，因为它们一直在购买东南亚制造的廉价服装。然而，中国在亚洲每个大型纺织品进口市场的份额都在飙升，因为许多工场仍然从中国大陆购买面料。例如，从2005年到2017年，它对越南的出口份额翻了一倍多，达到50%。其结果是，尽管中国在这个行业中一度主宰的角色已经消减，但它在重要的利基市场仍然很强大。

至于汽车行业，其供应链既具有本地性，又有全球性。福特的供应链负责人唐浩泰（Hau Thai-Tang）说：“除了后备箱中的千斤顶是所有人都从中国采购之外，我们拥有分布式的全球供应链已经很久了。”他认为三个中心辐射网络带来了更强的区域化趋势：美国的低成本分支是墨西哥；西欧是东欧和摩洛哥；亚洲则是东南亚和中国。

行业研究机构美国汽车研究中心的克里斯汀·季切克（Kristin Dziczek）认为，区域化的一个原因是美国市场正在脱离全球趋势。特朗普政府拒绝了碳监管，并推翻了奥巴马时代推动更节能汽车的规章。美国人越来越青睐皮卡车和运动型多功能车，这些“油老虎”在世界其他大部分地区都不受欢迎。这有很大的影响。例如，福特已决定在其国内市场完全淘汰小轿车，而通用汽车已经离开欧洲并正在整合其北美业务。

汽车公司投入巨资将墨西哥变成了出口基地。自2010年以来，这里的汽车出口额增长了一倍以上，去年接近500亿美元。主要原因不是几乎已经失效的北美自由贸易协定或低劳动力成本，而是墨西哥与其他国家签订了40多项自由贸易协定，允许其无关税出口到世界近一半的新车市场。汽车制造商重新调整了供应链来利用它。按价值计算，墨西哥对德国的汽车出口有接近40%的德国部件，而跨越北部边境的汽车则有超过70%的美国部件。

特朗普对中国征收的关税已经推动三大汽车生产商的供应链变得更加区域化。“我们终于准备离开中国。”一家全球汽车制造商的高级供应链高管表示。他的公司正在认真考虑将其全球市场采购从中国转移到印度，但发现印度供应商“不可靠”。它考虑在印度和墨西哥之间进行分配，但发现这样的话供应商将失去规模经济。他说，获胜者将是墨西哥。

可能颠覆汽车供应链的长期力量是电气化。据智库爱迪生电力研究所估计，美国新车销售中电动汽车（EV）的份额将从2018年的2%上升到2030年的20%以上。这可以大大减少零件贸易，因为电动汽车的运动部件比传统汽车少得多。据福特计算，转向电动将使品牌汽车制造商的附加值从30%降低到10%。

英国工程公司戴森（Dyson）正在新加坡设计和制造新的电动汽车，以便靠近中国。这不仅仅是因为中国大陆是这类车辆的最大市场，它也是全球电子产品生产的心脏。

世界上一半的电子制造能力基于中国大陆。它的优势不仅仅是单纯的规

模，还有产品的多样性和成熟度。即使硅谷也无法媲美中国珠江三角洲的硬件创新速度，以及它在规模和敏捷性上的独特融合。这就是为什么世界上大多数技术巨头都在中国生产设备的原因。

成本上升导致一些电子公司在几年前考虑从这里迁出。最著名的例子是三星在越南建立了一个庞大的智能手机制造基地。现在，与从中国采购相关政治风险，特别是对华为的打压，正在促使其他公司也考虑离开。制造坚固型数码相机的GoPro正在将其大部分生产转移到墨西哥。大型工具制造商史丹利百得（Stanley Black & Decker）正在将其Craftsman品牌工具的生产转移回美国。由于预计5G电信设备销售将飙升，瑞典的爱立信正在扩大在美国的生产规模。

许多公司发现离开中国不容易。约翰·科恩（John Kern）是美国电信设备公司思科的供应链负责人。由于美国和印度的客户不想使用从中国采购部件的产品，思科已经升级了墨西哥业务。但它仍然有许多全球客户没有这样的担忧。他表示，中国是思科的一个重要制造基地，并且“在未来许多年内仍将如此”。

在亚洲各地拥有卡车和人手的嘉里物流（Kerry Logistics）的杨荣文（George Yeo）注意到，投资东南亚的客户数量有所增加。他说越南和柬埔寨是最大的受益者。但劳动生产率是整个地区的一大问题，而且基础设施可能很糟糕。他看到的大部分投资都进入了纺织等劳动密集型产业。在电子行业方面，杨荣文认为转移仅限于低端设备。“由于自动化和高附加值，深圳仍是王者。”

仔细观察这三个行业后，我们发现全球化之后是一条混乱的道路。让这一挑战变得更加激烈的是，跨国公司的老板现在面临着双重威胁。他们不仅要让供应链更短，还要更快。 ■ ■



If robots don't take all the jobs

A different dystopia: July 2030

What if the real danger to future prosperity is not that there are too many robots, but too few? An imagined scenario from 2030

IT IS HARD to believe now, but a little more than a decade ago people were seriously worried about robots taking all the jobs. Back in 2018 the chief economist of the Bank of England, Andy Haldane, gave a warning that “large swathes” of the population would become “technologically unemployed”. He argued that the “fourth industrial revolution” of automation and artificial intelligence (AI) would create even more disruption to people’s working lives than the previous three. Robots would do everything. There would be universal leisure but mass unemployment. Similar warnings were a fixture at the World Economic Forum’s annual meeting in Davos. Bestselling books predicted dystopian outcomes in which society split into a wealthy, robot-owning plutocracy and an unemployed underclass, and repressive governments would be needed to rein in social discontent. But robots did not take all the jobs—and today, in 2030, much of the world faces the opposite problem as populations age and workforces shrink. What happened to the supposedly inexorable march of the machines?

At the height of the concern about the coming jobs apocalypse, in the late 2010s, the most vulnerable people were thought to be older, unskilled workers. In 2017 the McKinsey Global Institute, part of a business consultancy, predicted that 800m people in 46 countries, or roughly a third of the workforce, could lose their jobs to machines by 2030. Older workers were thought to be especially vulnerable because they were engaged in repetitive, unskilled manufacturing, the kind that was easiest to automate. In 2018 Mercer, another consultancy, used an index of risk developed by Carl Frey and Michael Osborne of the Oxford Martin School to calculate

that three-quarters of Chinese workers aged over 50 were at risk of being replaced by robots. In America just over half of older workers ran the same risk, while in Germany and Italy about 60% did.

But these dire forecasts did not come to pass, for two reasons. First, AI failed to advance as quickly as some people thought it would. In 2018 Rodney Brooks, a professor at the Massachusetts Institute of Technology (MIT), forecast that driverless-car services comparable to conventional taxis were unlikely before 2032 and that a robot which could navigate its way around the steps and clutter of an ordinary home would not become widespread until 2035. With just a few years to go, he seems likely to be proved right on both counts. During the 2020s robots powered by AI became more widespread, changing many industries and taking over repetitive jobs. But they were not cheap and still cannot handle many tasks requiring human discretion or empathy. In nursing and social care, in particular, robots are not up to the job.

Second, the 2020s showed that the level of employment depends on more than just automation: it also depends on ageing and immigration. As their populations aged, rich countries saw their workforces shrink. Many invested more in robots as they aged, and some let in more migrants, plugging some of the skills gaps and boosting productivity. Countries with relatively slow ageing and lots of robots did best. But those that underinvested in automation, or shut themselves off from the world, were hard hit.

Britain was an extreme example of the second group. In the 2020s its economy was still suffering a trade shock from Brexit and its political system was in turmoil. But the longer-term problems were demographic, made worse by the increased difficulty of hiring workers from abroad. Between 2000 and 2015 the British population had expanded by 11% and the workforce had grown by 14%, thanks to an influx of foreign-born workers.

Over the next 15 years these trends went into reverse. As ageing began to have a larger effect, the population increased by just 6.5% between 2016 and 2030, while net migration dropped to a few thousand a year. The workforce grew by barely 1% in total during that period.

That itself might not have been an insuperable problem. After all, the workforce was at least still growing, unlike Japan's or China's. But Britain was already suffering from a skills shortage, which suddenly got much worse. In 2015, 35% of the workers in health and social care, one of Britain's biggest employers, were over 50; 18% were foreign born. A poll in 2015 found that a third of doctors in the National Health Service were planning to retire by 2020. So as doctors retired and Spanish-born nurses went home, the country found it increasingly difficult to replace them, giving rise to a series of stomach-churning medical scandals which undermined the health service's already-tattered reputation. Similarly, successive governments' promises to build more houses founded on a lack of suitable workers. In 2018 two-thirds of small and medium-sized building firms said they could not find enough bricklayers, carpenters and joiners, in part because they had become overly reliant on importing plumbers from Poland and carpenters from Hungary. Brexit meant those options vanished altogether in the 2020s.

Had Britain invested more heavily in automation, it might have been better able to cope. As Daron Acemoglu of MIT and Pascual Restrepo of Boston University showed in 2018, countries which age fastest tend to invest the most in robotics—causing their GDP growth to hold up better than you might expect. Britain, though, was a technological laggard. According to the International Federation of Robotics its “robot density” (the number of industrial robots per 10,000 manufacturing workers) was only 85 in 2017, compared with an average of 106 across Europe, and 710 in South Korea. Risk-averse businesspeople and technophobic unions ensured that Britain

failed to catch up in the 2020s.

The results were painful. As the workforce stopped growing, labour markets tightened and wages rose. But overall output stagnated and tax revenues fell, reducing the funding available for public and social services, just as they were also being hit by skills shortages and the increasing demands of an older population. Class sizes increased as schools struggled to find enough teachers. Standards of service declined in health care, transport, hospitality and other labour-intensive sectors. A series of strikes successfully blocked an unpopular effort to raise retirement ages more quickly. In 2026, caught between the militancy of its supposed allies and the hostility of markets, Jeremy Corbyn's Labour government prevaricated, backtracked, appealed to voters and then finally collapsed.

Britain was an extreme case. Other countries faced different problems, or managed them better. Japan and South Korea have seen their workforces shrink in absolute terms but, by investing in robots and software to perform repetitive tasks, and by retraining workers for employment in caring professions, both countries softened the blow of the demographic transition and maintained high productivity growth.

Germany also had to deal with an ageing, shrinking workforce but reaped the rewards of allowing a large number of migrants into the country in 2015-16. America's population did not age as quickly as those in other rich countries so its workforce did not contract. After the isolation of the Trump years, the country has become more welcoming to immigrants; it has also maintained its traditionally high investment in automation. As for China, its workforce has contracted dramatically, damaging the Communist Party's attempt to introduce a proper pension- and social-security system, and making it hard even to find enough soldiers for the People's Liberation Army. Social disruption and discontent have reined in China's global ambitions.

The dystopia predicted in the late 2010s, of widespread technological unemployment, has not come to pass. Even at the time, the evidence for an imminent jobs apocalypse was noticeably lacking: employment across the rich world reached record levels in 2019, while productivity growth in many countries was anaemic. That suggested machines were not displacing human workers after all, and their ability to do so had been overstated. In retrospect, the doom-mongers of Davos were worried about the wrong thing. Today another dystopian scenario looms instead: that of a world in which there are too few robots, not too many. ■ ■



如果机器人没有抢走所有工作

另一种废托邦：2030年7月

要是对未来的真正威胁不是机器人太多，而是太少呢？**2030年的想象场景【《世界猜想》系列之二】**

现在听起来也许难以置信，但十多年前，人们非常担心机器人会抢走所有工作。早在2018年，英格兰银行首席经济学家安迪·霍尔丹（Andy Haldane）就发出警告称，“大片”人口将出现“技术失业”。他认为，自动化和人工智能（AI）的“第四次工业革命”对人们的工作生涯造成的干扰将比前三次更大。机器人会把所有事都做了。虽是全民休闲，但也是大规模失业。类似的警告是每年在达沃斯举行的世界经济论坛的固定议题。畅销书预言了废托邦的结局——社会分裂为拥有机器人的富豪统治者和失业的下层社会，需要政府镇压来控制住社会不满。但机器人并没有抢走所有的工作。在2030年的今天，随着人口老龄化和劳动力萎缩，世界上大部分地区都面临相反的问题。本应无可阻挡的机器行军哪里去了？

人们对工作大灾难即将到来的担忧在2010年代末达到顶峰，当时认为年长的非技术工人最容易受影响。一家商业咨询公司下属的麦肯锡全球研究所在2017年预测，到2030年，46个国家中有8亿人（约占劳动力的三分之一）可能被机器抢走工作。他们认为年长工人特别容易受到冲击，因为这些人从事的是重复性的、无需特别技能的制造业，最容易实现自动化。

2018年，另一家咨询公司美世（Mercer）利用牛津马丁学院的卡尔·弗雷（Carl Frey）和迈克尔·奥斯本（Michael Osborne）开发的一种风险指数计算出，50岁以上的中国工人有四分之三可能被机器人取代。在美国，面临这一风险的年长工人刚刚超过一半，而德国和意大利的数字在60%左右。

但这些可怕的预测没能成真，原因有二。首先，AI的进步不像某些人预想的那样快。2018年，麻省理工学院的教授罗德尼·布鲁克斯（Rodney Brooks）预测，在2032年之前，无人驾驶汽车服务不大可能与传统的出租

车相媲美，而能在普通住宅中上下台阶并绕过杂物障碍的机器人要到2035年才开始普及。现在离他预测的时限只差几年了，看起来这两个预测都是对的。在2020年代，由人工智能驱动的机器人变得更加普及，改变了许多行业并接管了重复性工作。但它们并不便宜，而且仍然无法处理许多需要人为判断或同情心的任务。特别是在护理和社会照护方面，机器人无法胜任工作。

其次，2020年代已表明就业水平不仅仅取决于自动化，它还取决于老龄化和移民。随着人口老龄化，富裕国家的劳动力逐渐减少。许多国家在人口老化时加大了对机器人的投入，有些国家则引入了更多移民，填补了一些技能空白并提高了生产效率。衰老相对缓慢且机器人数量最多的国家表现最佳。但那些在自动化方面投资不足或闭关锁国的国家却遭到了严重打击。

英国就是后一类国家中的极端例子。在2020年代，其经济仍受到脱欧的贸易冲击，政治体系陷入动荡。但更长期的问题是人口结构，由于从国外雇用工人愈发困难，形势越来越糟。2000年至2015年间，由于外国出生的工人涌入，英国人口增长了11%，劳动力增长了14%。这些趋势在接下来的15年里发生了逆转。随着老龄化的影响日渐显现，该国人口在2016年至2030年间仅增长了6.5%，而净移民则降至每年几千人。在此期间，员工总数仅增长了区区1%。

这本身也许还算不上一个不可克服的问题。毕竟，与日本或中国不同，劳动力至少还在增长。但英国已经在遭受技能短缺的困扰，而形势突然严重恶化。2015年，英国最大的雇主之一卫生和社会照护行业有35%的员工超过50岁，18%为外国出生。2015年的一项调查发现，英国国民医疗服务体系中有三分之一的医生计划到2020年退休。因此，随着医生退休、西班牙出生的护士回家，英国发现补充医护人员越来越困难，引发了一系列令人反胃的医疗丑闻，进一步破坏了医疗服务体系本已千疮百孔的声誉。同样，历届政府建造更多房屋的承诺因缺乏合适的工人而落空。2018年，三分之二的中小型建筑公司表示他们找不到足够的砖瓦匠和粗细木工，部分原因是它们已经过分依赖从波兰进口管道工和从匈牙利进口木匠。英国脱

欧意味着这些选择在2020年代彻底消失。

如果英国当初在自动化方面投入了更多资金，也许它能应对得更好些。正如麻省理工学院的达隆·阿齐默鲁（Daron Acemoglu）和波士顿大学的帕斯夸尔·雷斯特雷波（Pascual Restrepo）在2018年所展示的那样，老龄化最快的国家倾向于在机器人领域投入最多，这导致其GDP增长好于预期。但英国在技术方面行动迟缓。据国际机器人联合会称，其“机器人密度”（每万名制造工人的工业机器人数量）在2017年仅为85，而欧洲平均为106，韩国为710。英国厌恶风险的商人和惧怕技术的工会使得它在2020年代未能赶上来。

结果很痛苦。随着劳动力停止增长，劳动力市场收紧，工资上涨。但总体产出停滞不前，税收下降，减少了公共和社会服务的可用资金，同时这类服务也受到技能短缺和老年人口需求上升的冲击。学校找不到足够的教师，导致班级规模扩大。医疗、运输、酒店和其他劳动密集型部门的服务标准下降。一系列罢工成功地阻止了一项不得民心的加速提高退休年龄的尝试。2026年，夹在其所谓的盟友的好战心理与市场的敌意之间，杰里米·科尔宾（Jeremy Corbyn）的工党政府左右支绌，出尔反尔，求助于选民，最终崩溃。

英国是个极端案例。其他国家面临不同的问题，或者应对得更好。日本和韩国的劳动力绝对数量有所减少，但通过投资机器人和软件来执行重复性任务，以及再培训工人从事护理型职业，这两个国家都缓和了人口结构转变的冲击，并保持了生产率的高增长。

德国也必须应对因老龄化而不断萎缩的劳动力，但却获得了在2015到2016年间接收大量移民的回报。美国的人口没有像其他富裕国家那样迅速老化，因此其劳动力队伍没有萎缩。在经历了特朗普年代的隔绝孤立之后，这个国家更欢迎移民了；它还保持了一贯很高的自动化投资。至于中国，其劳动力大幅缩减，损害了共产党试图建立恰当的养老金和社会保障制度的努力，甚至难以让人民解放军找到足够的士兵。社会混乱和不满限制了

中国的全球野心。

在2010年代末预测的那种普遍性技术失业的废托邦并没有成真。即便在当时，就业大灾难即将到来的证据也显然不足：2019年富裕国家的就业人数达到创纪录水平，而许多国家的生产率增长乏力。这表明机器终究没有取代人类劳动者，它们这样做的能力被夸大了。回想起来，达沃斯的末世论者担心错了方向。今天，另一个废托邦情景隐隐浮现：一个机器人太少而非太多的世界。 ■ ■



Trade war

Which way out?

How firms making clothes, cars and computers would respond to an all-out trade war

LLAMASOFT, A SUPPLY-CHAIN analytics firm, looked at representative American MNCs in clothing, cars and electronics to assess the impact of America's threatened imposition of a 25% tariff on all Chinese imports. It assumed firms would move sourcing and manufacturing out of China only as much as economic logic dictates. The analysis recognised the costs of moving production and the benefits of reduced inventories, cheaper logistics and shorter cycle times for inventory from positioning supplies closer to consumers.

The clothing industry would see total costs jump by 11% after such tariffs. Sourcing costs would rise by 23% and manufacturing costs by 43%, but nearshoring would improve average cycle times from 19 to 14 days. Overall costs in the car industry would increase by less than 4%, but that would mask powerful counter-currents from the shift to regional hubs. Manufacturing costs would shoot up by 21%, but sourcing costs would drop by 25%. With cycle times falling from 127 days to 95, inventory and logistics costs would be cut.

The electronics sector, which has strong roots in China, would see an increase in total costs of only 2%. Because making such kit outside the mainland is much pricier, even the modest amount of nearshoring assumed sends manufacturing costs shooting up by 28%. However, the reduction in cycle times from 35 days to 28 days would cut logistics costs and inventory costs dramatically. ■



贸易战

路在何方

制造服装、汽车和电脑的公司会如何应对全面贸易战【专题报道《全球供应链》之四】

供应链分析公司LLamasoft研究了美国的服装、汽车和电子行业中具代表性的跨国公司，以评估美国威胁要对所有中国进口产品征收25%关税的影响。它假设企业会完全按照经济逻辑将一部分采购和制造从中国转移出去。该分析考虑到了转移生产的成本，以及让供应更接近消费者所带来的库存减少、物流成本降低和库存周期短的好处。

加征这样的关税后，服装行业的总成本将增加11%。采购成本将增加23%，制造成本增加43%，但近岸采购可将平均周期时间从19天减少到14天。汽车行业的总体成本将增加不到4%，但这将掩盖向区域中心转移带来的强大逆流。制造成本将增加21%，但采购成本将下降25%。随着周期时间从127天下降到95天，库存和物流成本将被削减。

牢固扎根于中国的电子行业的总成本仅将增长2%。因为在中国大陆之外制造这样的设备要贵得多，即使只假设适度的近岸采购，也会使制造成本上升28%。然而，将周期时间从35天减少到28天会大大降低物流和库存的成本。 ■



AI in space

In high detail

Speeding up the processing of space images

MUCH OF THE information that is beamed back from space is useless. Pictures taken by satellites orbiting the Earth might take days to download, only to show lots of cloud obscuring the area of interest. The subject matter may also be surrounded by irrelevant information. All this uses up a lot of valuable bandwidth.

Processing data in space, before transmission, would reduce clutter, but this can be tricky. Cosmic rays randomly flip the ones and zeroes that computers operate on, introducing unpredictable errors. High levels of radiation can also damage electronic circuits. KP Labs, based in Gliwice, Poland, is building a satellite to overcome some of these problems. Their device, called Intuition-1, is controlled by a neural network, a form of artificial intelligence modelled on the human brain. The satellite is what is known in the trade as a 6U CubeSat, which means it is composed of six standard-sized 10x10x11.5cm modules.

Intuition-1 will be equipped with a hyperspectral imager, which takes 150 pictures of every scene it looks at. Each picture is at a different spectral frequency, so contains different information. The neural network stitches these together using powerful graphics chips hardened against radiation. The developers have also built error correction into their software.

Intuition-1 will view a 15km-wide swathe of Earth at a resolution of 25 metres per pixel. This will be able to reveal details such as how well crops are growing or allow the number of trees in a forest to be counted.

But instead of transmitting back every last bit of image data, the satellite

will summarise what the user requests as useful information. This might, for instance, be a heat-map showing areas of weeds in a field or the location of a forest fire. Reducing the data load means that some of this information can be transmitted live.

The satellite will be used to prove that a hardened neural network can survive in space. This could pave the way for other space applications. For example, the Curiosity rover on Mars was successfully upgraded in 2016 with a set of algorithms to detect “interesting” rocks for investigation, instead of picking them randomly. A neural network could provide future rovers and deep-space probes with a better ability to make decisions.

The neural network and hyperspectral imager have already been built and tested by KP labs. The kit will go into a satellite body being constructed by Clyde Space, a satellite producer based in Scotland, and launched in 2022. After that there will be more intelligence in space. ■



太空AI

高处见微

加速太空图像处理

从太空传回的信息大多是无用的。在地球轨道上运行的卫星所拍摄的照片可能要花好几天才能下载回地面，结果却只看到目标区域被重重云层遮盖。主要内容还可能伴随着大量无关紧要的信息。这一切耗费了大量宝贵的带宽。

传输前在太空先行处理数据可以减少无用信息，但操作起来有难度。宇宙射线会导致计算机二进制信息的1和0发生随机翻转，导致不可预测的错误。强辐射也可能损坏电路。位于波兰格利维采（Gliwice）的KP实验室（KP Labs）正在打造一颗卫星来克服其中一些问题。这颗卫星名为“直觉一号”（Intuition-1），由一个神经网络（一种模拟人脑的人工智能形态）控制。按业内的说法，这是一种6U立方卫星（6U CubeSat）——由六个10x10x11.5cm的标准尺寸模块组成。

“直觉一号”将配备一台高光谱成像仪，对每一目标场景拍摄150张照片，每张照片的光谱频率不同，因而包含不同信息。卫星内的神经网络运用经抗辐射加固的图形芯片将照片拼合起来。开发人员还在软件中加入了纠错功能。

“直觉一号”将以每像素25米的分辨率拍摄15公里范围内的地球图像。这能够显示诸如作物长势或森林树木数量等细节。

但该卫星并不会把图像数据巨细靡遗地传回地球，而是提炼出用户所请求的有用信息，例如显示农田内的杂草区域或森林火灾位置的热点图。数据量减少意味着一些信息可被实时传输。

该卫星将用于证明一个经加固的神经网络能在太空持续使用。这可以为其他太空应用铺平道路。例如，火星上的好奇号探测车在2016年成功升级，

运用一套算法来挑选“有趣”的岩石进行研究，而不再是随机选取。神经网络可为未来的星球探测车和深空探测器提供更好的决断力。

KP实验室已制造并测试了上述神经网络及高光谱成像仪。该套件将安装到由苏格兰卫星制造商Clyde Space制造的一颗卫星上，于2022年发射。往后，太空将变得更智能。 ■



Futurology

Navigating the rapids

It is worth reading crazy-sounding scenarios about the future—including our own

PREDICTING THE future is hard. But preparing for its uncertainties, while you lie on the beach, can at least be entertaining. It can also broaden the mind and subtly change your understanding of the present. Rather than the Great American Novel or a tall stack of chick-lit bonkbusters, we propose a different sort of summer reading. Speculating about the future, even if it is far-fetched, can help people and institutions cope with what comes next. For the best material, here are three places to look.

The first is scenario planning. This originated in the armed forces during the second world war and was pioneered in industry by Royal Dutch Shell, enabling it to react more quickly and effectively than rival oil firms to the oil shock of 1973. The central idea was to avoid betting everything on a single forecast and instead to test future projects and plans against a set of plausible scenarios. Mapping out several futures, deciding how to respond to them and identifying the early signs that they might be coming about has been widely adopted by multinational firms, particularly after the terrorist attacks of September 11th 2001. In that spirit, we publish our own annual set of speculative scenarios, “The World If”, in this week’s edition. What if America leaves NATO, or antibiotics stop working, or Facebook switches itself off in Europe? These things may never happen, but it is mind-stretching to think about what you should do if they did.

Science fiction, a second realm of speculation, is perhaps a more familiar beach read. It is wrong to see sci-fi as chiefly predictive, however. Its contemplation of the future is often a commentary on the present: many sci-fi authors take current concerns, from robots to climate chaos to gender

politics, to the logical extremes and consider their implications. As a result, sci-fi can play a useful role as a forward-scanning radar for technological, social and political trends. But sci-fi does directly shape the future in one concrete way: the tech industry is full of people trying to make it come true. Amazon's Alexa voice-assistant is the talking computer from "Star Trek"; SpaceX lands its rockets on drone ships whose names are borrowed from Iain M. Banks's "Culture" novels; an entire industry is trying to bring to life the virtual world of Neal Stephenson's "Snow Crash". Beyond these familiar tropes, Chinese sci-fi and Afrofuturism offer refreshingly different perspectives and possibilities.

The last speculative category is corporate anthropology and trendspotting. Many large companies employ roving anthropologists to seek out "edge cases": examples of emerging technologies and behaviour that have yet to become widely adopted, but have the potential to go global. As the sci-fi novelist William Gibson once put it, "the future is already here—it's just unevenly distributed." Two decades ago, Japanese schoolgirls led the way with modern smartphones, capable of taking pictures and downloading apps; we are all Japanese schoolgirls now. What's next: the death of cash? Clothes made of mushrooms? Artificial meat? Trendspotters often get it wrong. But it is worth paying attention to what they think might be coming, just in case they are right.

Pierre Wack, one of the gurus of scenario planning at Shell, once likened dealing with the future to shooting the rapids in a boat. You know the general direction of travel, but not the exact path, and the trick is to be able to respond quickly. Reading about possible futures can shift your perception of the present and help you understand what might be around the corner. It can also be fun. So why not give it a try, starting with the speculative scenarios in this issue: who knows what might happen? ■ ■



未来学

激流勇进

关于包括我们自己在内的未来的狂想值得一读【《世界猜想》系列之一】

预测未来很难。不过，当你躺在海滩上时，为未来的不确定做些准备，至少还挺好玩的。它还能拓宽你的思维，微妙地改变你对当下的理解。所以，我们向你推荐的夏日读物不是最伟大的美国小说，也不是一大堆鸡仔文学畅销书，而是一类不一样的内容。对未来的猜想，即便有时令人难以置信，也能帮助人们和机构应对接下来发生的事。若想要找最好的材料，有三个地方可以看看。

首先是情景规划。它起源于二战期间的军队，由荷兰皇家壳牌公司率先在工业界启用，使得这家公司能比其行业竞争对手更快、更有效地应对1973年的石油危机。这种规划的核心思想是避免把所有东西押注在单一预测上，而以一组可能发生的前景来检测未来项目和计划。绘制出几种未来场景，决定如何应对它们，识别它们将要到来的早期迹象。这种方法已经在跨国公司中得到广泛运用，特别是在“9·11”恐怖袭击之后。基于这样的精神，我们在本期杂志中发表了年度未来猜想系列《世界猜想》。如果美国退出北约，如果抗生素失效，如果Facebook撤出欧洲，会怎样？这些事可能永远不会发生，但想一想假如它们发生你该做什么，不失为一种有益的思维拓展训练。

第二个猜想领域是科幻。它可能是人们更为熟悉的海滩读物。但是，认为科幻主要是预测性内容是错误的。它对未来的沉思往往是对现状的评论。从机器人到气候混乱，再到性别政治，许多科幻作者把当下的忧患在逻辑上发挥到极致，探讨其含义和影响。因此，科幻可以作为技术、社会和政治趋势的前视雷达。但它确实也以一种具体的方式直接塑造了未来——科技行业里到处都是试图让幻梦成真的人。亚马逊的Alexa语音助理就是《星际迷航》中会说话的电脑；SpaceX回收助推火箭的遥控船舶的名字源自伊恩·M·班克斯（Iain M. Banks）的《文明》（Culture）小说系列；一

整个行业都在努力将尼尔·斯蒂芬森（Neal Stephenson）的《雪崩》（Snow Crash）中的虚拟世界变为现实。除了这些人们耳熟能详的隐喻之外，中国的科幻作品和非洲未来主义（Afrofuturism）提供了令人耳目一新的不同视角和可能性。

最后一个猜想类别是企业人类学和趋势预测。许多大公司雇用行走于世界各地的人类学家来寻找“边缘案例”——那些尚未被广泛采用、却有潜力在全球流行的新技术样本。科幻小说家威廉·吉布森（William Gibson）就说过，“未来已经到来，只是分布不均而已。”20年前，日本女学生用能拍照和下载应用的现代智能手机引领潮流，而现在我们人人都是日本女学生。接下来是什么？现金灭亡？蘑菇做的衣服？人造肉？趋势预测者常是错的，但那些他们认为接下来可能发生的事仍然值得关注——或许他们说对了呢。

壳牌公司的情景规划传奇大师皮埃尔·瓦克（Pierre Wack）曾将应对未来比作划船穿越急流。你知道前行的大致方向，但不知道确切的路径，而诀窍在于能够快速做出反应。阅读对未来的猜想会改变你对现在的认知，帮助你理解可能即将发生的事。这也可能充满了乐趣。那么何不尝试一下，就从本期的猜想系列开始吧——谁知道会发生什么呢？■ ■



Heatwaves

Hot as hell

Climate change is already killing people. Countries must learn to adapt to extreme heat

IN RECENT DAYS heatwaves have turned swathes of America and Europe into furnaces. Despite the accompanying blast of headlines, the implications of such extreme heat are often overlooked or underplayed. Spectacular images of hurricanes or floods grab attention more readily, yet heatwaves can cause more deaths. Heat is one of climate change's deadliest manifestations. Sometimes its impact is unmistakable—a heatwave in Europe in 2003 is estimated to have claimed 70,000 lives. More often, though, heatwaves are treated like the two in the Netherlands in 2018. In just over three weeks, around 300 more people died than would normally be expected at that time of year. This was dismissed as a “minor rise” by officials. But had those people died in a flood, it would have been front-page news.

The havoc caused by extreme heat does not get the attention it merits for several reasons. The deaths tend to be more widely dispersed and do not involve the devastation of property as do the ravages of wind and water. Moreover, deaths are not usually directly attributable to heatstroke. Soaring temperatures just turn pre-existing conditions such as heart problems or lung disease lethal.

Heatwaves will inevitably attract more attention as they become more frequent. As greenhouse gases continue to accumulate in the atmosphere, not only will temperatures rise overall but extremes of heat will occur more frequently. Britain's Met Office calculates that by the 2040s European summers as hot as that of 2003 could be commonplace, regardless of how fast emissions are reduced. Urbanisation intensifies the risk to health: cities

are hotter places than the surrounding countryside, and more people are moving into them.

The good news is that most fatalities are avoidable, if three sets of measures are put in place. First, people must be made aware that extreme heat can kill and warning systems established. Heatwaves can be predicted with reasonable accuracy, which means warnings can be given in advance advising people to stay indoors, seek cool areas and drink plenty of water. Smart use of social media can help. In 2017 a campaign on Facebook warning of the dangers of a heatwave in Dhaka, Bangladesh's capital, reached 3.9m people, nearly half the city's population.

Second, cool shaded areas and fresh water should be made available. In poor places, air-conditioned community centres and schools can be kept open permanently (steamy nights that provide no relief from scorching days can also kill). In Cape Town, spray parks have been installed to help people cool down. Third, new buildings must be designed to be resilient to the threat of extreme heat and existing ones adapted. White walls, roofs or tarpaulins, and extra vegetation in cities, all of which help prevent heat from building up, can be provided fairly cheaply. A programme to install "cool roofs" and insulation in Philadelphia reduced maximum indoor temperatures by 1.3°C.

It is a cruel irony that, as with other effects of climate change, the places that are hardest hit by heatwaves can least afford to adapt. In poor countries, where climates are often hotter and more humid, public-health systems are weaker and preoccupied with other threats. Often, adaptation to extreme heat is done by charities if it is done at all. Particular attention should be paid to reaching both remote areas and densely populated urban ones, including slums where small dwellings with tin roofs packed together worsen the danger that uncomfortably high temperatures will become lethal.

Adaptation is not an alternative to cutting emissions; both are necessary. But even if net emissions are reduced to zero this century, the persistence of greenhouse gases in the atmosphere means that heatwaves will continue to get worse for decades to come. As the mercury rises, governments in rich and poor countries alike must do more to protect their populations from this very real and quietly deadly aspect of climate change. ■



热浪

酷热炼狱

气候变化已经在夺取生命。各国必须学习应对极端高温

近日，热浪将美国和欧洲的大片地区都变成了火炉。尽管这种极端高温频频登上新闻头条，但其影响往往被忽视或低估。飓风或洪水的震撼影像更容易吸引眼球，但其实热浪可能更致命。酷热是气候变化最致命的表征之一。它的影响有时确凿无疑——据估计，2003年欧洲的一场热浪夺走了七万条性命。然而更多时候，人们对热浪的态度和对2018年荷兰遭遇的那两场高温一样。在短短三周多的时间里，死亡人数比起同期正常情况约多出300人。对此官员们不以为意，称这只是“小幅上升”。但若这是一场洪水造成的死亡人数，肯定就上头版了。

极端高温造成的破坏并未引起应有的关注，原因是多方面的。热浪致死的案例往往更加分散，而且也不像飓风洪水那样损毁房屋。此外，死亡的直接原因往往不是中暑。高温只是加剧心脏病或肺病等现有问题而造成致命危险。

随着热浪侵袭愈加频繁，它肯定会引起更广泛关注。温室气体在大气中不断积聚，不仅令总体气温上升，也导致极端酷热天气更频繁地出现。据英国气象局统计，到本世纪40年代，无论减排速度有多快，欧洲的夏天像2003年时那样酷热可能成为常态。城市化加剧了健康风险：城市比周边乡郊热，而搬入城市的人越来越多。

好消息是，如果采取三套措施，大多数因酷暑致命的情况都可避免。首先，必须让人们意识到极端高温可能致命，并建立预警系统。对热浪来袭的预测已经比较准确，这使官方能够发出预警，建议人们留在室内，寻找阴凉处休息，并多喝水。巧妙利用社交媒体也有帮助。2017年，人们在Facebook上发起行动，警告孟加拉国首都达卡可能遭受热浪袭击，390万人收到了信息，几乎是该市人口的一半。

其次，应提供阴凉的避暑区，并备好饮用水。在贫困地区，有空调的社区中心和学校可以持续开放（酷暑天气里，夜间闷热不退同样可能致命）。南非开普敦已建造喷水公园帮助人们降温。第三，新建筑的设计必须能抵御极端高温，现有建筑则需加以改建。在城市里，白色的墙壁、屋顶或防水油布、增加植被等方式都有助于防止热量积聚，成本也相当低廉。美国费城一项安装“冷屋顶”和隔热材料的计划成功将室内最高温度降低了 1.3°C 。

一个无情的讽刺是，与气候变化的其他后果一样，受热浪影响最严重的地方也最无力做出调适。贫困国家的气候往往更炎热潮湿，公共卫生系统更薄弱且疲于应付其他威胁。如果真有人在应对酷热的威胁，通常是慈善机构。防暑行动应特别注意覆盖偏远地区和人口密集的城市地区，包括贫民窟，那里狭小的铁皮房密集，令难耐的高温更易致命。

面对热浪的应对措施不能替代减排的努力，两者都是必要之举。但即使净排放量在本世纪降到零，大气中长久积聚的温室气体也意味着热浪在未来几十年将继续恶化。随着气温上升，富国和穷国政府都必须采取更多措施，保护其人民免受这一真切存在而悄然致命的气候变化表现的冲击。■



Meteorology

Eye of the storm

Book review: Forecasting is a vital bastion of international co-operation

IN 1943 A German U-boat surreptitiously landed on the coast of Labrador, Canada's frigid north-eastern peninsula. Under cover of fog, the crew quickly deposited ten large canisters, each labelled "Canadian Meteor Service", on a nearby hill. Inside were nickel-cadmium batteries and ten-metre antennae—components of a clandestine weather station.

The landing by U-537 was the only known Nazi military operation on North American soil. It was an urgent, if risky, mission. Germany had been cut off from Allied-controlled weather-observation networks, leaving its U-boats vulnerable to eastern-moving storms. The German weather service scrambled to develop new kit that could automatically transmit vital weather reports back to Berlin.

As Andrew Blum explains in "The Weather Machine", his vivid account of the history and evolution of the modern daily forecast, conflict has always spurred innovation in atmospheric science. During the cold war, America raced to launch satellites that could spot a hurricane veering toward the Gulf of Mexico—or spy on Soviet weapons build-ups. Yet much as meteorologists thrive on competition, Mr Blum notes that weather prediction ultimately depends on global teamwork, facilitated by institutions such as the UN's World Meteorological Organisation. Superstorms and cyclones rarely observe national borders.

Like "Tubes", Mr Blum's book about the hidden infrastructure of the internet (published in 2012), "The Weather Machine" traces the "long supply chain of data" that produces the morning weather report. The smartphone weather

app is “the handsome face of a complex and sprawling machine”, a vast operation encompassing awesome supercomputers, tens of thousands of observation stations and over 100 satellites. The book strips this forecasting engine down to its parts, revealing the people and places that keep the gears turning.

One of them is a lighthouse on top of a worryingly blustery hill on the tiny Norwegian island of Utsira. A weather station has operated there since the 1860s, after the telegraph made it possible to track weather patterns across long distances. A wide-reaching observation network was the first step toward weather prediction; the next was to input the data into a mathematical model of the atmosphere to produce short-term forecasts. But calculating future atmospheric conditions proved quite a practical challenge in the pre-digital age. Lewis Fry Richardson, an English physicist, estimated in 1922 that a global forecasting office would require 64,000 “computers”—that is, humans working with pencil and paper. “The scheme is complicated because the atmosphere is complicated,” Richardson admitted.

The European Centre for Medium-Range Weather Forecasts has developed a more streamlined system. It maintains two supercomputers that together carry out 90trn calculations per second. Visiting the centre’s modernist compound in Reading, England, Mr Blum watches one of these machines run a weather model from start to finish, spitting out a ten-day forecast in just over two hours. In 2012 the centre predicted Hurricane Sandy eight days in advance; by 2025 it aims to forecast such high-impact weather events with as much as two weeks’ warning.

Mr Blum runs through the early history of weather prediction before embarking on a grand tour of forecasting institutions across Europe and America. He is a sharp analyst and engaging guide, adept at translating difficult concepts in meteorology and computer science for the uninitiated.

He compellingly emphasises the forecast's diplomatic foundations. Weather prediction represents "a last bastion of international co-operation", a global effort to warn of natural disasters that ravage crops and displace communities. As extreme weather events become more common, the weather report—a daily marvel on which lives and livelihoods depend—should not be taken for granted. ■ ■



气象

暴风眼

预报是国际合作的重要堡垒【《气象机器》书评】

1943年，一艘德国U型潜艇在加拿大东北部寒冷的半岛拉布拉多（Labrador）某处偷偷登陆。在大雾的掩护下，船员们迅速将十个大罐子放在附近一座山上，罐子上均标有“加拿大气象服务”（Canadian Meteor Service）的字样。里面装的是一个秘密气象站所需的组件——镍镉电池和十米天线。

那次U-537潜艇登陆是纳粹在北美领土上唯一已知的军事行动。这是一次紧急行动，可能也很冒险。德国已被切断了从盟军控制的气象观测网络获得气象信息的途径，这让它的U型潜艇容易受到东向移动风暴的影响。德国气象机构匆忙开发了新装置，可将重要的气象信息自动传回柏林。

冲突一直在推动着大气科学的创新，安德鲁·布鲁姆（Andrew Blum）在《气象机器》（The Weather Machine）一书中解释道。这本书对现代日常气象预报的历史和演变做了生动的叙述。冷战期间，美国一直加紧发射卫星，以探测飓风是否转向墨西哥湾——也能监视苏联集结武器的情况。然而，布鲁姆指出，尽管这种竞赛培养出了大批气象学家，气象预报最终还是要依赖联合国世界气象组织（World Meteorological Organisation）等机构推动的全球合作。超级风暴和气旋可不管国界划在哪里。

和布鲁姆关于互联网隐形基础设施的著述《管线》（Tubes，2012年出版）一样，《气象机器》追溯了生成每天早上天气预报的“长长的数据供应链”。智能手机上的天气应用是“复杂而庞大的机器的光鲜外表”，背后包括令人惊叹的超级计算机、成千上万的观测站和100多颗卫星。本书剥丝抽茧地拆解这部预测机器，揭示了令其齿轮保持正常运转的人和地点。

其中一个地方是挪威于特希拉小岛（Utsira）上的一座小山丘顶部的灯塔，这里常年狂风大作，令人心悸。自19世纪60年代起可以通过电报长距

离追踪天气变化模式以来，这里就有一个气象站一直在运作。广泛的观测网络是实现天气预报的第一步；第二步是将数据输入到大气的数学模型中生成短期预测。但在数字时代之前，计算未来的大气状况实践起来挑战巨大。1922年，英国物理学家刘易斯·弗里·理查森（Lewis Fry Richardson）估计，一个全球性天气预报机构将需要6.4万台“计算机”——这里指的是用纸笔计算的人。“这个机制很复杂，因为大气本身就很复杂。”理查森说。

欧洲中期天气预报中心（European Centre for Medium-Range Weather Forecasts）开发出了一个更精简的系统，由两台超级计算机组成，每秒可进行总共90万亿次计算。该预报中心位于英国雷丁市（Reading），是一组现代风格的建筑群。布鲁姆在参观该中心时，观看了其中一台超级计算机运行天气模型的全过程，短短两个多小时内就生成了未来十天的天气预报。2012年，该中心提前八天预报了飓风桑迪；到2025年，它的目标是能提前两周预报这类影响重大的天气事件。

在梳理了天气预报的早期历史后，布鲁姆踏上了探访欧美天气预报机构的宏伟旅程。他是一位敏锐的分析师和有趣的向导，擅于深入浅出地向门外汉们解释气象学和计算机科学中的复杂概念。他令人信服地强调了天气预报中的外交基础。天气预报代表着“国际合作的最后一座堡垒”，是一项全球性工作，对毁坏作物、让人流离失所的自然灾害发出预警。随着极端天气事件越来越常见，天气预报这个生命和生计所依赖的日常奇迹不应被视为理所当然的存在。■



Corporate earnings

Earnings reprieve

Profits are down in America Inc. Is it time to worry?

“IT’S NOT that bad,” remarked Jamie Dimon, boss of JP Morgan Chase, of the global economy on July 16th. But, Wall Street’s favourite banker had to concede, business sentiment “is a little bit worse”. Prospects for American companies have indeed dimmed. Analysts expect earnings of the biggest among them, which have just begun reporting their latest set of results, to have declined in the second quarter. This would mark two consecutive quarters of falling profits, the first such “earnings recession” since 2016. Coming just as the current economic expansion makes history as America’s longest ever, it raises the prospect of a long boom running out of steam. Bosses are getting twitchy.

America Inc has enjoyed an extraordinarily good run since the country rebounded from the global financial crisis of 2008-09. The economy has grown, inflation has been low and interest rates rock-bottom. Despite unemployment hovering below 5% wage pressures have been modest. All told, annualised corporate profits exceeded \$2trn last quarter, nearly double the level a decade ago. President Donald Trump’s tax reform cut the corporate tax rate from 35% to 21%. This and his deregulatory efforts have freed up capital. Companies have used the windfall to buy back shares—reducing the amount of stock and superficially boosting earnings per share. The S&P 500, Dow Jones Industrial Average and Nasdaq Composite, three leading share indices, hit record highs on July 15th.

Today the mood in boardrooms is less ebullient. The latest survey by the Business Roundtable, a conclave of bosses (chaired by Mr Dimon), put confidence higher than the historical average and well above the level which

would signal a recession. But it has slipped. The National Federation of Independent Business observes a similar decline in optimism among bosses of small and medium-size enterprises. Nearly four-fifths of S&P 500 firms that have issued guidance on financial performance for the latest quarter have indicated that earnings per share will fall year on year.

Analysts' forecasts reflect these sentiments. Profits in six out of eleven big industries may have declined from April to June compared with a year earlier (see chart). FactSet, a research firm, estimates an average drop of 2.8% for S&P 500 earnings, on top of a 0.3% dip the quarter before. Observers—and executives themselves—see three reasons for the darkening outlook.

The most prominent is Mr Trump's trade war with China. Doug McMillon, boss of Walmart, has warned that tariffs will lead to higher costs for the retail giant, which sells plenty of Chinese-made goods. David Herring, head of the National Pork Producers Council, last month told Congress that the lobby group's members were suffering from Chinese retaliatory tariffs on American pork. Despite his friendly encounter with China's president, Xi Jinping, at a G20 summit in late June, Mr Trump threatened in mid-July to impose fresh tariffs on \$325bn of Chinese imports. According to JP Morgan Chase, the new levies could tip the economy into a contraction.

A survey of companies by the Institute for Supply Management (ISM) echoes such worries. A manager at a chemicals firm told ISM that the levies were increasing costs. Another at a metals company worried they would weaken global demand for its products. Trade frictions are "wreaking havoc with supply chains and costs", according to an executive at electronics manufacturer. "The situation is crazy."

The second reason for falling profits—rising labour costs—is good for

workers but worrying for firms and investors. Amazon raised wages to \$15 an hour in late 2018, as the labour market tightened. Costco and other retailers are doing the same. If pork tariffs weren't enough, Mr Herring also reckons that farms and packing plants may shut down for lack of workers. Michael McDonald, president of the Sewn Products Equipment & Suppliers of the Americas, a trade group, says that clothesmakers face a "sizeable labour shortage".

David Kostin of Goldman Sachs, an investment bank, calculates that total compensation, which includes wages and all benefits, represents 13% of sales for a typical American firm. Wages and benefits are now rising at roughly 3% a year, up from 2% in 2018 and just 1% earlier in the business cycle. Michael Wilson of Morgan Stanley, another investment bank, reckons the official figures conceal much higher rises in such industries as retail, hotels and commercial services.

The final explanation for the earnings crunch has to do with technology companies. Patrick Palfrey of Credit Suisse, one more investment bank, notes that the list of top ten contributors to the second quarter's profit crunch includes representatives of Big Tech. Hardware and semiconductor goliaths such as Apple and Intel are facing a cyclical downturn in demand for their products. Trade spats exacerbate it. So too has Mr Trump's decision on national-security grounds to impose sanctions on Huawei, China's tech champion, which has upended global supply chains. Some internet firms are sputtering. Netflix's share price lost 12% in after-hours trading on July 17th, when the streaming giant reported the first drop in American subscribers since 2011.

Big trouble at a few massive—and massively profitable—tech firms may be dragging down average earnings. As Mr Kostin points out, some tech titans may see profits squeezed by 10% whereas the median technology firm can expect a rise in earnings per share of perhaps 3%. Some big firms, like

Microsoft and Amazon, continue to thrive. Similarly, the aggregate decline in second-quarter earnings hides the fact that the median American company should see profit growth of 4%.

The good times, on this view, are not quite over. “The headwinds will abate by 2020,” predicts Mr Palfrey. Many American bosses agree. Unless the Sino-American tariff tiffs turn into a full-blown trade war, they think, companies can handle the challenges. The Federal Reserve has recently turned dovish, partly in response to Mr Trump’s hawkishness on trade. It may cut interest rates, which could extend the economic expansion further.

Not everyone accepts this view. Morgan Stanley expects profits across the metals and mining industries to decline, for example. The bank is also bearish on tech, where the “breadth of the expected negative results is stunning”. Mr Wilson, who was among the first to foresee the current decline in profits, believes that earnings have not yet hit the bottom. “The picture is getting worse, not better,” he warns.

Unless America’s expansion enters Australia’s territory of 20-plus years of continuous GDP growth, the boost to profits from Mr Trump’s tax cuts came nearer the end than the beginning. That may have created excesses. As a share of GDP, corporate debt is nearly where it was before the subprime bubble burst in 2008. Inventories are building up across the economy. Firms must absorb higher depreciation costs from a tax-fuelled splurge of capital spending. All this can weigh on profitability.

The quarterly financial results unveiled in mid-July by several big banks bolster the case for cautious optimism. A boom in credit cards and mortgages pushed profits up at JPMorgan Chase, Citigroup and Wells Fargo. This implies that, as Mr Dimon also said that week, “the consumer in the United States is doing fine.” This will be cold comfort to industrial firms and other business-facing companies whose margins are shrinking. Given the

sheer length of America's record economic expansion, however, it really is not that bad. ■



公司财报

盈利放缓

美国企业利润下滑。要担忧了吗？

“没那么糟糕。”摩根大通的老板杰米·戴蒙（Jamie Dimon）7月16日如此评论全球经济。不过，这位华尔街最受欢迎的银行家不得不承认，商业情绪“变差了一些”。美国公司的前景确实变黯淡了。分析师预计，最大的那些公司（刚开始陆续公布最新业绩）第二季度的收益有所下降。如果是这样，企业利润将录得连续两个季度的下滑，是自2016年以来首次出现“收益衰退”。美国当前的经济扩张创下了有史以来持续时间最长的记录，目前看来这场长期繁荣已经后继乏力。老板们变得心神不宁。

自美国从2008到2009年的全球金融危机中复苏以来，企业经营异常出色。经济持续增长，通胀走低，利率跌至谷底。尽管失业率徘徊在5%以下，但工资压力并不大。上个季度企业年化利润总额超过2万亿美元，几乎是十年前的两倍。特朗普的税改政策将公司税率从35%降至21%。加上他放松管制的做法，使资本得以释放。公司便利用这一利好回购股票，以此减少股票总量，从而在表面上提高了每股收益。7月15日，标准普尔500指数、道琼斯工业平均指数和纳斯达克综合指数这三个主要股指均创下历史新高。

但今天董事会里的气氛已经没那么高涨。由戴蒙担任主席、各大企业老板组成的“商业圆桌会议”（Business Roundtable）所做的最新调查显示，目前商业信心高于历史平均值，也远高于经济衰退的预警值。但信心确已下滑。美国全国独立企业联合会（National Federation of Independent Business）注意到，中小企业老板们的乐观情绪也出现了类似的下滑。在已发布最新季度财务业绩指引的标普500指数公司中，近五分之四表示每股收益将同比下降。

分析师的预测反映出这些情绪。与去年同期相比，今年4月至6月，11大板

块中有6个利润可能下降（见图表）。研究公司FactSet估计，标普500指数公司的平均收益继上一季度下跌0.3%后，会进一步下跌2.8%。观察人士以及公司高管们认为前景黯淡有三方面原因。

首要原因是特朗普与中国的贸易战。零售巨头沃尔玛销售大量中国产品，其老板道格·麦克米伦（Doug McMillon）指出，关税将推高沃尔玛的成本。上月，美国猪肉生产者协会（National Pork Producers Council）主席大卫·赫林（David Herring）告知国会，该游说团体的成员企业正饱受中国对美国猪肉报复性关税之苦。尽管特朗普在6月底的G20峰会上与中国国家主席习近平进行了友好会晤，但到了7月中旬他仍威胁要对价值3250亿美元的中国进口产品征收新关税。据摩根大通分析，新征关税可能令美国经济陷入萎缩。

美国供应管理协会（ISM）对一些公司展开的调查同样反映出这类担忧。一家化学品公司的管理人员告诉ISM，关税正在推高成本。另一家金属公司的管理人员担心关税会削弱全球对其产品的需求。贸易摩擦正在“重创供应链以及成本，”一家电子产品制造商的高管说，“局面很疯狂。”

利润下滑的第二个原因是劳动力成本上升，这让工人们欢喜却让企业和投资者担忧。随着劳动力市场收紧，2018年底亚马逊将工资提高到每小时15美元。好市多（Costco）和其他零售商也在跟上。如果猪肉关税还不足以让前景黯淡，赫林还认为农场和包装厂可能因劳动力短缺而倒闭。行业组织美洲缝纫设备供应商协会（Sewn Products Equipment & Suppliers of the Americas）的主席迈克尔·麦克唐纳（Michael McDonald）表示，制衣商们面临着“相当程度的劳动力短缺”。

根据投资银行高盛的大卫·科斯廷（David Kostin）的计算，一家美国公司的总薪酬（包括工资和所有福利在内）通常占其销售额的13%。工资和福利现在每年增长约3%，高于2018年的2%，而在这一轮商业周期的早期仅为1%。另一家投资银行摩根士丹利的迈克尔·威尔逊（Michael Wilson）认为，零售、酒店和商业服务等行业的涨幅要高得多，官方数据未能体现

出来。

利润下滑的最后一个原因与科技公司有关。另一家投资银行瑞士信贷（Credit Suisse）的帕特里克·帕弗瑞（Patrick Palfrey）指出，第二季度利润萎缩最多的十家公司里就包括那些科技巨头。苹果和英特尔等硬件与半导体巨头正面临着对其产品需求的周期性下滑。贸易争端加剧了下滑。同样，特朗普以国家安全为由决定对中国科技领军企业华为实施制裁，破坏了全球供应链的秩序，也加剧了这一势头。一些互联网公司蹒跚前行。7月17日，流媒体巨头Netflix公布其美国付费用户数量出现自2011年以来的首次下降，公司股价在当日盘后交易中下跌了12%。

少数几家规模庞大且利润丰厚的科技公司遭遇的大麻烦可能正在拉低平均收益水平。正如科斯廷所指出，一些科技巨头的利润可能会缩水10%，而中型科技公司的每股收益有望增长3%。微软和亚马逊等一些大公司仍在蓬勃发展。同样，第二季度盈利总额的下降掩盖了美国中型企业应该会有4%的利润增长这一事实。

这样看来，好光景并未完全终结。“到2020年逆风会减弱。” 帕弗瑞预测道。许多美国公司的老板都认同他的看法。他们认为，除非中美关税之争升级为全面贸易战，否则公司可以应对眼前这些挑战。美联储的态度最近转向温和，部分是为回应特朗普对贸易的强硬态度。它可能会降息，从而进一步延长美国的经济扩张。

但也不是每个人都接受这种观点。比如，摩根士丹利预计金属和采矿业的利润将下滑。它也看跌科技业，认为该行业“预期将出现负增长的广度令人震惊”。威尔逊是最先预测到当前利润下滑的人之一，他认为盈利下滑尚未触底。“情况不是在好转，而是在恶化。”他警告道。

除非美国的经济扩张是像澳大利亚那样持续20多年的GDP增长，否则特朗普的减税政策对利润的推高来得太晚了。这可能已经造成了过剩。企业债务占GDP的比例几乎与2008年次贷危机爆发前的水平相当。整个经济中的库存都在增加。税改加剧了巨额资本支出，而企业必须消化由此带来的折

旧成本。所有这些都会影响盈利能力。

7月中旬，几家大银行公布的季度财报支持了谨慎乐观的看法。信用卡和抵押贷款的激增推高了摩根大通、花旗集团和富国银行的利润。这意味着——用戴蒙的话说——“美国消费者过得还不错”。但对于利润萎缩的工业企业和其他从事企业业务的公司来说，这于事无补。不过，鉴于美国创纪录的经济扩张持续如此之久，情况确实不算太糟糕。 ■



Bartleby

Send in the clouds

Microsoft's transformation required a change of culture

LIKE AN NFL changing room, the technology industry is littered with the bodies of fallen champions, from AOL to Yahoo to Blackberry, in urgent need of rehabilitation. Ten years ago many might have expected Microsoft to end up in the same state. But the software giant has made a startling comeback, frequently vying for the title of the most valuable company on global stockmarkets, with a market capitalisation above \$1trn.

The story of this revival is the subject of a new case study by Herminia Ibarra and Adam Jones of London Business School (LBS). In large part the success has resulted from a shift away from a focus on the Windows operating system and towards Azure, Microsoft's cloud-based services offering. It involved a willingness to let programs run on Apple and Android smartphones, something the company had previously avoided.

However, the turnaround also required a change to the company's culture and that is the main subject of the LBS study. The shift to cloud-based services meant that revenues would be generated in a different way. Under the old system, clients bought software under a fixed-term contract; once the sale was made, the revenue was guaranteed. Cloud services are paid for on a metered basis; revenue comes in only when customers use them. That required a new approach by the company's sales team, led by Jean-Philippe Courtois.

The shift was enormous. Around 40,000 people had to change how they did their jobs. Three elements were important. First, staff had to understand how customers were using cloud-based services, so that they could be

encouraged to use them more. This required 5,000 specialist hires.

Second, to permit existing sales staff to concentrate on attracting and retaining customers, they had to be relieved of some duties, such as preparing sales forecasts. Internal review meetings were reduced, including an intimidating ordeal known as the mid-year review in which senior executives grilled employees—and for which workers spent lots of time cramming like students for a test.

Lastly, salespeople needed an incentive to put in the work to flog the new products, which were potentially less lucrative for them than the old fixed-term contracts. This involved a greater use of performance bonuses.

Technology chivvied the process along. A new tool helped workers analyse how much time they spent in meetings or writing emails and whether they were interacting with fellow employees or with clients. It also allowed the usefulness of meetings to be gauged. If staff were fiddling with their smartphones, they were not listening to their colleagues. (The test could be usefully applied at a lot more places than Microsoft.)

Managers have had to change, too. Microsoft is introducing a programme called “Reimagine Managers” which aims to foster an approach of coaching and caring for the staff. Technology has made some routine management tasks (like organising rotas) easier, leaving more time for talking to employees.

Changing a corporate culture is an enormous task, and Mr Courtois admits that it is a work in progress. Microsoft, he says, has shifted from a “fixed mindset” to a “growth mindset”.

But what is interesting about the Microsoft case study (which is mostly free of such management jargon) is that it highlights the practical changes needed to transform a company. Microsoft could have been a classic victim

of “creative disruption”, so dependent on an existing technology (personal computers) that it failed to manage the shift to a world dominated by mobile devices. But the shift has only been successful (so far) because it has involved not just strategic insight, but a change in approach across the workforce.

Microsoft can still trip up. Tech companies are like the Red Queen in Lewis Carroll’s “Through the Looking Glass”—constantly running to stay in the same place. IBM successfully shifted from hardware to services in the 1990s, but has struggled to get its revenues to grow or to lift its share price in recent years.

In the long run Microsoft’s fortunes may depend on whether acquisitions like LinkedIn, a career site, or GitHub, a software-development startup, prove to be wiser than its failed bet on Nokia’s mobile-phone business earlier in the decade. But Microsoft has already shown that, even in a big organisation, culture change is possible. ■



巴托比

上云端

微软转型要求文化变革

科技行业就像美国职业橄榄球大联盟（NFL）的更衣室一样，充斥着式微的昔日冠军。从美国在线（AOL）到雅虎，再到黑莓，各家都迫切需要重振雄风。十年前，很多人可能都以为微软最终也会沦落至此。但这家软件巨头出人意料地卷土重来，市值已过万亿美元，时常向“全球股市最具价值的公司”这一宝座发起冲击。

微软的复兴故事成了伦敦商学院（LBS）的埃美尼娅·伊巴拉（Herminia Ibarra）和亚当·琼斯（Adam Jones）新案例研究的主题。在很大程度上，微软成功的原因是将重心从Windows操作系统转向云服务Azure。这一过程需要微软愿意让自己的软件在苹果和安卓的智能手机上运行，而此前它对此是抗拒的。

然而，扭转乾坤还要求变革企业文化，这正是LBS案例研究的主要课题。向云服务转变意味着将以一种不同的方式产生收入。在旧模式中，客户以一份固定期限合同购买软件，一旦销售完成，就锁定了收入。云服务却是按使用量付费，仅在客户使用服务时才会产生收入。这样一来，微软由让-菲力浦·吉德华（Jean-Philippe Courtois）领导的销售团队就得采取一种新方式。

这是个巨大的转变。约有四万人不得不改变他们以往的工作方式。其中有三个重要因素。首先，员工必须了解客户使用云服务的方式，以便鼓励他们更多地使用。这需要雇用5000名专业人员。

其次，为了让现有的销售人员能够集中精力吸引和留住客户，必须减去他们的一些职责，比如不用再制定销售预测。内部评审会议减少了，包括一项称作年中评定的令人生畏的严酷考验——高级主管长时间“拷问”员工，员工则要像学生备考一样花大量时间做填鸭式的准备。

最后，需要向销售人员提供激励，好让他们努力地销售新产品，因为他们从新产品中的获利可能少于旧的定期合同。这就需要用到更多的绩效奖金。

科技推动了这一过程。一个新工具能帮助员工分析他们在开会或写电子邮件上花费了多少时间，以及他们是否与同事或客户互动。它还能衡量会议的效果。如果员工在开会时一直摆弄自己的智能手机，他们就没在听同事讲什么。（这个工具可以在除微软之外更多的地方派上用场。）

管理者也必须做出改变。微软正在推行一项名为“重塑经理人”（Reimagine Managers）的计划，力争形成一种指导和关怀员工的方法。科技已经让一些日常管理工作（如安排值班）变得更容易，主管们就有了更多时间与员工交流。

变革企业文化是一项艰巨的任务。古德华承认这项工作还在进行中。他说，微软已从“固定型思维模式”转变为“成长型思维模式”。

但这项微软案例研究（里面基本没有上述管理学术语）的有趣之处在于它突显了企业转型所需的实际变革。微软本可能成为“创造性破坏”的典型受害者——过于依赖一项既有技术（个人计算机）而未能成功向移动设备主导的世界转变。但是，这种转变之所以能成功（到目前为止），是因为它不仅用到了战略洞察力，还改变了所有员工的工作方法。

微软的前路仍不平坦。科技公司就像路易斯·卡罗尔（Lewis Carroll）的《爱丽丝镜中世界奇遇记》（Through the Looking Glass）中的红皇后——不停奔跑，但始终停留在原地。IBM在上世纪90年代成功地从硬件转向服务，但近年来一直难以提升收入或股价。

从长远来看，微软的命运可能取决于它对职业网站领英或软件开发创业公司GitHub等企业的收购是否比早几年对诺基亚手机业务失败的押注更明智。但微软已经表明，即使在一个大型组织中，变革文化也是可能的。■



Microsoft

Rebooted

What the software company's surprising comeback can teach other tech giants

IT MUST FEEL good to be back on top—and this time, almost liked. Twenty years ago Microsoft was considered an evil empire, scheming for domination and embroiled in a bruising antitrust battle with America's Justice Department. Five years ago, having dozed through the rise of social media and smartphones, it was derided as a doddery has-been. Now, after several stellar quarters—last month it reported revenue of \$33.7bn, up by 12% year on year—Microsoft is once again the world's most valuable listed company, worth over \$1trn. How did Satya Nadella, the boss since 2014, pull off this comeback? And with American trustbusters starting on a new review of “search, social media, and some retail services online”—ie, Google, Facebook and Amazon—what can the other tech giants learn from Microsoft's experience?

First, be prepared to look beyond the golden goose. Microsoft missed social networks and smartphones because of its obsession with Windows, the operating system that was its main moneyspinner. One of Mr Nadella's most important acts after taking the helm was to deprioritise Windows. More important, he also bet big on the “cloud”—just as firms started getting comfortable with renting computing power. In the past quarter revenues at Azure, Microsoft's cloud division, grew by 68% year on year, and it now has nearly half the market share of Amazon Web Services, the industry leader.

Second, rapaciousness may not pay. Mr Nadella has changed Microsoft's culture as well as its technological focus. The cult of Windows ordained that customers and partners be squeezed and rivals dispatched, often by questionable means, which led to the antitrust showdown. Mr Nadella's

predecessor called Linux and other open-source software a “cancer”. But today that rival operating system is more widely used on Azure than Windows. And many companies see Microsoft as a much less threatening technology partner than Amazon, which is always looking for new industries to enter and disrupt.

Third, work with regulators rather than try to outwit or overwhelm them. From the start Microsoft designed Azure in such a way that it could accommodate local data-protection laws. Its president and chief legal officer, Brad Smith, has been the source of many policy proposals, such as a “Digital Geneva Convention” to protect people from cyber-attacks by nation-states. He is also behind Microsoft’s comparatively cautious use of artificial intelligence, and calls for oversight of facial recognition. The firm has been relatively untouched by the current backlash against tech firms, and is less vulnerable to new regulation.

True, missing the boat on social media means thorny matters such as content moderation pose greater difficulties for Facebook and Google. Still, others would do well to follow Microsoft’s lead. Apple has championed its customers’ privacy, but its treatment of competitors’ services in its app store may soon land it in antitrust trouble. Facebook and Google have started to recognise that with great power comes great responsibility, but each has yet to find its equivalent of Azure, a new business model beyond its original golden goose. Amazon, in its ambition and culture, most resembles the old Microsoft.

Even a reformed monopolist demands scrutiny. It should not be forgotten that Microsoft got where it is today in part through rapacity. Critics argue that in its battle with Slack, a corporate-messaging service which competes with a Microsoft product, it is up to some of its old tricks. A growing number of women at the firm are complaining about sexual harassment and discrimination. The new Microsoft is far from perfect. But it has learned

some lessons that other tech giants should heed. ■



微软

重启

微软东山再起，出人意料。其他科技巨头能从这家软件公司得到什么启示？

重回峰顶的感觉肯定不错，而且这一次还堪称受欢迎。20年前，微软被视作一个邪恶帝国，密谋夺取支配地位，还卷入了与美国司法部激烈的反垄断斗争中。五年前社交媒体和智能手机兴起之时，微软毫无作为，被嘲讽为老迈蹒跚的过气明星。现在，在经历了几个季度的辉煌业绩后（7月它公布营收为337亿美元，同比增长12%），它再度成为全球最有价值的上市公司，市值超过1万亿美元。自2014年起担任掌门人的萨蒂亚·纳德拉（Satya Nadella）是如何成功令公司东山再起的呢？而随着美国的反垄断官员开始新一轮对“搜索、社交媒体和在线零售服务”（也就是谷歌、Facebook和亚马逊）的审查，这些科技巨头能从微软的经历中学到什么？

首先，目光要放长远，不要只盯着眼前那只“下金蛋的鹅”。微软过去沉迷于自己最重要的“印钞机”——Windows操作系统，结果错过了社交网络和智能手机的机遇。纳德拉接掌后最重要的一个动作就是取消Windows的优先地位。更重要的是，就在各家公司开始习惯于租用计算能力之时，他在“云”上押下重注。过去一个季度，微软云部门Azure的收入同比增长了68%，市场份额接近行业领头羊亚马逊网络服务（Amazon Web Services）的一半。

其次，贪婪强取不一定有回报。纳德拉不止改变了微软的技术重点，还有它的文化。对Windows的狂热推崇导致客户和合作伙伴被压榨，竞争对手遭扼杀——且往往是通过有问题的手段，结果招致反垄断调查。纳德拉的前任曾称Linux和其他开源软件为“癌症”。但今天，Azure使用Linux操作系统比用Windows更多。许多公司认为，作为技术合作伙伴，微软的威胁要比总在寻求进入和颠覆更多行业的亚马逊小得多。

第三，与监管机构合作，而不是试图智胜或压倒它们。微软从一开始设计

Azure时就想使它顺应本地的数据保护法。公司总裁兼首席法务官布拉德·史密斯（Brad Smith）长期以来提出了许多政策提案，例如《数字日内瓦公约》，以保护人们免受民族国家的网络攻击。他还主张微软相对谨慎地使用人工智能，并要求对面部识别加以监督。相对而言，眼下对科技公司的抵制潮没怎么影响到微软，它也不太容易受到新监管的冲击。

诚然，微软错过了社交媒体的良机，它因而也不用像Facebook和谷歌那样面对内容审核这个棘手难题。不过，其他公司最好还是效法微软。苹果致力维护用户隐私，但它的应用商店对待竞争对手服务的方式可能很快会招来反垄断干预。Facebook和谷歌已经开始认识到能力越大，责任越大，但它们都还没能在各自最初的摇钱树之外找到自己的Azure。亚马逊的野心和公司文化与从前的微软最为相像。

就算是洗心革面的垄断者也需要严格的审视。在一定程度上，微软正是靠贪婪和掠夺达到今天的地位，这一点不应忘记。批评者认为，在与Slack（一个与微软某款产品竞争的企业即时消息服务）的较量中，微软就使用了一些自己的老招数。此外，越来越多微软女员工抱怨遭到了性骚扰和歧视。新的微软远谈不上完美。但它起码吸取了其他科技巨头也应注意的一些教训。 ■



Europe's economic history

Plumbing the glaciers

Arctic lead levels reveal the impact of climate and disease on Europe's history

TODAY, JACHYMOV is a small Czech town nestling in a valley on the German border. In 1534, though, it was Joachimsthal, the largest city in Bohemia apart from Prague and home to the almighty thaler—a weighty silver coin that became the de facto currency of Europe and the New World. The thaler lent an English version of its name, “dollar”, to the money of the United States and a score of other jurisdictions. Joachimsthal’s silver rush began in 1512. By the middle of the century the local mines were the most prolific in Europe.

Joachimsthal’s mines left another legacy, however: lead. Silver and lead often co-mineralise, and refining silver from its ore releases some of that lead into the atmosphere, where winds can carry it far and wide. Lead transported in this way to the Arctic often ends up trapped in layers of glacial ice. That is where a team of researchers led by Joseph McConnell of the Desert Research Institute, in Reno, Nevada found it, in ice cores pulled from glaciers in Greenland and Siberia.

In their new study, published in the *Proceedings of the National Academy of Sciences*, Dr McConnell’s team used coring to analyse lead emissions and produce a record of the European economy from Roman to modern times. Moreover, by comparing records from Greenland and Siberia, Dr McConnell could distinguish mines in western and eastern Europe. Eastern mines left more lead in Siberia than in Greenland, and western ones the reverse.

The data illuminate the historical record. As Charlemagne conquered most of western Europe, his mints turned out huge quantities of new silver

currency. After his reign, his empire disintegrated and smaller potentates took over minting. Silver production rose gradually but steadily through the prosperous medieval warm period. Conflict punctuates the record, as combatants fought over mining regions.

Disease, too, makes its terrible impact plain. Major modern economic shocks, like the Great Depression, have taken a decade or so to recover from. By comparison, the Black Death halved lead levels, and it took 100 years for them to recover afterwards. The implication is that silver mines were unprofitable—either because of a lack of demand, or of a shortage of affordable labour, or both—well into the Renaissance. When plague recurred across Europe in the late 16th and 17th centuries, growth in lead emissions stalled as well.

After 1750, industrial processes overtook silver production as the chief source of lead pollution. Leaded gasoline, introduced in the 1930s, sent lead levels still higher. Starting in the 1970s, environmental policies in America and Europe decoupled lead pollution from economic growth. Arctic lead levels have since fallen by more than 80%—but they remain 60 times higher than in the medieval era. ■ ■



欧洲经济史

探测冰川

北极的铅水平揭示了气候和疾病对欧洲历史的影响

今天的亚希莫夫（Jachymov）是一个捷克小镇，坐落于德国边境旁的山谷里。但回到1534年，这里叫约阿希姆斯图尔（Joachimsthal），是波西米亚（Bohemia）除布拉格之外最大的城市，也是“万能的泰勒”的故乡。泰勒是一种沉甸甸的银币，后来成为欧洲和新大陆实际使用的货币。美国和其他20个司法管辖区使用的货币的英文名“dollar”就来自泰勒。约阿希姆斯图尔的银矿开采热始于1512年，到了16世纪中叶，当地银矿的产量在欧洲已是首屈一指。

然而，约阿希姆斯图尔的银矿还留下了另一种遗产——铅。银和铅常常会共生，从它们的共生矿中提炼银会将其中一部分铅释放到大气中。大气中的风会把铅带到各处。被风带到北极的铅最后往往留存于冰川的冰层中。内华达州里诺市（Reno）的沙漠研究所（Desert Research Institute）的约瑟夫·麦康奈尔（Joseph McConnell）领导的研究团队就从格陵兰岛和西伯利亚的冰川提取的冰芯中发现了铅。

麦康奈尔团队在他们发表于《美国国家科学院院刊》的一项新研究中，利用冰芯提取来分析铅排放，提供了欧洲经济从罗马时代到现代的记录。此外，通过比较格陵兰岛和西伯利亚两地的数据，麦康奈尔可以辨别这些铅是来自西欧还是东欧。东欧的矿山在西伯利亚留下的铅比在格陵兰岛留下的多，而西欧的矿山正好相反。

这些数据印证了历史记载。查理曼大帝征服了大半个西欧后，他的铸币厂铸造了大量新银币。他的统治结束后，查理曼帝国瓦解，一些势力较小的君主接管了铸币权。在整个繁荣的中世纪暖期，白银产量缓慢稳步增长。其间也不乏冲突，各方为争夺矿区兵戎相见。

疾病带来的可怕影响也显而易见。现代经济在遭受像大萧条这类重大冲击

后，通常经历十年左右才复苏。相比之下，黑死病让铅水平下降了一半，之后花了100年才复原。这反映了当时银矿已无利可图——究其原因，不是需求不足就是廉价劳动力短缺，抑或两者兼而有之，而这种情况一直持续到了文艺复兴时期。16世纪末和17世纪，当鼠疫再次在欧洲肆虐时，铅排放的增长也停滞了。

1750年以后，工业生产取代白银开采成为铅污染的主要来源。上世纪30年代推出的含铅汽油使铅水平进一步升高。从70年代开始，美国和欧洲的环境政策使铅污染与经济增长脱钩。此后，北极的铅含量下降了80%以上，但仍是中世纪时的60倍。 ■



The Federal Reserve and emerging markets

An opportunity

The Fed has cut interest rates. That may help emerging markets more than anyone

AMERICA'S ECONOMY is caught in two stalemates. The first involves its central bank. On July 31 the Federal Reserve cut interest rates by a quarter of a percentage point, the first reduction since 2008. The Fed is determined not to let the economy succumb to a recession. But nor will the economy warm up enough to let the Fed raise rates to normal levels. The other stalemate is with China. Talks last week in Shanghai confirmed that the trade war is unlikely either to end soon or escalate soon.

All the signals point to continuing sluggish expansion in America which, after 121 months, is already the longest on record. Less well appreciated is that such tepid conditions have a potential silver lining for the billions of people living in financially exposed emerging economies. An American slump would hurt them, but so might a boom if it led the Fed to raise rates, sucking capital out of the developing world. The Fed's 0.25-percentage-point cut gives emerging economies welcome breathing space to ease their own interest rates and get back on a path to higher growth.

They need a break. Emerging markets have had a difficult few years. In July the IMF cut its growth forecast for developing countries to 4.1%, the slowest rate of expansion since 2009. India is losing steam. Turkey and Argentina have suffered currency crises. Investors have also had a rough ride. Since the start of 2013 America's S&P 500 index of leading firms has more than doubled. Emerging-market equities have dropped by almost 2%.

It was not meant to be this way. In the early 2000s Brazil, Russia, India and China, the so-called BRICs, grew at miraculous rates. It was easy to

think poorer economies would naturally catch up with rich ones, because imitation is easier than innovation, especially when innovative firms build plants in imitative countries. Many also believed that emerging economies had become resilient, with well-run central banks, higher dollar reserves and more flexible currencies.

Sadly the pace of convergence between poor countries and rich has slowed and its scope has narrowed. It appears those barnstorming growth rates relied heavily on China's transformation into the workshop of the world, a feat that will not be repeated. Meanwhile there have been several bouts of market jitters: the taper tantrum in 2013, the commodity-price collapse in 2014, China's devaluation in 2015, the Fed's interest-rate rises in 2018, financial carnage in Turkey and Argentina, and the uncertainties of the trade war this year.

That is where monetary policy comes in. In America the central bank can ease policy to offset threats to growth. But many emerging economies felt unable to cut interest rates last year, because the Fed was doing the opposite. Tighter American monetary policy tends to spoil investors' appetite for risky emerging-market assets. To stabilise their currencies, policymakers in many places found themselves tightening into a slowdown. Indonesia's central bank, for example, raised rates by 1.75 percentage points in 2018, even though inflation remained below 3.5%. Central banks in Russia and India also turned hawkish, and Brazil had to stop its easing cycle.

The Fed's doveish turn has changed that. Emerging economies now feel able to ease, too. South Korea has just lowered its benchmark rate for the first time in three years. Brazil cut rates to record lows last week. South Africa and Indonesia have loosened. Mexico is expected to ease soon. Easier money will help revive growth. But to sustain it much more is required. Emerging economies must use benign times to prepare for bad ones by, for instance, reducing short-term, foreign-currency debt. And to exploit catch-

up growth, they must make themselves hospitable to global manufacturing, emulating China rather than riding on its coat-tails. The euphoria of the BRICs era may never return. But the Fed's cut creates a moment of opportunity. Emerging markets should use it. ■



美联储与新兴市场

一线机会

美联储降息，新兴市场可能受益最多

美国经济陷入两个僵局。第一个事关美联储。7月31日，美联储降息0.25个百分点，是自2008年以来首次降息。它决意不让美国经济滑入衰退。但即便美国经济回暖，程度也不足以让美联储把利率升至正常水平。另一僵局涉及中国。上周在上海举行的会谈证明，中美贸易战短期内不太可能结束或升级。

所有信号都显示美国的缓慢增长仍在持续。这轮扩张已持续121个月，是有史以来最长的一次。较不为人知的是，美国这种不温不火的状态可能对生活在具有高财政风险的新兴经济体内的数十亿人有利。美国经济衰退会伤害他们的利益，但如果美国经济繁荣导致美联储加息，把资本从发展中国家吸走，同样也不利于这些国家的人民。美联储这次0.25个百分点的降息为新兴经济体提供了宝贵的喘息空间，让它们能降低本国利率，重回较高增长的轨道。

它们需要片刻喘息。这几年新兴市场一直处境艰难。今年7月，国际货币基金组织将发展中国家的预期增长率下调至4.1%，为2009年以来最低。印度发展的动力渐失。土耳其和阿根廷遭遇了货币危机。投资者也不好过。自2013年初以来，由美国领先企业构成的标普500指数翻了一倍多，新兴市场股市则下跌近2%。

情况似乎不应如此。本世纪初，巴西、俄罗斯、印度、中国这“金砖四国”以不可思议的速度增长。很容易认为贫穷经济体会自然赶上富裕经济体，毕竟模仿比创新更容易，特别是考虑到创新型企业在善于模仿的国家建厂生产。许多人还认为新兴经济体已经变得强韧，拥有运转良好的中央银行、更充沛的美元储备以及更灵活的货币。

不幸的是，穷国和富国之间趋同的速度已经放缓，范围也已缩窄。之前令

人兴奋的增长似乎很大程度依赖于中国向“世界工厂”的转变，但这样的壮举可一不可再。与此同时，市场爆发了多次恐慌：2013年的“QE削减恐慌”、2014年的大宗商品价格暴跌、2015年的人民币贬值、2018年的美联储多次加息、土耳其和阿根廷的金融危机，以及今年变数频生的贸易战。

这时候货币政策就出马了。在美国，美联储可以放宽政策以抵消威胁经济增长的因素。但许多新兴经济体去年却无法降息，因为美联储正反其道而行。美国如果收紧货币政策，通常会破坏投资者对新兴市场上高风险资产的兴趣。为稳定自身货币，许多国家的政策制定者会收紧货币政策，继而导致经济放缓。例如，印尼央行在2018年将利率提高了1.75个百分点，尽管通胀率一直低于3.5%。俄罗斯和印度的央行也收紧了政策，而巴西也不得不停止其宽松周期。

美联储这次转向宽松政策令情况发生了变化。新兴经济体现在可以实施宽松政策了。韩国三年来首次降低了基准利率。巴西上周将利率降至历史新低。南非和印尼已放松货币政策。估计墨西哥很快也会降息。低成本的资金将有助于重振增长。但要长久增长，这还远远不够。新兴经济体必须在风平浪静之时未雨绸缪，例如减少短期外币债务。而要利用追赶性增长，它们必须迎合全球制造业的需求，仿效中国但非搭中国的便车。金砖四国时代那股强劲势头可能是一去不复返了，但美联储降息带来了片刻机遇，新兴市场应该好好利用它。 ■



Live music

Touting for business

How big stars maximise their take

BUYING TICKETS to a marquee music show can be a miserable experience. You go online as soon tickets are released only to find they are sold out and available only on resale sites at a hefty markup. Touts often use bots to buy up tickets. But it has long been a dirty secret in the music industry that some end up on the secondary market at the behest of performers themselves.

A secret, that is, until July 19th, when *Billboard*, an industry magazine, reported on a phone conversation in 2017 between an executive at Live Nation, a concert promoter, and someone claiming to represent Metallica, a heavy-metal band. The representative asked Live Nation to place 88,000 tickets for an upcoming tour on ticket-resale sites, bypassing outlets where they could be bought at face value. Live Nation admitted that it had previously placed concert tickets on resale sites for other artists.

“None of the bands who had tickets on the secondary market would ever take responsibility,” says Paul Hutton of Crosstown Concerts, a British music promoter. “It was always blamed on an unscrupulous manager or agent.” Live Nation’s admission has destroyed that defence.

The reason for the ruse is that performers want to be rich, but not to make fans think them greedy. In an article in 2016 for *The Ringer*, a sport and pop-culture website, Nathan Hubbard, the former boss of Ticketmaster, a large primary-ticketing agency, wrote that “the biggest artists sign contracts that guarantee them money every time they step on the stage, and that guaranteed amount is usually more than 100% of the revenue if every ticket is sold at face value.” Sending marked-up tickets straight to resellers closes

the gap.

Some artists are exploring more creative ways to maximise revenues without arousing fans' ire. For Taylor Swift's "Reputation" tour last year, fans who shopped in her online store had more chance of getting tickets. These were released in batches, becoming progressively pricier, like airline seats. Garth Brooks extends his tours until demand is sated, adding extra dates until shows stop selling out. Bruce Springsteen and Madonna have played in theatres, where high prices are more palatable—the average ticket for "Springsteen on Broadway" last year cost more than \$500.

Historically, tours were loss-leaders used to promote albums. As revenues from recorded music have collapsed and productions have become increasingly elaborate to draw the crowds, ticket prices have risen steeply. The cost of a concert ticket in America increased by 190% between 1996 and 2018, compared with 59% for overall consumer prices. But as the continued success of scalpers demonstrates, they are still far below the market-clearing price. ■



现场音乐会

倒票生意

巨星们如何实现收入最大化

购买热门音乐会的门票可能是件糟心事。你上网买票，却发现票一放出就“秒光”，只有到转售网站上出高价才能买到。票贩子经常使用自动程序抢票。但音乐行业长期以来存在着一个不可告人的秘密——一些门票是应演出方的要求被转到二级市场出售的。

7月19日，行业杂志《公告牌》（Billboard）报道了音乐会承办商Live Nation的一名高管与一名自称是重金属乐队Metallica代理人的人在2017年的一次电话通话，这一秘密才被公之于众。此人要求Live Nation绕开那些按票面价值售票的销售点，把一场即将举办的巡演的8.8万张门票投放到转售网站上。Live Nation承认，此前它也曾将其他一些艺人的音乐会门票投放到转售网站上。

“门票流到二级市场上，乐队从来不会担责，”英国音乐会承办商Crosstown Concerts的保罗·赫顿（Paul Hutton）表示，“背锅的总是不择手段的经理人或经纪人。”Live Nation的坦白撕掉了这层防护衣。

之所以有这样的伎俩，是因为艺人既想多赚钱，又不想让粉丝觉得自己贪婪。大型一级票务代理公司特玛捷（Ticketmaster）的前老板内森·哈伯德（Nathan Hubbard）2016年在为体育和流行文化网站The Ringer撰写的一篇文章中写道：“最大牌的艺人签的合同都确保他们每次踏上舞台就能拿到钱，而那笔钱通常都超过全部门票以票面价值出售的总收入的100%。”直接将加价的门票送到转售商那里填补了这一差额。

一些艺人也在探寻更有创意的做法，以期在不激怒粉丝的情况下实现收入最大化。去年，那些在泰勒·斯威夫特（Taylor Swift）的网店购物的粉丝有更大的机会买到她的“Reputation”巡演门票。这些门票分批发售，票价

就像机票一样逐批升高。加斯·布鲁克斯（Garth Brooks）则通过延长巡演时间来充分满足观众的需求，他会增加演出场次直到门票卖不出去为止。布鲁斯·斯普林斯汀（Bruce Springsteen）和麦当娜都曾在剧院里举办演出，在那里高票价更能让人接受——去年“斯普林斯汀：百老汇音乐会”的平均票价超过500美元。

过去，为推广专辑而举办的巡演是赔本赚吆喝的买卖。由于唱片收入大跌，同时演唱会为吸引观众制作越来越精良，因此门票价格大幅上涨。1996年至2018年间，美国的音乐会门票价格上涨了190%，而总体消费价格上涨了59%。但黄牛党的生意一直红火，表明如今的票价仍远低于市场出清价。 ■



The Economist film

Education: How to spot a child genius?

Gifted children tend to share three defining characteristics.



经济学人视频

教育 | 如何发现天才儿童？

天才儿童往往有三个重要的共同特征。



Skilled but jobless

Idle hands

The growing ranks of unemployed graduates are worrying the authorities

THRONGS OF YOUNG people roam around the makeshift booths in an exhibition hall in northern Beijing. They are at a job fair organised by the municipal government, aimed at unemployed college graduates. Like most jobseekers in attendance, Su Jian has brought along a stack of CVs to hand out to prospective employers. But Mr Su (not his real name), who graduated in June from a second-tier university in the capital, is unimpressed by what he sees.

The most popular booth at the fair belongs to China Railway, a state-owned behemoth. The firm's recruiter says it pays new graduates around 4,000 yuan (\$580) a month. That is less than half the average salary in Beijing and not even double the city's minimum wage. Mr Su nonetheless submits his CV. "What can you do? There are too many of us," he laments.

Chinese universities produced a record 8.3m graduates this summer. That is more than the entire population of Hong Kong, and up from 5.7m a decade ago. Tougher visa policies in much of the West mean that China will also receive nearly half a million returning graduates from foreign institutions this year. It is not a propitious time to enter the job market. China's economy, buffeted by the trade war with America, is growing at its slowest pace in nearly 30 years. This year fully two-thirds of all workers joining the labour force will be university graduates, up from around half just three years ago. Mr Su wonders whether the number of graduates has outstripped the labour market's ability to absorb them.

As recently as the early 1990s the government simply assigned graduates to

jobs. It no longer dictates people's lives so crudely, but it is clearly worried about what will happen if they do not find work. On July 12th five state agencies warned local governments that boosting employment "has become more onerous". They linked the "employment of graduates" with "overall social stability". Such warnings have been made annually since 2011, but this year, unusually, the public-security ministry attached its name to the notice.

Last month the government announced measures aimed at getting more graduates into work. Small firms that hire unemployed graduates can apply for a tax rebate. The national system of household registration, *hukou*, which restricts where people can receive subsidised public services, will be kinder to new graduates. The new rules instruct all provincial capitals (but not megacities such as Beijing and Shanghai) to make it easier for graduates to apply for local *hukou*, boosting labour mobility.

Graduates who want to start their own businesses may be eligible for a state loan with little or no collateral, the ministry of human resources says. Those who cannot get hired and lack entrepreneurial drive are invited to visit one of its many local branches for "one-on-one assistance". Local governments are also trying to help. One city in Guangxi province announced on July 26th that helping graduates find jobs had become "the utmost priority".

There are no official statistics on the employment status of fresh graduates, but MyCos, a consultancy on education in Beijing, found that the proportion of them who had found full-time jobs within six months of graduation had fallen from 77.6% in 2014 to 73.6% in 2018. The average monthly salary for new graduates fell from a peak of 4,800 yuan in 2015 to 4,000 yuan in 2017, according to Zhaopin, China's biggest job-recruitment platform.

The trade war with America seems to have tempered hiring, especially in export industries. A crackdown on shadow banks (lenders that do not take

state-guaranteed deposits), which have been enthusiastic recruiters of new graduates, has forced mass layoffs. Growing international suspicion of Chinese tech firms may slow their expansion plans, too. Civil-service recruitment, meanwhile, was cut to 14,500 this year, the lowest intake in a decade.

A recent graduate from Peking University recounts how she was laid off by a financial-services firm earlier this year. She is looking for a job at an internet firm. Prospective employers, she says, have extended the probation period from two or three months to six. “During the probation period employers are legally entitled to pay only 80% of the normal salary,” she explains. “More and more companies are exploiting this power.”

With a degree from China’s most prestigious university, she is at least confident she will soon secure a good job. Graduates from lesser-known institutions face a much harder time. Several recruiters at the job fair in northern Beijing admit to chucking CVs from “no-name schools” straight into the bin. Part of the problem, says Joshua Mok, a professor at Lingnan University in Hong Kong, is that the “average quality” of graduates may have deteriorated in recent years. The number of universities has increased from just over 1,000 in 2000 to around 2,700 today. Employers, unfamiliar with so many new names, often dismiss the obscure ones as degree mills. They are not always wrong.

In 2009 a sociologist coined the term *yizu*, or “ant tribe” to refer to struggling graduates from the provinces who swarm to megacities. An estimated 100,000 so-called “ants” lived in Beijing in 2010. But the term is no longer widely used, says a graduate from the southern province of Yunnan who lives in Beijing. Rising rents, combined with a crackdown on the illegal subdivision of flats, have driven most provincial graduates away. She, too, may move home soon: salaries may be lower in Yunnan, but so is the cost of living.

Many graduates have unrealistic expectations, says Yao Yuqun of Renmin University: “Everybody wants to be a manager right away.” There are plenty of jobs to go around, he says. A report in May by the China Institute for Employment Research, a think-tank, found that there were 1.4 entry-level vacancies (excluding unskilled work) for each graduating student. Many jobs are in second- and third-tier cities. Graduates, it seems, are too snooty to take them. One calls this the “BAT or bust” mentality, referring to Baidu, Alibaba and Tencent, three sought-after online giants. The government counsels humility. Anyone blessed with a job offer, it said recently, should “promptly sign the contract”. ■



有技能，没工作

游手好闲

未就业毕业生数量不断增加，引发政府担忧

北京北部的一个展厅里，大批年轻人在一个个临时搭起的展位间来回走动。他们正在参加一场由市政府组织的面向离校未就业高校毕业生的招聘会。与会场内的大多数求职者一样，苏健（化名）也带了一叠简历四处投递。他6月从北京一所二本大学毕业，这场招聘并没有让他多兴奋。

会上最受欢迎的展位是国有巨头中国铁路。该公司的招聘人员表示，中铁为应届毕业生开出的月薪在4000元左右。这还不及北京平均工资的一半，甚至不到该市最低工资的两倍。但苏健还是递了简历。“能怎么办呢？我们人太多了。”他感叹道。

今年夏天，中国大学毕业生的数量达到了创纪录的830万，比香港的总人口还多。十年前这个数字是570万。由于很多西方国家都收紧了签证政策，这意味着今年中国还要接收近50万名海归毕业生。眼下不是进入就业市场的有利时机。受中美贸易战的冲击，中国经济正以近30年来最低的速度增长。今年加入劳动力的所有人员中足足有三分之二是高校毕业生，三年前这一比例还只是一半左右。苏健怀疑毕业生人数已经超过了劳动力市场的吸收能力。

就在上世纪90年代初，政府还在为毕业生分配工作。如今政府已不再如此粗暴地决定人们的人生，但显然还是担心如果他们找不到工作会怎样。7月12日，五部门向各地政府发出警告，称促进就业的任务变得“更加繁重”。它们将“毕业生就业”与“社会大局稳定”联系起来。自2011年以来每年都会发出这样的警示，但今年不同以往的是通知上多了公安部的名字。

政府在上个月公布了一系列促进毕业生就业的措施。雇用未就业毕业生的小公司可以申请退税。户口制度（限制了人们可在哪享受受补贴的公共服务）也将对应届毕业生放宽。新规定指示所有省会城市（但北京和上海

等大都会除外)降低毕业生在当地落户的难度,以提高劳动力流动性。

人力资源部表示,想自己创业的毕业生可能有资格获得一笔少量抵押或无抵押的国家贷款。那些就业困难、也没有创业欲望的人可以前往该部门众多当地分支机构中的某一个寻求“一对一帮扶”。地方政府也在努力提供帮助。7月26日,广西某市宣布帮助毕业生就业已成为“重中之重”。

官方没有公布应届毕业生就业状况的统计数据,但北京一家教育咨询公司麦可思发现,毕业后六个月内找到全职工作的人数占比已从2014年的77.6%下降到2018年的73.6%。根据全国最大的就业招聘平台智联招聘的数据,应届毕业生的平均月薪从2015年的最高点4800元降至2017年的4000元。

与美国的贸易战似乎已令招聘的步调放缓,特别是在出口行业。此前影子银行(不吸收国家担保存款的贷款机构)一直积极地聘用应届毕业生,但政府对这类银行的打击已迫使它们大规模裁员。中国的科技公司越来越多地受到其他国家的怀疑,这也可能导致它们放缓扩张计划。与此同时,今年的公务员招聘人数缩减至14,500人,为十年来最低。

一名北大应届毕业生讲述了今年早些时候被一家金融服务公司裁员的经历。她现在正在找一份互联网公司的工作。她说,准雇主们已将试用期从两三个月延长到六个月。“在试用期内,雇主在法律上有权只支付正常工资的80%,”她解释说,“越来越多的公司正在利用这种权力。”

拿着中国最负盛名的大学的文凭,她至少有把握很快就能找到一份好工作。那些不知名大学的毕业生日子可就难过多了。在北京北部的这场招聘会上,几名招聘人员承认自己会把“非名校”的简历直接丢进垃圾桶。香港岭南大学的教授莫家豪表示,问题一部分出在近些年毕业生的“平均素质”可能已经降低。高校数量已从2000年的1000出头增加到今天的2700所左右。雇主对这么多的新校名并不熟悉,往往把那些自己没怎么听说过的学校归为“野鸡大学”。他们并不全然是错的。

2009年,一位社会学家创造了“蚁族”一词,用以指从各省涌入大城市艰难

求生的毕业生。2010年估计有10万名所谓的“蚁族”生活在北京。但据一名来自云南的在京毕业生说，这个词已经不那么流行了。房租上涨，加上对非法群租公寓的打击，已迫使大多数来自地方省份的毕业生离开大城市。她可能很快也会回老家——云南的工资可能比较低，但生活成本也低。

中国人民大学的姚玉群表示，许多毕业生都抱有不切实际的期望：“人人都想马上做主管。”他说，工作机会有很多，足够分配给每个人。智库中国就业研究所5月份发布的一份报告显示，每名即将毕业的学生对应1.4个入门级职位空缺（不包括非技术工作）。许多工作都在二三线城市。而毕业生似乎太过心高气傲，看不上这些机会。有个毕业生管这种心态叫“非BAT不去”；BAT指的是百度、阿里巴巴和腾讯这三家备受求职者追捧的网络巨头。政府劝毕业生们要谦逊。近期它指出，任何有幸得到工作机会的人都应该“立即签合同”。 ■



US-China trade

Dangerous miscalculations

America cannot have a strong economy, a trade war and a weak dollar all at the same time

SINCE THE trade war began in 2018 the damage done to the global economy has been surprisingly slight. America has grown healthily and the rest of the world has muddled along. But last week the picture darkened as the confrontation between America and China escalated, with more tariffs threatened and a bitter row erupting over China's exchange rate. Investors fear the dispute will trigger a recession, and there are ominous signs in the markets—share prices fell and government-bond yields sank to near-record lows. To avoid a downturn, both sides need to compromise. But for that to happen President Donald Trump and his advisers must rethink their strategy. If the realisation has not dawned yet, it soon should: America cannot have a cheap currency, a trade conflict and a thriving economy.

The latest spike in tensions began on August 1st, when the White House threatened to impose a further round of duties on \$300bn of Chinese exports by the start of September. China responded four days later by telling its state-run companies to stop buying American agricultural goods. On the same day it let its heavily managed currency pass through a rate of seven against the dollar, a threshold which may seem arbitrary but is symbolically important.

That lit a fuse beneath the Oval Office. Mr Trump has long claimed that other countries, including China, keep their currencies artificially cheap to boost their exports, hurting America. He has been griping about the strong dollar for months. In June he accused Mario Draghi, the head of the European Central Bank, of unfairly weakening the euro by hinting at rate cuts. Hours

after the yuan dropped, America's Treasury designated China a "currency manipulator" and promised to eliminate its "unfair competitive advantage". As the hostilities rose, markets swooned, with ten-year bond yields in America reaching 1.71%, as investors judged that the Federal Reserve will slash interest rates to try to keep the expansion alive.

There is no denying that China has manipulated its exchange rate in the past. But today a different dynamic is playing out around the world. Mr Trump wants a booming economy, protected by tariffs and boosted by a cheap dollar, and when he doesn't get them he lashes out. But economic reality makes these three objectives hard to reconcile. Tariffs hurt foreign exporters and dampen growth beyond America's borders; weaker growth in turn leads to weaker currencies, as business becomes cautious and central banks ease policy in response. The effect is particularly pronounced when America is growing faster than other rich countries, as it has recently. The dollar's enduring strength is a result, in part, of Mr Trump's policies, not of a global conspiracy.

Unless this fact sinks in soon, real harm will be done to the global economy. Faced with the uncertainty created by a vicious superpower brawl, firms in America and elsewhere are cutting investment, hurting growth further. Lower interest rates are making Europe's rickety banks even more fragile. China could face a destabilising flood of money trying to leave its borders, as happened in 2015. And further escalation is possible as both sides reach for economic weapons that were considered unthinkable a few years ago. America could intervene to weaken the dollar, undermining its reputation for unfettered capital markets. China or America could impose sanctions on more of each other's multinational firms, in the same way that America has blacklisted Huawei, or suspend the licences of banks that operate in both countries, causing havoc.

As it pursues an ever more reckless trade confrontation, the White House may imagine that the Federal Reserve can ride to the rescue by cutting rates again. But that misunderstands the depth of unease now felt in factories, boardrooms and trading floors around the world. In September talks between America and China are set to resume. It is time for a settlement. The world economy cannot stand much more of this. ■



中美贸易

危险的误算

美国不可能同时拥有强大的经济、贸易战和弱势美元

自2018年开战以来，贸易战对全球经济的破坏程度之轻令人惊讶。美国经济健康增长，世界其他地区也还算过得去。但局势在上周变得更加晦暗，中美之间的对抗升级，美国威胁开征更多关税，人民币汇率也引发了激烈的争吵。投资者担心这些争端将引发经济衰退，市场也出现了不祥迹象——股价下跌，政府债券收益率跌至接近历史低点。为避免经济滑坡，双方都需要妥协。但要实现这一点，特朗普总统及其顾问就必须重新考虑他们的战略。有一件事如果他们还没有领悟，那也应该快了：美国无法同时拥有廉价货币、贸易冲突和繁荣的经济。

最近一次局势骤然紧张是从8月1日开始的，当时白宫威胁要在9月初对中国3000亿美元的输美商品征收新一轮关税。四天后，中国做出回应，告诉其国有企业停止购买美国农产品。同一天，它让它受到严格调控的货币兑美元汇率跌破7: 1关口。把“7”做门槛看起来似乎武断，但它具有重要的象征意义。

这触动了椭圆形办公室的神经。特朗普长期以来一直声称，包括中国在内的其他国家人为地制造廉价货币以增加出口，从而伤害美国。几个月来，他一直对强势美元抱怨连连。今年6月，他指责欧洲央行行长马里奥·德拉吉（Mario Draghi）暗示降息，从而不公平地削弱欧元。人民币贬值后数小时，美国财政部将中国列为“汇率操纵国”，并承诺消除其“不公平的竞争优势”。随着敌对行为升级，市场暴跌，美国10年期债券收益率跌至1.71%，因为投资者认为美联储将削减利率以试图保持扩张。

无可否认，中国过去确实操纵过汇率。但眼下世界各地的形势有所不同。特朗普想要受关税保护和廉价美元推动的繁荣经济，如果没有实现就大加挞伐。但经济现实使这三个目标难以调和。关税损害了外国出口商，抑制

了美国之外其他地区的增长；疲弱的增长反过来导致货币走软，因为企业会变得谨慎，而央行会放松政策作为应对。当美国的增长速度超过其他富裕国家时，这种影响尤为明显，最近就是这种情况。美元持续走强部分是因为特朗普的政策，而不是全球阴谋。

除非特朗普很快领悟这一事实，否则将对全球经济造成真正的损害。面对超级大国的恶毒争吵带来的不确定性，美国和其他地方的公司正在削减投资，进一步损害经济增长。较低的利率使得欧洲摇摇欲坠的银行更加脆弱。中国可能面临资金外逃引发不稳定，就像2015年发生过的那样。随着双方诉诸几年前被认为是不可想象的经济武器，局势还可能进一步升级。美国可以做出干预让美元贬值，从而损害其自由资本市场的声誉。中国或美国可以对彼此更多的跨国公司实施制裁，就像美国将华为列入黑名单那样，或是吊销同时在两国经营的银行的许可证，造成大破坏。

在白宫追求更加鲁莽的贸易对抗时，它可能会期待美联储再次降息来出手相救。但这没能认识到世界各地的工厂、董事会和交易所现在所感受到的不安情绪之强烈。中美会在9月恢复会谈。现在是解决问题的时候了。世界经济再也承受不了多少这样的对抗了。 ■



Currency wars

The guns of August

The trade war escalates, and the fog of war descends

CARL VON CLAUSEWITZ, the Prussian military theorist, never wrote about currency wars. But some policymakers see them in his terms: as the continuation of trade politics by other means. That, at least, is how the Trump administration views China's decision on August 5th to let its currency weaken past seven yuan to the dollar for the first time since 2008. Though arbitrary, that threshold has assumed huge symbolic importance among traders, economic officials and fund managers. They were left stunned.

America's Treasury quickly branded China a "currency manipulator", a charge it has not levelled against any country for 25 years. China, in the Americans' view, was cheapening its currency to gain an unfair edge in retaliation for President Donald Trump's surprise announcement four days earlier that he would impose new tariffs of 10% on roughly \$300bn of Chinese goods.

This marked the end of investors' hopes for a peaceful summer. At the end of July the Federal Reserve had cut interest rates to guard against a slowdown in America's respectable growth rate, and trade tensions had "returned to a simmer", as Jerome Powell, the Fed's chair, noted with satisfaction. But after the yuan's move America's stockmarket suffered its worst day this year. Emerging-market currencies, including the Brazilian real, Indian rupee and South African rand, fell. The price of Brent crude oil tumbled below \$60 a barrel and safe havens, such as gold, rallied. The same search for safety pushed American ten-year government bond yields to 1.7%, as investors bet that the Fed would be forced to slash interest rates further to prevent

a recession. The Reserve Bank of New Zealand cut its benchmark interest rate by twice as much as expected, citing “heightened uncertainty” and “historically low” global bond yields. The Australian dollar fell to its lowest level in a decade.

In matters of war and peace, countries must prepare for the worst. But precautions can look like provocations. In allowing the yuan to fall, China signalled it is prepared for a protracted trade war. It let the yuan weaken in response to the threat of tariffs much as a floating currency would. Otherwise it would have needed to defend an arbitrary line against the dollar every time America turned belligerent. Its move nonetheless makes further belligerence more probable. Mr Trump is now unlikely to change his mind about the new tariffs before they kick in on September 1st.

Both sides blame the other for starting the fight. China has raised tariffs only in response to America’s. But America sees its combative economic diplomacy as a belated response to decades of intellectual-property theft and other misdeeds. Each side’s attempt to get even looks to the other like one-upmanship. China views a weaker yuan as a reasonable response to Mr Trump’s trade duties; Mr Trump, according to the *Wall Street Journal*, sees those tariffs as retaliation for China failing to commit to buy more American farm goods.

The irony is that Chinese purchases of American soyabeans and pork were already rising, and the government was offering buyers exemptions from some tariffs. But after Mr Trump’s new tariff threat it has reportedly told state-owned companies not to buy American farm goods after all. Thus Mr Trump’s tariffs may have caused the decision they were designed to punish.

Whatever the cause of the new levies, what might be their effect? Some of America’s existing tariffs (of 25% on roughly \$250bn-worth of merchandise)

had been imposed on Chinese goods that American importers can buy elsewhere. That minimised the harm to American buyers and maximised the harm to China's exporters, which lost business to close rivals elsewhere. Indeed, according to Goldman Sachs, other Asian countries have filled around half of the gap created by the previous round of tariffs.

The next round of tariffs will hit goods for which China has fewer competitors. That should make it harder for American buyers to switch suppliers. Nonetheless the new tariffs' direct impact could reduce China's growth by at least 0.3 percentage points in 2020, according to UBS, to below 6% for the first time since 1990.

To support a slowing economy, China's government has already cut taxes, increased infrastructure spending and relented in its campaign to restrain credit growth. But it is reluctant to boost the property market, which helped pull the economy out of previous slowdowns, points out Andrew Batson of Gavekal, a research firm. House prices have risen mercilessly and developers have accumulated worrying levels of debt. China, in short, wants to keep growth stable, stand up to America in the trade war and constrain excesses in the housing market. It is becoming harder to do all those things at once.

The damage to America's economy is less tangible. A survey by the Federal Reserve Bank of Atlanta suggested that tariffs and trade-war uncertainty had hurt private investment by 1.2% (and manufacturing investment by over 4%). The unease has also made it harder for the Fed both to preserve stable growth and to raise interest rates to more normal levels. That will give it less room to act if the economy flounders for other reasons.

In a tweet, Mr Trump called on the Fed to respond to China's weakening currency. Although the dollar is technically the responsibility of America's Treasury, the Fed's decisions have a profound influence over its value. It

does not take orders from the president and treats the exchange rate with benign neglect. But if the uncertainties of the trade war inflict enough harm on confidence and spending, it might cut interest rates anyway. The futures market prices in a roughly 40% chance of at least 0.75 percentage points of easing by the year's end. The fog of war can be as damaging as war itself.

The trade fight has reverberated globally. America's Treasury had already expanded the list of countries it is monitoring for signs of currency manipulation. None of the countries listed met all three of the Treasury's criteria (a large bilateral surplus with America, a material overall surplus and persistent currency intervention by the central bank). But then, neither did China. The definition of manipulation is, it seems, highly manipulable.

One of the currencies most affected has been Japan's yen. A haven in troubled times, it rose sharply after Mr Trump's surprise announcement. A strong yen makes it harder for Japan's central bank to revive inflation, especially as its interest rates already lie below zero. Although Japan has not intervened directly in the currency markets since 2011, its officials are watching the yen's rise with alarm. If the currency strengthens closer to the psychological threshold of 100 to the dollar, Japan's authorities might feel compelled to act. Currency wars can also be the continuation of monetary policy by other means.

Nor has Europe escaped. Industrial production in Germany fell by 5.2% in the year to June. "Foreign macro shocks" account for about two-thirds of Germany's slowdown since 2017, according to Goldman Sachs. European banks, including ABNAMRO, Commerzbank and UniCredit, last week warned of squeezed interest margins, rising provisions or flagging revenues. In a recent economic bulletin, the European Central Bank worried that trade uncertainty had delayed global investment, damaging European exports of manufacturing, machinery and transport equipment. In a globalised economy, everything is a continuation of everything else. ■



货币战

八月炮火

贸易战升级，战争迷雾笼罩

普鲁士军事理论家卡尔·冯·克劳塞维茨（Carl von Clausewitz）从未就货币战争著书立说。但如今一些政策制定者会运用他的理论，把货币战视为贸易政治的延续。至少，近日人民币贬值时，特朗普政府就是这么看的。中国在8月5日决定让人民币汇率跌破一美元兑七元人民币的水平，是自2008年以来首次。“七”这一关口尽管带有随机性，但在交易商、经济官员和基金经理看来具有重大的象征意义。他们一时都傻了眼。

美国财政部随即把中国列为“汇率操纵国”，过去25年里美国没有对任何国家做出过这种指控。在美国看来，中国是靠贬值人民币来不公平地获得竞争优势，以报复特朗普在四天前突然宣布将对约值3000亿美元的中国商品加征10%的关税。

投资者安度今夏的期望就此破灭。7月底，美联储降低利率以防止美国不俗的经济增长势头走低，美联储主席杰罗姆·鲍威尔（Jerome Powell）志得意满地指出贸易冲突已“降为小火”。但就在人民币贬值后，美国股市创下年内最大单日跌幅。巴西雷亚尔、印度卢比、南非兰特等新兴市场货币的汇率纷纷下跌。布伦特原油价格跌破每桶60美元，黄金等避险工具价格上升。同样的求稳心理还把美国十年期国债收益率推低至1.7%，因为投资者认为美联储将被迫进一步降息以防经济衰退。新西兰央行下调基准利率的幅度是人们预测的两倍，原因是“不确定性增加”以及全球债券收益率触及“历史新高”。澳元跌至十年来最低水平。

在战争与和平的问题上，各国必须为最坏的情况做好准备。但防御措施也有可能被看成挑衅。中国让人民币贬值，这表明它准备好打一场持久的贸易战。它让人民币贬值来应对加征关税的威胁，就像汇率浮动的货币会自然发生的那样。否则，每次美国进逼来犯，它都得守卫那条不无随机性的

汇率底线。然而，此举可能令美国变得更加杀气腾腾。现在看来，9月1日新关税实施之前，特朗普已不太可能回心转意。

两国都指责对方挑起战事。中国提高关税只是对美国加征关税的回应。但美国认为自己好斗的经济外交政策是对中国几十年来盗窃知识产权和其他不端行为迟来的回应。双方试图“扯平”的举动在对方眼里都是在变本加厉。中国认为人民币贬值是对特朗普加征关税的合理回应，而据《华尔街日报》报道，特朗普认为加征关税是报复中国没有承诺购买更多美国农产品。

讽刺的是，中国对美国大豆和猪肉的购买量此前已经在上升了，而且中国政府也开始向买家提供一定的关税豁免。但据报道，在特朗普最近威胁要再加征关税之后，中国政府已指示其国有企业不要购买美国农产品。因此，特朗普的关税政策可能反而导致中国政府做出了美国本想惩罚的决策。

且不管加征新关税的原因究竟为何，先看看它们可能有什么影响？美国已经征收的关税（对约值2500亿美元的中国商品征收25%的关税）中有一部分是针对美国进口商可从其他地方买到的商品。这最大限度地减少了对美国买家的伤害，同时最大程度地打击了中国出口商，因为它们被紧追其后的外国竞争对手抢走了生意。事实上，根据高盛的数据，美国上一轮关税打压造成的缺口已有约一半被其他亚洲国家填补。

下一轮关税将打击中国竞争对手较少的商品。这样一来，美国买家要更换供应商应该会更棘手些。尽管如此，瑞银表示，新关税可能直接导致中国在2020年的经济增速减缓至少0.3个百分点，自1990年以来首次降至6%以下。

为撑起正在放缓的经济，中国政府已经推出了减税政策，增加了基础设施支出，还放松了之前抑制信贷增长的措施。但研究公司Gavekal的安德鲁·巴特森（Andrew Batson）指出，尽管房地产市场过去多次帮助中国避免了经济衰退，但这次中国并不愿意提振楼市。房价已经升得过高，而开发

商的负债水平令人担忧。简而言之，中国希望保持稳定增长，在贸易战中力抗美国，并抑制楼市过热。但要同时做到这些变得越来越难。

美国经济受到的破坏更不易察觉。亚特兰大联邦储备银行的一项调查显示，关税和贸易战的不确定性已导致私人投资减少1.2%（制造业投资减少了4%以上）。这种不安也使美联储更难在保持经济稳定增长的同时把利率恢复到更正常的水平。如果美国经济因其他问题陷入困境，调整的空间会变得更小。

特朗普在推特上呼吁美联储采取行动回应人民币贬值。虽然严格说来美元归美国财政部管，但美联储的决定对美元的价值有着深远影响。美联储不听命于美国总统，而且向来善意地忽视美元汇率。但如果贸易战的不确定性对信心和消费的损害达到一定程度，美联储可能还是会降息。期货市场的价格已经将年底前有40%的可能性至少降息0.75个百分点的预期考虑在内。战争的迷雾可能有着和战争一样的破坏性。

中美贸易战在全球也产生了广泛影响。美国财政部已经扩大了汇率操纵国观察名单。名单上的所有国家都没有同时符合美国财政部定下的三项标准（对美有巨额双边贸易顺差、有巨额经常账户盈余、央行持续干预货币市场）。但中国也没有三项全中。对“操纵”的界定似乎是可以大加操纵的。

受影响最大的货币之一是日元。在特朗普突然宣布加征关税后，作为动荡时期避风港的日元飙升。日元走强使日本央行更难重振通胀，尤其是日本已处于负利率状态。虽然日本政府自2011年以来没有直接干预过货币市场，但日本官员现在正警觉地关注着日元升势，如果升值接近100日元兑一美元的心理关口，日本当局可能觉得必须要采取行动了。货币战也可能是货币政策的延续。

欧洲也不能幸免。截至6月的一年里，德国工业产值下降了5.2%。根据高盛的数据，德国自2017年以来的经济放缓有约三分之二是“外国宏观冲击”造成的。荷兰银行、德国商业银行和裕信银行等欧洲银行上周警告，称未来可能出现利差缩窄、准备金率上升或收入下降的情况。欧洲央行在最近

发布的一份经济公报中担忧贸易前景的不确定性已导致全球投资滞后，损害欧洲的制造业、机械和运输设备出口。在全球化经济中，一切都是其他一切的延续。 ■



Buttonwood

The meaning of seven

How yuan-dollar became the world's most closely watched asset price

A PRINCIPLE FOLLOWED by traders who speculate on short-term movements in market prices is “cut your losses early”. This doctrine finds expression in the stop-loss—an order to sell a security, such as a company share, automatically when it hits a predetermined price. People being people, stop-loss orders tend to cluster at salient levels, such as whole or round numbers. They might instruct a broker to sell the pound at \$1.20, say, or sell Apple at \$200.

The round-number fetish is a strange one. But when a situation is uncertain (and financial markets are always uncertain) arbitrary numbers or thresholds are often charged with great meaning. And few have had the significance of seven yuan per dollar. So when the yuan broke through seven on August 5th, it prompted a violent sell-off in stocks and a rally in bonds. That was followed by a formal charge by the US Treasury that China was manipulating its currency.

On the face of it, that looks like an overreaction. If things were fine when the yuan was at 6.99, why did all hell break loose when it reached 7.01? Odder still is the idea that a currency that has only fairly limited use outside China is suddenly a prime mover in global capital markets. Yet China’s heft in the world economy has made it so. The yuan-dollar exchange rate is now the world’s most watched asset price. And “seven” mattered simply because people had come to believe that it did.

To understand why, go back four years. Until August 2015 the yuan had been closely tied to the dollar. Since then its external price has been set by

officials each day, ostensibly by reference to a basket of currencies. The idea is that the yuan's value should somewhat reflect market forces. The outcome is that the yuan has moved in a limited range against the dollar, capped at seven. Were the yuan to surge, it would hurt China's exports; were it to plummet, the dollar debts of Chinese firms would loom larger. A large fall would intensify an ever-present fear: devaluation and capital flight.

The yuan is still a long way from being a free-floating currency. It is further away still from being a global one to rival the dollar. It is not a straightforward business to buy and sell yuan. Traders joke that it is less liquid than the shares of Alibaba, a giant Chinese e-commerce firm, which is listed in New York. Yet despite the constraints, the waxing and waning of the yuan's value has had a growing influence on the foreign-exchange market and on asset prices more generally.

This is in large part because the currencies of economies that do a lot of trade with China have tended to move in tandem with the yuan. Its clout owes much to China's weight in the global economy, but also to its gravity in export markets. When the yuan moves, it imparts news about global trade. The message is quickly picked up by the currencies of other export-oriented economies, not only in Asia but in Europe too.

It is not wholly surprising, then, that President Donald Trump's trade war with China has bled into a conflict over the yuan-dollar exchange rate. Reports from China in recent months suggested that it had become a sticking point in the stalled trade negotiations. The governor of China's central bank even dropped a public hint in June that there was no red line at seven. America's treasury secretary, Steven Mnuchin, countered that if China gave up supporting the yuan, it might be interpreted as an attempt to weaken it. That is one reason why crossing seven caused such a fuss.

But there are others. The yuan-dollar exchange rate has become a gauge of

global risk appetite. A weak yuan is often associated with weakness in a host of other important currencies, including the euro. The result is a strong dollar. That in turn squeezes global credit, because many countries and companies beyond America's borders borrow in dollars. One consequence is slower global GDP growth. Another is that money tends to flow out of riskier sorts of securities, such as stocks and emerging-market bonds, into safer assets such as Treasury bonds.

Arbitrary numbers often take on a life of their own in financial markets. China bears some blame in this instance. It has a penchant for control and opaque policymaking. Left to their own devices, investors start to impute greater significance to key thresholds. Officials follow their lead. The markets had become used to the yuan trading in a familiar range. It is not clear what the new rules are. The only thing that is certain is that yuan-dollar remains the asset price to watch. ■



梧桐

“七”的意义

人民币兑美元汇率何以成为全球最受关注的资产价格

利用市场价格的短期波动来投机的交易员遵循的原则之一是“及早止损”。这一原则体现在止损单上，即在证券（例如公司股票）价格达到预先设定的价位时自动卖出。但这毕竟是人为的标准，止损单的预设价位一般都定在很显眼的水平，像是整数或经过取整的数字。比如，它们可能指示经纪人到1.20美元就卖出英镑，或到200美元就卖出苹果股票。

执迷于取整是个怪现象。但当情况不明朗时（而金融市场总是充满变数），带有随意性的数字或关口位往往就会被赋予重大意义。七元人民币兑一美元这一关口的意义少有其他数字能比得上。因此，8月5日人民币兑美元汇率破七后，股市暴跌，债市反弹。之后美国财政部正式指控中国操纵汇率。

表面看来，这似乎是反应过度。如果人民币汇率在6.99时还风平浪静，为何到了7.01就天下大乱了？更奇怪的是，在中国境外使用相当有限的一种货币突然间似乎成了全球资本市场的主要推动力量。但是，这是中国在世界经济中的影响力使然。人民币兑美元汇率是当今全球最受关注的资产价格。而“七”之所以重要，不过是因为人们已渐渐认定它重要。

要探讨原因，且回到四年前。2015年8月之前，人民币汇率一直与美元密切挂钩。而之后，人民币对外价格由官员每日设定，表面上是参考一篮子货币汇率。此举意在让人民币价值在一定程度上反映市场动态。其结果是人民币兑美元汇率一直在一定范围内浮动，上限为七。人民币如果大幅升值，则中国的出口受损；如果暴跌，则中国企业的美元债务会加重。汇率大幅下跌将加剧一直存在的恐慌：货币贬值和资本外逃。

人民币还远不是汇率自由浮动的货币，更遑论能与美元竞争的全球性货币。买卖人民币并不是件简单直接的事情。交易员开玩笑说，人民币的流

动性比中国电商巨头阿里巴巴的股票（在纽约上市）还要低。然而，尽管受到限制，人民币价值的涨跌对外汇市场和更广泛的资产价格的影响力日增。

这在很大程度上是因为有大量对华贸易的经济体的货币往往与人民币同步涨跌。人民币的影响力主要归功于中国在全球经济及出口市场中的分量。人民币的涨跌会传递全球贸易动态的信息。而这些信息会被其他出口导向型经济体的货币迅速吸收，不仅在亚洲，在欧洲也一样。

所以，特朗普发起的对华贸易战会蔓延到人民币兑美元的汇率之争也就不那么意外了。中国近几月的报道表明，汇率问题已成为贸易谈判僵局的一个胶着点。中国央行行长甚至在6月公开暗示人民币汇率没有所谓的“保七”红线。美国财政部长史蒂文·努钦（Steven Mnuchin）反驳说，如果中国政府放弃力保人民币，就可以解读为是企图引导人民币贬值。这也是“破七”引发如此轰动的原因之一。

但也有其他原因。人民币兑美元汇率已成为全球风险偏好的衡量指标。人民币走弱通常与欧元等许多其他重要货币疲软有关。结果是美元走强。这反过来又令全球信贷受到挤压，因为美国以外的许多国家和公司是以美元借款的。后果之一是全球GDP增长放缓。另一影响是资金往往回流至股票和新兴市场债券等较高风险的证券转移至美国国债等较安全的资产上。

在金融市场上，随机性数字常常变得非常重要。在眼下这个案例中，中国要负一定责任。中国政府惯于管控，决策过程也不透明。全凭自己摸索的投资者变得越来越看重一些所谓的关口。官员们也被牵着走。市场已经习惯人民币在熟悉的汇率幅度内交易，新规则是什么现在尚不清楚。唯一确定的是，人民币兑美元汇率仍会是备受关注的资产价格。■



The cashless economy

Tossing the coin

Ditching cash requires high internet penetration and state support

ON JULY 27TH, outside Brooklyn's hipper-than-thou Smorgasburg street-food market, a dozen hungry visitors stand idle amid the barbecue fumes. Rather than queuing for food, they are waiting at a cash machine. Yet inside the market, vendors are trying to wean their customers off cash. Gourmets who use Apple Pay, a mobile-payment service, receive hefty discounts on their purchases. "Apple pays us the difference," one trader explains.

Most transactions around the world are still conducted in cash. However, its share is falling rapidly, from 89% in 2013 to 77% today. Despite the attention paid to mobile banking in emerging markets, it is rich countries, with high financial inclusion and small informal economies, that have led the trend. Within the rich world, more-digitised societies tend to make fewer cash payments. In Nordic countries like Norway and Denmark, where 97% of people use the internet, around four out of five transactions were already cashless by 2016, according to a recent review chaired by Huw van Steenis of the Bank of England. In contrast, internet penetration in Italy is just 61%, and 85% of transactions there were still handled in cash in 2016.

Beyond this broad pattern, decisions by both individual firms and governments have large effects. At the company level, installing infrastructure for contactless payments bears fast fruit. AT Kearney, a consultancy, finds that in rich countries the number of transactions per card has risen by 20-30% within three years of contactless technology becoming widespread. Banks can accelerate the process by building fast, low-cost systems that enable direct transfers between accounts, such as iDEAL in the Netherlands or Swish in Sweden. America has ditched banknotes faster than

its modest 75% internet-penetration rate would suggest because it is the domestic market of many large firms promoting digitisation, such as card networks (Visa, MasterCard), tech giants (Apple, Google) and payment apps (PayPal, Venmo).

Public policy also makes a difference. Some cities, such as London and Amsterdam, have banned on-board cash payments on public buses. Estonia—the birthplace of Skype, an internet-telephony app—has been a leader in digitising public services, such as filing taxes and voting. Its residents are comfortable using new technology and sharing data, and often snub cash. Japan, in contrast, uses more cash than its internet usage would indicate. Historically, it had a sleepy credit-card monopoly entrenched by regulation, which discouraged foreign firms from investing.

So far, cash has proved stubbornly difficult to stamp out completely. Even in Sweden, a front-runner, one in four transactions involves it. But a tipping-point may loom. Handling cash is expensive. Studies estimate its overall cost to society at 0.5% of GDP. As more payments become digital, this burden will fall on ever fewer stores, shoppers and banks. If cash-withdrawal fees rise to \$10 a time, even technophobes and older shoppers may start paying for those truffle fries with their phones. ■



无现金经济

抛掉硬币

摒弃现金需要很高的互联网普及率和国家支持

上月27日，在纽约布鲁克林时尚的斯摩格斯堡（Smorgasburg）小吃集市外，十几个饥肠辘辘的游客在烧烤的烟雾中百无聊赖地排着队。他们不是在等着买吃的，而是等着到取款机上取钱。而在集市里，商贩们正试图让顾客不再依赖现金。吃货们在购物时如果使用移动支付服务Apple Pay，可以享受很大的优惠。“苹果会补给我们差价。”一名商贩解释说。

世界各地的大部分交易仍在使用现金，但所占份额正在迅速下降，从2013年的89%下降到了如今的77%。尽管新兴市场也在关注移动银行业务，但引领这一趋势的还是金融普及程度高、非正规经济规模小的富裕国家。在富裕世界中，数字化程度更高的社会往往更少使用现金支付。英国央行的休·范斯滕尼斯（Huw van Steenis）近期主导撰写的一项报告显示，在互联网普及率达97%的挪威、丹麦等北欧国家，在2016年约80%的交易已经是无现金交易。相比之下，意大利的互联网渗透率只有61%，2016年那里85%的交易仍是现金交易。

除了这一总体模式外，企业和政府的决策也都起到了很大的作用。从企业层面看，安装非接触式支付的基础设施带来了立竿见影的效果。咨询公司科尔尼（AT Kearney）发现，在非接触式技术普及的三年内，富裕国家每张银行卡的交易次数增加了20%到30%。银行可以建立快速、低成本的系统来实现账户之间的直接转账，从而加快这一进程。荷兰的iDEAL或者瑞典的Swish等系统就属于此类。美国75%的互联网普及率不算太高，相比之下它去现金化的速度显得更快，这是因为美国是许多推动数字化的大公司的本土市场，比如Visa、万事达等银行卡网络，苹果、谷歌等科技巨头，以及PayPal、Venmo等支付应用。

公共政策也起了一定作用。伦敦、阿姆斯特丹等城市已经禁止在公共汽车

上使用现金支付。互联网通讯应用Skype的诞生地爱沙尼亚是公共服务数字化（如报税和投票等）方面的先驱。该国居民乐于使用新技术和共享数据，通常都不爱用现金。相反，日本的现金使用量与其互联网普及率相比则显得有些多。过去日本的监管阻碍了外国公司的投资，使信用卡业陷于垄断，了无生气。

到目前为止，事实证明很难完全摈弃现金。即使是在非现金交易方面领跑的瑞典，也还有25%的交易涉及现金。但是可能很快就会迎来转折点。处理现金的成本很高。研究估计它给社会带来的总成本为GDP的0.5%。随着数字化支付日益普及，承受这一负担的商店、购物者和银行也将越来越少。如果提现费用涨到每次10美元，即使是技术恐惧者和年长者可能也会开始用手机买松露薯条了。 ■



The disinformation age

A world of lies

Peter Pomerantsev's new book chronicles the age of disinformation

REREAD PETER POMERANTSEV'S first book today and you experience a sense of vertigo. Published in 2014, "Nothing is True and Everything is Possible" is a memoir of working in Russia's television industry in the 2000s. During his first meeting in Moscow in 2006, Mr Pomerantsev, then a producer-director, now a fellow at the London School of Economics, listens to one of the country's top TV presenters declare: "We all know there will be no real politics. But we still have to give our viewers the sense that something is happening." The question is, "Who's the enemy this week?" Politics should feel "like a movie!"

That book was acclaimed as a searing insight into the semiotics of Vladimir Putin's Russia. But in the era of Brexit, Donald Trump and Cambridge Analytica, of Rodrigo Duterte and Jair Bolsonaro, the ruses it depicts are eerily recognisable: the spurious storylines and made-up enemies, the redefinition of what constitutes a fact, the wholesale manipulation of the citizenry. Even the title (adapted from Hannah Arendt) seems as applicable to today's social-media-inflected Western world as to the Russia of a decade ago.

Now the author has updated his analysis for the current moment. In "This is Not Propaganda", Mr Pomerantsev asks: what if Russia "had been a pre-echo of what was to come"? In answering that question he ranges from identity politics to the disavowal of objectivity in much of the media; from the distressingly familiar online harassment of Filipino journalists to the "information war blitzkrieg" that accompanied the Russian invasion of Ukraine. This time his beat extends across Europe to China, the Americas

and the Middle East, letting him draw helpful connections between dispersed but similar battles in “the war against reality”.

“Nothing is True” was the account of an insider. Here, Mr Pomerantsev plays the more traditional role of a researcher and reporter. He meets information-age mountebanks and the idealists attempting to resist or expose them. He describes in detail how social media have been weaponised by the bad guys, though he neglects to tease out the influence of would-be good guys: optimistic tech types keen on making the world a better place. He shows how the digital tools used to mobilise peaceful revolutions have been co-opted by autocrats.

The personal experience on which Mr Pomerantsev draws for this book is partly vicarious, as he movingly weaves the story of his parents, Igor and Lina, into his narrative. As dissidents in Soviet Ukraine, they lived under claustrophobic censorship and the constant fear of arrest and interrogation; eventually they were exiled for possessing and circulating *samizdat*. They moved to London (via Austria and Germany), where Igor worked for the BBC’s Russian service, revelling in the freedom to say and think what he wanted.

The contrast between the tight regulation of information by repressive regimes in the 20th century, and the free-for-all of today’s media environment, gives the book its disconcerting force. Once authoritarian states concentrated on suppressing unwelcome news and opinions; now some also flood the zone with a million different takes. Once they pushed a monolithic ideology; now they shape-shift, so nobody knows what they stand for. In the past, propaganda often complemented military action; now fighting may be necessary only to provide images for propaganda.

“If you can’t convince them, confuse them,” is an old political motto. But the means for doing that so cheaply and widely are new. If politics in the

television age had to feel like a movie, the trick now is to make it seem like an account of real life. ■



虚假信息时代

漫天谎言

彼得·波莫兰契夫的新书是一部虚假信息时代的编年史【《这不是宣传》书评】

现在重读彼得·波莫兰契夫（Peter Pomerantsev）的第一本书会有一种眩晕感。这本在2014年出版的《俄罗斯，实境秀》（Nothing is True and Everything is Possible）是作者本世纪初在俄罗斯电视行业工作经历的回忆录。现任伦敦经济学院研究员的波莫兰契夫在2006年时是一名制片人兼导演。他第一次在莫斯科参加会议期间，听俄罗斯的一位大牌电视节目主持人说道，“我们都知道（俄罗斯）没有真正的政治，但我们仍然必须让观众感到有正常的政治生活。”要提出问题是，“本周谁是我们的敌人？”政治报道应该像“电影一样”！

这本书被誉为是对普京治下俄罗斯符号学的深刻洞察。但可怖的是，在英国脱欧、特朗普、剑桥分析、杜特尔特和博索纳罗的年代也可以看到书中所描绘的那些诡计：虚假的叙事、捏造的敌人、重新定义事实、大规模操纵民意。甚至书的标题（引自汉娜·阿伦特[Hannah Arendt]的著作）看起来也适于形容眼下被社交媒体影响的西方世界，就和形容十年前的俄罗斯一样贴切。

现在，作者根据当前的情况更新了自己的分析。在《这不是宣传》一书中，波莫兰契夫问道，如果俄罗斯其实“早已是将到来的时代的前兆”呢？在回答这个问题时，他从身份政治讲到很多媒体对客观性的背弃，从菲律宾记者在网络上受到的那种可悲的似曾相识的骚扰，讲到伴随俄罗斯入侵乌克兰而发起的“信息闪电战”。这一次，他论述的范围跨越整个欧洲并延伸到中国、美洲和中东，让他得以在“反现实的战争”分散但相似的局部战役之间建立起对论证有益的连接。

《俄罗斯，实境秀》是一个内幕人士的自述。而在新书中，波莫兰契夫扮演了一个更传统的研究员和记者的角色。他接触那些信息时代的江湖骗

子，以及试图抵制或揭露他们的理想主义者们。他详述了社交媒体如何变成了坏人的武器，虽然他没能筛选出那些想做好人的人的影响——渴望让世界变得更美好的乐观的科技派们。他揭示了用来推动和平革命的数字工具如何被独裁者利用。

波莫兰契夫在书中记述的个人经历有一部分是间接观察：他用感人的笔触把他的父母伊戈尔（Igor）和莉娜（Lina）的故事交织进自己的叙事中。他们在苏维埃乌克兰是异见人士，生活在严酷的审查制度下和随时会被逮捕和审讯的恐惧中；最终他们因持有和传播地下出版物被流放。后来他们经奥地利和德国迁往伦敦，在那里伊戈尔为BBC的俄罗斯分部工作，陶醉于可以随心所欲地表达所思所想的自由之中。

20世纪专制政权对信息的严格管控与当今媒体环境的自由放任之间形成了鲜明的对比，让这本书具有了令人不安的力量。过去，专制国家把精力集中在压制它们不喜欢的新闻和观点上；如今，一些专制国家同时还会让大量不同的观点充斥于媒体。过去，它们推动单一的意识形态；如今，它们上演变形记，谁也不知道它们到底主张什么。过去，宣传往往是为配合军事行动而搭台唱戏；如今，打仗可能就只是为了给宣传提供影像。

“不能说服他们，就整懵他们。”这是一个古老的政治格言。但是，现在践行它的成本之低、范围之广是前所未有的。如果电视时代的政治必须被描绘成电影，现在的秘诀就是要让它看起来像是对现实的记述。■



The Economist film

Life expectancy: How long will you live?

Dramatic improvements in life expectancy have occurred in the past century.



经济学人视频

预期寿命：你会活多久？

过去一个世纪，人们的预期寿命已经大大提高了。



Digital marketplaces

How to beat Bezos

A new generation of online retailers takes on the giants of e-commerce

DELIGHT OGUALU'S hair is straight, black and gloriously glossy. She made it herself. Mrs Ogualu and her husband run a business selling wigs, which are fashionable in Nigeria. At first buyers came to their small Lagos shop in person. Then they started selling their goods on Jumia, an e-commerce site, to customers across the country. Today about 60% of the Ogualus' sales are made online.

Around the emerging world, businesses like the Ogualus' are finding a route to market through the internet. Global e-commerce has been growing for more than a decade. But companies like Jumia are having a moment. Investors are piling in again, spying opportunities to lock in newly connected consumers.

Jumia floated on the New York Stock Exchange in April. MercadoLibre, Latin America's dominant marketplace from Argentina, which listed in New York 12 years ago, has seen its share price more than double since the start of 2019; PayPal has just invested \$750m in the company. Shares in Sea, an online conglomerate which listed in New York in 2017, have tripled in value this year. In March it raised \$1.5bn to fund the growth of its e-commerce arm, Shopee. Last year Walmart paid \$16bn for control of Flipkart, an Indian firm. Money is pouring into Russian e-commerce, where a "sprint" is on for control of the \$18bn market, says Fedor Virin of Data Insight, a research firm. Last year Alibaba, China's online titan, teamed up with Mail.ru, a Russian internet firm. Sberbank, a big Russian state-controlled lender, launched an e-commerce joint-venture with Yandex, another local company. Both are chasing Ozon, Russia's biggest generalist online retailer.

Such companies—call them baby Amazons—are following the path charted by America's e-commerce colossus. They have a way to go. After stripping out Amazon's mature north American business, some \$277bn of goods changed hands on its platform last year, compared with perhaps \$30bn for the biggest emerging-world firms (see table). At around \$65bn, their combined value is dwarfed by Amazon's \$949bn (though its cloud-computing arm, AWS, may account for half of that). And their revenues, some \$6bn all told, are a tenth of the American firm's.

But whereas Amazon's international e-commerce sales grew by a comparatively measly 12% year on year in the second quarter, the upstarts' sales are rising by high double digits or more, as the emerging world embraces the virtual one. MercadoLibre's swelled by 94% in its most recent quarter. Shopee's ballooned by 342%. Small wonder investors are giddy.

Although all these firms no doubt want to be like the American paragon when they grow up, they are going about it differently than it did. Where Amazon's growth piggybacked on the US Postal Service and credit-card networks, they had to build their own, or do without. This limited their early growth. With better infrastructure now in place, and potential customers flocking online, they eye a new era. "The opportunity in the next 20 years is much bigger than the last 20 years," enthuses Sean Summers, MercadoLibre's chief marketing officer.

The companies share four characteristics. First, they were born adapted to tricky local markets. Walmart pulled out of Brazil in 2018, when it became clear that, partly as a function of Brazil's long-standing protectionism, the giant American retailer could not easily access global supply chains it relies on to offer low prices in other places. Red tape related to tax, shipping and payments proved too much hassle for foreign behemoths to bother with, says Mr Summers. In their absence, the local companies can thrive.

Before that could happen, though, they often had to build their own infrastructure in places where payment and delivery systems are rudimentary or non-existent. This is the second shared feature. Many of Jumia's customers do not have an address, so delivery men phone ahead for directions. The company works with over 100 logistics providers and, in cities like Lagos, runs its own last-mile fleet of motorbikes and lorries. In Indonesia, a booming market of 265m people dispersed across 15,000 islands with few decent roads or, as in Nigeria, precise addresses, Shopee and its regional rivals, Tokopedia and Lazada, enlist local shopkeepers who know the area to direct deliveries to the right recipients.

Jumia, Souq (an Emirati firm bought by Amazon in 2017) and MercadoLibre have all built their own sophisticated payment networks. MercadoLibre's has turned into a fully fledged money-management system, complete with payments to friends, investment options and small loans.

The third similarity is that the emerging e-merchants tend not to hold and sell merchandise themselves. Some 40% of Amazon's sales come from products it stocks rather than from third parties. In the case of MercadoLibre and Shopee that number is close to zero. The need to build and maintain payment and delivery systems leaves little energy—or resources—to run a shop. Regulators in developing countries have also been tougher on anticompetitive behaviour than their counterparts in America and Europe. India's competition authority recently ordered Flipkart to stop selling wares in its marketplace, where it could undercut third-party sellers.

The mini e-marts are different from Amazon in one last crucial way—they do not make much money at the moment. Many are burning through cash. Jumia lost €170m (\$188m) last year and has lost a cumulative €862m since being founded in 2012. Shopee does not yet make a profit, though analysts expect that it will do so before 2023. Last year MercadoLibre made no money for the first time since it broke even in 2006. Mr Summers says the firm is

now investing everything it can in growth.

Investors will need patience—and deep pockets. Eghosa Omoigui of EchoVC Partners, a venture-capital fund in Lagos, is convinced that e-commerce will one day succeed in Africa. In the meantime, “you have to keep shoving coal into the engine.” In Russia, Mr Virin predicts, the race will also come down to fuel. “The winner will be the one who doesn’t run out of money.”

For the time being, there appears to be no risk of that. Shopee’s parent raised \$884m when it listed in New York two years ago. Besides reinvesting profits, MercadoLibre raised \$2bn in March, partly by offering shares on the secondary market, and in part by selling a stake to Paypal. Tokopedia picked up \$1.1bn from SoftBank, a Japanese tech holding company, in December. Jumia has about €380m in cash, enough for about two years at the rate the firm is currently burning through it.

The companies are hoping that their markets will expand fast enough to generate profits before the capital taps run dry. There is room to grow. Fewer than 1% of retail sales in Jumia’s markets currently take place online. By 2025 that figure may reach 10% in Africa’s biggest economies, consultants at McKinsey reckon. The consumer class is growing fast, says Jeremy Hodara, one of Jumia’s co-founders. “They come to us and say, ‘Look, it’s the Africa Cup of Nations [football tournament] and my country’s qualified. I need my first TV.’”

Shopee’s revenues are rising even as it spends less on marketing and promotions. Last year it had 50m active buyers, up from 21.7m the year before. In 2017 Google and Temasek, a Singaporean sovereign-wealth fund, predicted that the south-east Asian internet economy will be worth \$200bn by 2025. Last year they revised their forecast up by a fifth, to \$240bn. Marcel Motta of Euromonitor International expects e-commerce’s share of total retail in Brazil to double to 10% by 2023. In Russia annual online sales of

physical goods could reach €50bn by then, from €22bn in 2019.

The e-commerce hopefuls see a route to riches by closing the gap between online retail's penetration in their markets and that enjoyed by Amazon in America, which remains three times larger. The sale of goods is not their only path to profits. Some will sell themselves to the giants, as Souq and Flipkart have done. Others will continue on their own. MercadoLibre wants to be something close to a fully fledged digital bank. All show that, having built their own infrastructure, they can sell access to it. In this respect, at least, they may give their American role model a run for its money. ■



数字市场

如何打败贝佐斯

新一代网络零售商挑战电商巨头

迪拉特·欧瓜鲁（Delight Ogualu）有一头乌黑亮丽的直发。那是她自己做的假发。假发在尼日利亚是畅销商品，欧瓜鲁和丈夫就开了一家假发店。起初，买家会到他们位于拉各斯的小店里来挑假发。后来他们开始在电商网站Jumia上向全国各地的顾客售货。现在，欧瓜鲁夫妇店里约60%的销售额是在网上完成的。

在新兴世界，像欧瓜鲁夫妇这样的商家正通过互联网找到打开市场的途径。全球电子商务已经发展了十多年，但Jumia这类电商平台目前正当好时候。投资者再次蜂拥而入，寻找机会以锁定新接入互联网的消费者。

Jumia于今年4月在纽约证交所上市。12年前，雄霸拉美市场的阿根廷电商平台MercadoLibre在纽约上市，自今年初，其股价上涨了一倍多，PayPal刚向该公司投资了7.5亿美元。2017年在纽约上市的网络业务集团Sea今年股价增长了两倍，并在3月成功融资15亿美元用于拓展其电子商务部门虾皮购物（Shopee）。去年，沃尔玛斥资160亿美元收购了印度电商Flipkart的控股权。研究机构Data Insight的费奥多尔·维林（Fedor Virin）表示，资金正涌入俄罗斯的电子商务领域，抢滩价值180亿美元的市场。去年，中国网络巨头阿里巴巴与俄罗斯互联网公司Mail.ru合作。而俄罗斯国有控股银行俄罗斯联邦储蓄银行（Sberbank）则与另一家当地公司Yandex联手建立了一家电商合资企业。这两宗合作的目标都是为赶超俄罗斯最大的综合电商平台Ozon。

这些公司（且称之为“小亚马逊们”）正循着美国电商巨头开辟的道路前行。但它们还有很长的路要走。不算上北美的成熟业务，去年在亚马逊平台上买卖的商品约价值2770亿美元。相比之下，新兴世界最大电商的交易额约为300亿美元（见图表）。这些新兴电商的市值总计约650亿美元，与

亚马逊的9490亿美元一比就相形见绌了（虽然亚马逊的云计算部门AWS可能占了它市值的一半）。前者的收入合计约60亿美元，仅为后者的十分之一。

但第二季度亚马逊的国际电子商务销售额同比增长相对平淡，仅为12%，而随着新兴世界进入电子商务时代，新兴电商的销售额正以高双位数或以上的速度增长。MercadoLibre最近一季度销售暴增94%。虾皮更是狂涨342%。难怪投资者会欣喜若狂。

尽管这些公司无疑都想到它们的美国榜样亚马逊那样的高度，但它们的成长方式不同于当年的亚马逊。亚马逊当时借助美国邮政服务（US Postal Service）和信用卡网络成长起来，而新兴电商必须建立自己的网络或者在没有这类支撑的情况下发展。这限制了它们初期的成长。但基础设施如今业已改善，潜在顾客也涌上互联网，它们正在凝视一个新时代。“未来20年的机遇远远超过过去20年。”MercadoLibre的首席营销官肖恩·萨默斯（Sean Summers）兴奋地说。

这些公司有四个共同特征。首先，它们天生就是顺应障碍重重的本地市场而生。2018年，沃尔玛退出了巴西市场，因为这家美国零售巨头看明白了一点：在这里难以利用自己赖以在其他地方提供低价产品的全球供应链（部分原因是巴西长期奉行保护主义）。萨默斯表示，新兴经济体在税务、货运和支付方面的繁文缛节对外国大公司来说太耗精力。它们的缺席让本地公司得以蓬勃发展。

但在蓬勃发展之前，本地电商往往要在支付和配送系统薄弱或根本不存在的地方建起自己的基础设施。这是新兴电商的第二个共同特征。Jumia的许多顾客都没有地址，所以快递员要提前打电话询问。该公司与100多家物流供应商合作，在拉各斯等城市还拥有自家的摩托车和卡车车队，负责“最后一英里派送”。印尼是一个拥有2.65亿人口的蓬勃市场，人们分布在15,000个岛屿上，像样的道路不多，跟尼日利亚一样，有精确地址的也不多。在这里，虾皮及其地区竞争对手Tokopedia和来赞达（Lazada）招募

熟门熟路的本地店主为快递员带路。

Jumia、Souq（2017年被亚马逊收购的一家阿联酋公司）和MercadoLibre都自行建立了先进的支付网络。MercadoLibre的支付网络已成长为一套完善的资金管理系统，附带向亲友转账、投资和小额贷款等功能。

第三个共同点是新兴电商往往不做自营业务。亚马逊约40%的销售额来自自营产品而非第三方。MercadoLibre和虾皮的这一比例接近零。它们需要建立并维护支付及交付系统，基本再没有精力或资源去打理自营业务。相比欧美国家，发展中国家的监管机构对反竞争行为的态度也更强硬。印度的竞争监管机构最近命令Flipkart停止在自家平台上销售商品，因为它有可能压价而令第三方卖家生意难做。

这些小电商平台与亚马逊的最后一个关键区别是它们目前还没怎么盈利。许多正在大笔烧钱。Jumia去年亏损1.7亿欧元（1.88亿美元），自2012年成立以来累计亏损8.62亿欧元。虾皮尚未盈利，但分析师预计它将在2023年前实现盈利。MercadoLibre自2006年达到收支平衡以来，去年首次没有盈利。萨默斯表示，目前公司正倾尽一切来扩大规模。

投资者需具备耐心及雄厚的资金。拉各斯的风投基金EchoVC Partners的埃格萨·奥莫伊吉（Eghosa Omoigui）确信电子商务终有一天会在非洲取得成功。与此同时，“你必须不断给发动机加燃料。”维林预测，在俄罗斯的竞争最终也就是“燃料”之争。“谁有足够的资金撑到最后，谁就是赢家。”

目前似乎还没有燃料耗尽的风险。两年前，虾皮的母公司在纽约上市时融资8.84亿美元。除了把利润再投资以外，MercadoLibre还在今年3月融资20亿美元，一部分是通过在二级市场上发行股票，另一部分是通过向Paypal出售股份。去年12月，Tokopedia获得了日本科技控股企业软银11亿美元的投资。Jumia现有约3.8亿欧元的现金，按其目前的烧钱速度足够运营两年左右。

这些公司希望所在市场能快速扩张，好让自己能在资本的水龙头枯竭之前实现盈利。市场的确有发展空间。目前在Jumia所处的市场中，网络销售

还不到零售市场总额的1%。据麦肯锡的顾问估计，到2025年，在非洲最大的一些经济体，这个数字可能会达到10%。Jumia的联合创始人之一杰里米·霍达拉（Jeremy Hodara）表示，消费群体正在快速成长。“他们来找我们说：‘看，非洲国家杯开始了，我们的国家队入围了。我要买自己的第一台电视机。’”

在虾皮减少营销和促销开支之际，收入却在上升。去年它拥有5000万活跃买家，而前一年只有2170万。2017年，谷歌以及新加坡主权财富基金淡马锡（Temasek）预测，到2025年，东南亚互联网经济的规模将达到2000亿美元。去年，他们又将此预测上调五分之一，至2400亿美元。欧睿国际（Euromonitor International）的马塞尔·莫塔（Marcel Motta）预计，在巴西，电子商务占零售总额的比例到2023年将翻倍至10%。到那时，俄罗斯的实物商品网络年销售额也将从2019年的220亿欧元上升至500亿欧元。

电子商务的种子选手们认为，致富之道在于缩小自己在所在市场的渗透率与亚马逊在美国的地位之间的差距，后者仍为前者的三倍。售卖商品并不是它们获利的唯一途径。其中一些会像Souq和Flipkart那样最终把自己卖给巨头。其余的将继续自力更生。MercadoLibre希望成为一家成熟的数字银行。所有这些都表明，在建成自己的基础设施后，它们可以销售对这些设施的使用权。至少在这方面，它们可能会给自己的美国榜样亚马逊一点颜色瞧瞧。 ■



Digitisation

Where's my stuff?

New technologies are modernising an old-fashioned industry

“DIGITISATION WILL have the impact on supply chains that steam and electricity had on manufacturing,” declares Joe Terino of Bain. His claim seems hyperbolic, but it may yet prove prescient. Nearly 30 years after the internet first emerged as a tool for business, the management of supply chains at most MNCs, which do not operate in the rarefied air of Amazon and Alibaba, remains a surprisingly backward-looking, sluggish affair.

The good news is that companies in many industries are experimenting with a variety of new technologies and methods that promise to improve how they plan, source, make and deliver. These innovations are making supply chains smarter by increasing their predictability, transparency and speed of delivery.

First, to predictability. Firms have long used historical sales data to come up with demand forecasts, then manufactured and distributed according to the plan. This antiquated approach cannot keep pace with today’s on-demand economy. So firms are experimenting with AI to assess everything from social-media trends and shifts in demand to inventory turnover and vendor behaviour. Their goal is to fine-tune supply chains in real time.

An annual survey by KPMG, a consultancy, and JDA, a supply-chain software firm, released in May, asked executives which technologies had the highest potential impact on supply chains and were most likely to be adopted. Cognitive analytics and AI came out on top, shooting up from their rankings the previous year. Blockchain and drones were down year-on-year.

JDA uses deep-learning algorithms developed by Blue Yonder, a German

startup it acquired that originally created the software for particle-physics experiments at the CERN laboratory in Geneva. Morrisons, a British grocery chain, reduced the incidence of out-of-stock items on its shelves by 30% and cut its inventory needs by several days by replacing manual stock planning with JDA's AI system for demand forecasting and replenishment.

ORSAY, a German fashion retailer, last year used JDA's self-learning algorithm to make 112,000 autonomous pricing decisions. This enabled the firm to reduce the volume of stock that needed discounts of over 30% to sell.

Intel, a big manufacturer of computer chips, estimates that it has already saved \$58m through better forecast modelling. The firm uses so many bots (software that runs automated tasks) that it has created new bots to manage the worker-bots. One executive says that lawyers have been called in to decide whether management is liable for bad decisions made by boss-bots.

McKinsey estimates that 40% of all procurement tasks (vendor management, order placement and invoice processing) can be automated today, and 80% soon; this could produce annual cost savings of 3-10%. All told, it reckons application of AI to supply-chain management and manufacturing could create \$2trn of value.

As for transparency, Adam Mussomeli of Deloitte, a consultancy, says that an age-old question still bedevils supply-chain managers: "Where's my stuff?" This may seem surprising in an age of personal connectivity, smartphones and GPS, but it is still true.

Pawan Joshi of E2Open, a supply-chain-software firm, explains why. Because of widespread outsourcing, typical MNCs do not make products (contract manufacturers do); they do not ship them (third-party logistics providers do); they do not store them (warehousing firms do) and they do not sell them (resellers and retailers do). So, he says, "the data needed to

make real-time decisions are not inside the ecosystem of the manufacturer.” Data inside firms are also compartmentalised into specialised software used by different divisions. E2Open connects and makes sense of all these data.

In November 2017 a strike by German cargo-handlers stranded a shipment of IBM mainframe computers at Frankfurt airport. Unable to track its precise location, the firm assumed the pricey cargo was safe inside an airport warehouse. In fact, it sat on an icy tarmac for nearly a month, exposed to blizzards. When it was eventually located, the kit—reportedly sitting in four inches of water—was a total write-off.

The rise of the internet of things (IoT) will help. Sensors are coming onto the market that track not only the location of goods, but also the orientation of crates and factors such as temperature and humidity. In February IBM launched a “track and trace” service in partnership with Sigfox, an IoT service provider. Initially it will track only containers travelling from suppliers to factories run by Groupe PSA, a big French car manufacturer, but the service is to expand across Europe this year.

Digital innovations from the top down and bottom up are making shipping smarter too. Singapore is building a massive new port that will expand its use of automated cranes and driverless vehicles. It has also launched an international effort to digitise trade. Tan Chong Meng, head of Singapore’s PSA, a giant port operator, explains that “like the SWIFT codes used in banking, we need common digital standards.”

IBM and Maersk are using blockchain to try to make shipping paperless and transparent. Their TradeLens initiative got a big boost in May when CMACGM and MSC, two big European shipping firms, joined. The consortium accounts for almost half the world’s cargo-container shipments. Every participant in the process, from shipper to customs agent to auditor, will be able to track shipments from start to finish by inspecting

the relevant parts of the blockchain rather than ploughing through lots of paperwork.

Standing at Flex's Pulse command centre near Silicon Valley, Tom Linton looks every inch a commander-in-chief. The system gives him access to 92 variables from his supply chain in real time. Rather than hoard this intelligence, he shares it with employees, suppliers and clients on computers and mobile phones.

His "data democracy" has decentralised a lot of decision-making and speeded up the flow of parts. In the first two years of using Pulse, Flex reduced inventory by 11 days and released \$580m of cash. "The theory of everything is speed, and you need visibility to get velocity," says Mr Linton.

To deliver that speed, product design is undergoing a transformation. Spencer Fung is chief executive of Li & Fung, an Asian supply-chain firm that has helped Western MNCs with sourcing for over a century. Getting a new fashion item from paper sketch to the high street used to take 40 weeks, he recalls. Now it can take half that.

Ford's Hau Thai-Tang says the use of 3D prototyping and digital design shortened the development of the new Mustang GT500, a sports car, by 18 months. Carbon, a Californian 3D-printing unicorn rumoured to be considering a public flotation, is now printing parts used on production lines that produce hundreds of thousands of Ford vehicles and Adidas running shoes a year.

Logistics innovators are harnessing platform technologies like those pioneered by Uber and Airbnb. Warehouse Exchange, a startup, matches owners offering slivers of warehouses on short-term contracts to firms with uncertain or highly fluctuating storage needs. UPS, a big American courier, last year launched Ware2Go, a platform that connects firms with warehouse

space, inventory management and other logistics services.

Fast Radius, a Chicago-based unicorn, has an advanced manufacturing facility located at a big shipping hub in Kentucky run by UPS, one of its investors. Its secret weapon is a collection of 3D printers from top manufacturers. An aerospace firm urgently needed a tool to restart production. Making and shipping it using normal manufacturing methods would have taken 45 days. Lou Rassey, Fast Radius's boss, says his firm got the digital file, printed the tool and delivered it via UPS, all within two days.

At a busy warehouse in Yantian, a port district in the southern Chinese city of Shenzhen, Flexport, a Californian firm, is digitising the freight-forwarding business. As lorries arrive at the loading bay, cargoes are measured digitally, with no manual entries or paper forms, to capture dimensions straight to handheld devices and the cloud. Every pallet is barcoded and weighed on a digital scale. Computer vision turns analogue forms into digitally searchable ones, and machine learning (ML) optimises loading. Flexport reached a valuation of \$3.2bn after a \$1bn investment by Japan's SoftBank in February. Ryan Petersen, its boss, argues that the old model of shipping 40ft-containerloads of a single product from China to a handful of big distribution centres in America or Europe cannot meet today's demands for endless variety and speedy delivery.

Rivals send containers across the Pacific to America that are only 65% full. Because his firm digitises packing lists using ML and can run real-time analytics, it is often able to fill the empty third of the container quickly with smaller loads also waiting to ship. To match supply and demand in smaller and varied shipments, says Mr Petersen, "brains, spreadsheets and phone calls aren't enough. You need technology and data to make decisions right."

Dave Clark, a senior operations executive at Amazon, agrees. Supply-chain management has gone from a negotiation and procurement job to a

technology and science function, he says. Two decades at the trailblazing firm have convinced him that managers introduce huge variability by relying on gut instincts. Rather than machines eliminating human labour downstream in the warehouse, as techno-pessimists fear, he sees a future in which ML replaces human judgment upstream in prediction and planning. He sums up Amazon's thinking neatly: "We are a supply-chain technology company." ■ ■



数字化

我的东西在哪儿？

新技术正在让一个老式行业实现现代化【专题报道《全球供应链》系列之五】

“数字化给供应链带来的影响，就好比蒸汽和电力对制造业的影响。”贝恩的乔·特里诺（Joe Terino）说。这种说法似乎夸张，却仍可能有先见之明。在互联网首次成为商业工具近30年后，大多数跨国公司（它们不在亚马逊和阿里巴巴那个空气稀薄的世界里运作）在供应链管理上的落后和懈怠仍然叫人吃惊。

好消息是，众多行业里的公司在尝试各种各样的新技术和方法，有望改善规划、采购、制造和交付的方式。这些创新提高了供应链的可预测性、透明度和交付速度，令供应链变得更加智能。

首先是可预测性。长期以来，企业根据历史销售数据做出需求预测，再遵循计划开展制造和分销。这种过时的方式跟不上今天的按需经济。因此企业正在试验用人工智能（AI）来评估一切，从社交媒体趋势、需求变化到库存周转和供应商行为等。目标是实时微调供应链。

咨询公司毕马威（KPMG）和供应链软件公司JDA于5月发布了一项年度调查，询问企业高管哪些技术对供应链的潜在影响最大且最有可能被采用。结果发现认知分析和人工智能排在最前，较前一年的排名大幅提升。区块链和无人机的排名则同比下降。

JDA使用它收购的德国创业公司Blue Yonder开发的深度学习算法。这家公司最初为日内瓦的欧洲核子研究组织（CERN）研发出了用于粒子物理实验的软件。英国食品杂货连锁店威廉·莫里森（Morrisons）用JDA的需求预测和补货AI系统取代了手动库存规划，此后库存缺货的发生率降低了30%，库存需求减少了几天。

德国时装零售商Orsay去年使用JDA的自主学习算法做出了11.2万个自动定

价决策，这帮助它减少了需要打七折以下才能售出的库存量。

计算机芯片制造巨头英特尔估计公司已经通过更好的预测建模节省了5800万美元。英特尔使用的机器人（也就是运行自动化任务的软件）数量如此之多，它已经创建了一批新型机器人来管理这些“机器人员工”。一名高管表示，公司已经请律师来判定管理层是否须对“机器人老板们”做出的错误决策负责。

据麦肯锡估计，目前所有采购任务（供应商管理、下单和发票处理）中有40%可以实现自动化，该比例很快能达到80%。这可以每年省下3%到10%的成本。它估算AI在供应链管理和制造业中的应用可以创造2万亿美元的价值。

至于透明度，咨询公司德勤的阿达姆·穆索梅利（Adam Mussomeli）说，一个古老的问题仍然困扰着供应链主管们：“我的东西在哪儿？”在个人联网、智能手机和GPS的时代，这听起来可能令人惊讶，但仍是实情。

供应链软件公司E2Open的帕万·乔希（Pawan Joshi）解释了原因。由于广泛外包，典型的跨国公司并不生产商品（由合约制造商生产），不发货（第三方物流供应商发货），不存储货物（仓储公司会做），也不卖商品（这是经销商和零售商的活）。因此，他说，“做实时决策所需的数据并不在制造商的生态系统内部。”公司内部的数据也区隔在不同部门使用的专用软件里。E2Open把所有这些数据连接起来并展开分析。

2017年11月，德国搬运工罢工使得IBM的一批大型主机被滞留在法兰克福机场。由于无法追踪确切位置，IBM以为这批昂贵的货物安全地躺在机场的某个仓库里。而事实上，它们在冰冷的停机坪上放了近一个月，暴露在暴风雪中。最终找到这批机器时，据报道它们泡在约十厘米深的水里，只能全数报废。

物联网（IoT）的兴起将带来助益。各种传感器正在进入市场，不仅能跟踪货物的位置，还能跟踪集装箱的朝向以及温度和湿度等因素。2月，IBM与物联网服务供应商Sigfox合作推出了“货物追踪”（track and trace）

服务。最初它将只跟踪从供应商到法国汽车制造巨头标致雪铁龙集团（Groupe PSA）旗下工厂的集装箱，但今年这项服务将扩展到整个欧洲。

自上而下和自下而上的数字创新也使运输变得更智能化。新加坡正在建设一个庞大的新港口来扩大自动起重机和无人驾驶车辆的使用。它还启动了一项将贸易数字化的国际性努力。新加坡大型港口运营商国际港务集团（PSA）的一把手陈聪敏（Tan Chong Meng）解释说，“就像银行业中使用SWIFT代码一样，我们需要通用的数字标准。”

IBM和马士基集团正在尝试使用区块链来使运输无纸化且更透明。5月，两家欧洲大型航运公司达飞海运集团（CMACGM）和地中海航运公司（MSC）加入了它们的TradeLens区块链计划，大大推动了它的发展。这支合作队伍几乎占到了世界货运集装箱出货量的一半。从托运人到海关代理人到审计员，货物运输过程中的每个参与者都能通过查看区块链的相关部分来从头到尾跟踪货物，而不再需要费力翻阅大量文书。

站在伟创力（Flex）位于硅谷附近的“脉搏”指挥中心里，汤姆·林顿（Tom Linton）怎么看都像一名总司令。眼前的系统让他能够实时访问供应链中的92个变量。他没有把这些信息藏着掖着，而是通过电脑和手机与员工、供应商及客户分享。

他的“数据民主”已经令很多决策过程实现去中心化，加快了配件的流动。使用“脉搏”的头两年，伟创力将库存周期减少了11天，释放出了5.8亿美元的现金。“全部原则就是速度，而你需要透明度来获得速度。”他说。

为实现这种速度，产品设计正在经历转型。亚洲供应链公司利丰（Li & Fung）帮助西方跨国公司采购已有一个多世纪之久。公司首席执行官冯裕钧（Spencer Fung）回忆说，一件时尚单品从纸上草图到在商业街上架过去需要40周时间。现在可能只要一半时间了。

福特的唐浩泰（Hau Thai-Tang）表示，3D原型设计和数字设计的应用把新款野马GT500跑车的开发时间缩短了18个月。据传正考虑公开上市的加州3D打印独角兽Carbon在打印生产线上使用的零部件。从这些生产线上

每年产出福特汽车和阿迪达斯跑鞋共几十万件。

物流业的创新者正在利用类似于优步和爱彼迎开创的那类平台技术。创业公司仓库交易所（Warehouse Exchange）把提供短期、零星的仓储合同的业主与有着不确定或高度波动仓储需求的公司配对。美国大型快递公司UPS去年推出了Ware2Go平台，它把企业与仓库空间、库存管理和其他物流服务连接起来。

总部位于芝加哥的独角兽公司Fast Radius拥有一个先进的制造工厂，位于肯塔基州由其投资者之一UPS运营的一个大型货运中心内。它的秘密武器是集结了一批顶级制造商的3D打印机。曾有一家航天企业紧急需要一件工具来重启生产。使用常规方法来制造和运送它需要45天。Fast Radius的老板洛乌·拉西（Lou Rassey）说他的公司拿到了数字文档，打印出了这件工具，然后通过UPS交付，总共花了两天。

在位于深圳盐田港的一个繁忙的仓库里，加州公司Flexport正将货物转运业务数字化。卡车到达装货区后，货物用数字方式接受测量，过程不涉及手动输入或纸张表格，得到的尺寸数字被输入手持电子设备和云端。每个运货托盘都配了条形码，并在数字秤上称重。计算机视觉把模拟形式转换为可搜索的数字形式，而机器学习优化了装货过程。在2月份获得日本软银集团10亿美元投资后，Flexport的估值达到32亿美元。其老板赖安·彼得森（Ryan Petersen）认为，从中国向美国或欧洲的少数几个大型配送中心运送只装单种产品的40英尺标箱的旧模式，无法满足今天对无尽多样化和快速交付的需求。

竞争对手们让装载量仅65%的集装箱跨越太平洋运往美国。而彼得森的公司运用机器学习将包装清单数字化，并可以运行实时分析，所以通常能用同样排队待运的小件包裹填充剩余的三分之一空间。彼得森说，要在更小规模且多样化的运货中匹配供需，“靠大脑、电子表格和打电话是不够的。你需要技术和数据来做出正确的决策。”

亚马逊高级运营主管戴夫·克拉克（Dave Clark）赞同这一点。他说，供应

链管理已经从一项谈判和采购的工作转变为技术和科学职能。他在这家开拓性的公司工作了20年，相信管理者对直觉的依赖给供应链管理带来了巨大的波动。技术悲观者担心机器会取代下游仓库里的工人，而在他眼中的未来，机器学习会在上游的预测和规划方面取代人类判断。他言简意赅地总结了亚马逊的思路：“我们是一家供应链技术公司。”■ ■



Distribution

The speedy strawberry

Amazon and Alibaba are pacesetters of the next supply-chain revolution

GREG SMITH is obsessed with the freshness of strawberries. Walmart's top supply-chain executive in America is overhauling the retail giant's distribution system, and in his mind speed is paramount. Strawberries have only 12.2 days of life after picking, he reckons, and the firm did not always get them to stores fast enough. The radical changes he is introducing can sometimes cut three to four days out of their journey to the store.

In the past, Walmart had a one-size-fits-all approach to its supply chain, he says, but now it is fast-tracking certain perishable and quick-selling goods. It used to keep inventories stored at warehouses, but now it is "flowing" priority goods directly to retailers. When his lorries get to stores, fresh items are sent directly to shelves for purchase rather than sitting in back rooms.

To gauge progress, visit a Walmart outlet down the road from the company's headquarters in Bentonville, Arkansas. A robot made by Bossa Nova, a Californian startup, roams the isles scanning every shelf for out-of-stock items. The back of the store houses a semi-automated system for unloading lorries. The stockroom is surprisingly bare. An inspection of the produce aisles confirms that the strawberries are, indeed, delectably fresh.

The story of the speedy strawberry illustrates a broader transformation. "Retail before Walmart was slow, lumbering and inefficient," recalls an industry veteran. The firm already revolutionised supply chains once, before the arrival of the internet, by stripping out inefficiencies in logistics and telling the world's biggest brands that it would manage their product flow through its superior supply chain. Now it wants to repeat the trick

for a more digitised age. Mr Smith says Walmart is replacing all its supply-chain systems, both physical and digital, to shift from batch processing to continuous replenishment.

Upstream, the firm is investing in technologies that he hopes will allow it to track individual stock-keeping units (SKUs) through the supply chain. Its warehouses are introducing automatic storage and retrieval systems and autonomous vehicles (AVs). In July the firm will open an automated facility in California that will handle three times the volume of ordinary ones.

The firm is moving faster downstream, too. It is working with Alert Innovation, an automation startup, to develop a robot that can fill online grocery orders more quickly for dispatch from its retail outlets. It is crowdsourcing the last-mile delivery of orders through a service called Spark Delivery.

All this is producing results. Productivity at Walmart's distribution centres, measured in cases per hour, went up 13% in the past 18 months. Billions of dollars have been stripped out of inventory. In the most recent quarter, same-store sales in America were up 3.4% on the previous year and e-commerce sales up 37%.

On May 1st Walmart implemented a new policy under which suppliers must meet tougher "On Time, In Full" (OTIF) targets for deliveries of stock or else suffer hefty fines. On June 7th it unveiled a new service that allows customers who order groceries online to have them delivered directly into their fridge.

Why does the firm ranked number one by revenue on the most recent *Fortune* 500 list feel such need for speed? A Walmart executive explains: "A competitor who will remain nameless...is forcing all of us to think differently, and we should."

Amazon's introduction of the idea of "low cost, always in stock" is turbocharging innovation. The new front-line is next-day delivery. Over half of Amazon's customers in America—some 100m people—are Prime members who pay an annual fee to get free two-day shipping. They spend about \$1,400 a year each with the firm, more than double the amount spent by non-Prime shoppers.

The firm operates dozens of fulfilment centres in America and has splashed out on automation. With the aid of machine-learning algorithms, robots work in tandem with humans to pick and pack items speedily. By one estimate, Amazon can usually ship a parcel just hours after an online purchase despite operating with a third less inventory than typical retailers.

By employing predictive models, the firm works out where orders are likely to come from. It then uses its intimate knowledge of consumers to manage capacity, place products closer to them and determine delivery routes. Its integrated business model gives it a massive data advantage over rivals that allows it "to have visibility through the entire supply chain...and make better decisions," says Udit Madan, its last-mile-delivery guru.

Now the race is hotting up. In April Amazon announced plans to spend \$800m upgrading its supply-chain infrastructure in the second quarter to speed up free delivery worldwide, from two days to one. In May Walmart fired back. It unveiled free one-day delivery on over 200,000 items in its online store for orders over \$35. It expects the service, which requires no membership, to be available in most of the United States by the end of this year. It will spend over \$200m on infrastructure.

"We like larger cities," says Mr Madan, "as density increases the number of deliveries we can make in a given time and speed is usually faster." Complexity and variability in the messy megalopolises of emerging markets (because of the lack of formal addresses, say, and standstill traffic) spur

innovation. In such markets, his drivers carry sophisticated handheld devices that allow the cancellation of orders up to a minute before delivery.

The rich-world giants are right to look to the developing world for inspiration. China is leapfrogging from ropey logistics to supercharged supply chains, just as it did with e-commerce and mobile payments, in which it went from laggard to world-beater.

The robots come out after dark in Hangzhou. Seven hundred of them are moving purposefully around the upper floor of a large distribution centre run by China Post, the state-run postal carrier. These flat yellow workhorses made by Libiao, a local startup, work through the night sorting packages for delivery across China. Workers scan packages and place them on the devices. The robots make their way to the chute for the destination city among scores of openings and drop the packages in. On the floor below the packages are whisked from the chutes to waiting lorries.

Amazon leads in the use of AI-powered robots in logistics, but China's entrepreneurs have the edge in speed. Mainland innovators are capable of cutting-edge inventions, for example in facial-recognition software. However, they are also good at frugal engineering, throwing together cheap solutions that can get to market faster than the gold-plated ones favoured by Western innovators.

Xia Huiling, who co-founded Libiao with her husband, eschewed complex AI and navigation systems that would have made each robot autonomous, in order to keep the system affordable. Her dumb robots merely follow trajectories calculated centrally. Through Tompkins, an American supply-chain firm it acquired, Libiao is trying an inventive business model too. Retailers facing seasonal demand spikes can lease a handful of robots for as long as needed. "They are plug and play," says Ms Xia.

Libiao is one of the promising startups in which GLP, a privately held Chinese logistics firm, has a stake. Victor Mok, GLP's China co-president, is introducing logistics parks with smart gates and loading docks for expedited clearing of lorries as well as automation inside warehouses. Through its investment in Inceptio, a local startup, it is developing autonomous lorries, too.

Not far from the China Post warehouse is the headquarters of Alibaba, the world's biggest e-commerce firm by transaction volume. On its leafy campus is an outlet of Hema Xiansheng, a chain in which it has a stake. It looks like a conventional supermarket, albeit with an unusually large selection of Maine lobsters. On closer inspection, many shoppers appear to be leaving without proffering cash, card or mobile payment. Bags of groceries whizz by on an overhead conveyor system.

Hema has invested in the technologies needed to combine online and offline shopping. In-store shoppers can pay using facial-recognition (young people favour this, whereas oldies tend to pay by traditional means). The flying groceries go to an army of waiting couriers, who deliver online orders free within a 3km radius within 30 minutes.

Cainiao, Alibaba's logistics platform, is investing 100bn yuan (\$14.5bn) upgrading logistics to ensure next-day delivery in China and three-day delivery worldwide. "Our warehouse system is the most heavily used in the world," says Ben Wang of Cainiao. Last year, on November 11th, a shopping extravaganza known as Singles Day, the firm sold \$30bn-worth of goods. Shoppers wearing virtual-reality goggles could buy stuff with a flick of the head. Cainiao delivered the first 100m parcels (of 1bn orders) within 2.6 days, better than 2.8 days a year earlier.

Amazon is looking seriously at drones and autonomous robots for the last mile, which it considers the choke point for fast delivery. In June it unveiled

its Prime Air drone, a hybrid aircraft which is to start making deliveries in “the coming months”. Ask Mr Madan to look five years ahead and he predicts that product selection will grow and delivery will get even faster. How fast? “Thirty minutes,” he says confidently. Then, after reflection, he adds with a mischievous smile, “Maybe 15.” How can the rest of the industry keep pace with supercharged superstars like Amazon and Alibaba? The only hope is for them to make their supply chains smarter. ■ ■



分销

快销草莓

亚马逊和阿里巴巴是下一次供应链革命的排头兵【专题报道《全球供应链》系列之六】

格雷格·史密斯（Greg Smith）沉迷于草莓是否新鲜的问题。这位沃尔玛的美国供应链最高主管正在改革这家零售巨头的分销系统，在他看来速度是至关重要的。他估计草莓采摘后只有12.2天的保鲜期，而沃尔玛并不总能足够快地把它们送到商店。他推出的激进改革有时能把它们前往商店的旅程缩短三四天。

他说，过去沃尔玛对自己的供应链采用一刀切的方法，但现在它正在加速处理某些易腐和畅销商品。它以前把库存都存放在仓库中，而现在让优先商品直接“流”向零售商。当沃尔玛的货车到达商店时，生鲜被直接放到货架上出售，而不是放在后头的库房里。

要衡量进展，可以去距位于阿肯色州本顿维尔（Bentonville）的沃尔玛总部不远处的一家沃尔玛超市一探究竟。由加州创业公司Bossa Nova制造的机器人正在货架间的走道上缓慢移动，扫描每个货架以找出缺货商品。超市后面的库房里有一个帮助货车卸货的半自动系统。库房空荡荡得叫人吃惊。到蔬果区看一看，草莓果然新鲜诱人。

快销草莓的故事是更广泛转型的缩影。“沃尔玛出现前，零售业缓慢、笨拙又低效。”一位资深业内人士回忆道。在互联网到来之前，这家公司曾经带来过一次供应链革命——铲除物流过程中的低效环节，并告诉世界上最大一批品牌它将通过自己优越的供应链为其管理产品流。现在，它想为一个数字化的时代再使这一招。史密斯表示，沃尔玛正在更新它的整个供应链系统——无论实体或数字，从批量处理转为不间断补货。

在供应链上游，沃尔玛希望它正在投资的技术能让它跟踪每一个库存量单位（SKU）。其仓库引入了自动存储、检索系统和自动驾驶车辆。7月，

该公司在加州的一家自动化仓库开工，处理量是普通仓库的三倍。

供应链下游也在加速。沃尔玛正与自动化创业公司“警觉创新”（Alert Innovation）合作开发一种机器人，能让在线食品杂货订单更快地从零售店发货。它通过名为“火花递送”（Spark Delivery）的服务将最后一英里交付的环节众包。

所有这些改革的成果正在显现。沃尔玛配送中心的生产率（按每小时配送订单数衡量）在过去18个月里增长了13%。已有数十亿美元的资金从库存中释放出来。最近一个季度，美国同店销售额比上一年增长了3.4%，电子商务销售额增长了37%。

5月1日起沃尔玛实施了一项新政策，要求供应商在交付货品时必须满足更严格的“准时、足量”（OTIF）目标，否则要支付巨额罚款。6月7日，它推出了一项新服务，在线购买食品杂货的客户可以选择直接送货至自家冰箱。

为何这家在最新财富500强（按收入计）榜单名列榜首的公司，会对速度有如此迫切的需求？沃尔玛一名高管解释说：“有一个竞争对手，我不具体说是谁了……正在迫使我们所有人改换思考方式。而我们也确实应该这么做。”

亚马逊推出的“低成本、不断货”理念正在推动创新。新战场是“次日送达”。亚马逊超过一半的美国客户（共约1亿人）是Prime会员，他们支付一笔年费以获得两天免费送达服务。他们每人每年在这家公司花费约1400美元，是非Prime会员购物者花费的一倍多。

亚马逊在美国经营几十间配送中心，大举投资于自动化。在机器学习算法的辅助下，机器人与人类员工协同工作，快速选取和包装货物。据一项估计，亚马逊通常能在顾客下单后的几小时内发货，尽管其库存比典型零售商少三分之一。

这家公司采用预测模型来估测订单将来自何处，然后利用它对消费者的深

入了解来管理仓储量，把库存放在更靠近消费者的地点，并确定交付路线。它的集成商业模式让它拥有超越竞争对手的巨大数据优势，令它“能够在整个供应链实现可见性……并做出更好的决策。”公司的最后一英里交付专家乌迪特·马登（Udit Madan）说。

现在，这场比赛愈发激烈。4月，亚马逊宣布将在第二季度投资八亿美元升级其供应链基础设施，以将全球免费送货从两天提速到一天。5月，沃尔玛回击了。它推出了在线商店订单满35美元可享超过20万件商品免费一日送达的服务。它预计到今年底，这项无需会员资格的服务将在美国大部分地区推出。它将在基础设施上花费超过二亿美元。

“我们喜欢更大些的城市，”马登说，“因为密集的人口提高了我们能在特定时间内完成的交付量，而且速度通常更快。”新兴市场混乱的特大城市的复杂多变（比如缺乏正规地址以及交通堵塞）刺激了创新。在这类市场中，亚马逊的司机们携带先进的手持设备，允许用户最短在交付前最后一分钟取消订单。

富裕世界的巨头们向发展中国家寻求灵感是明智的。中国正在实现从糟糕的物流到超级供应链的跨越式发展，正如它在电子商务和移动支付领域从落后变成领先全世界那样。

杭州的夜幕降临后，机器人出动了。在国营邮政运营商中国邮政的一个大型配送中心里，七百个机器人在二楼目标明确地四下移动。这些由本地创业公司浙江立镖机器人公司制作的扁平的黄色小车彻夜分拣发向中国各地的包裹。工作人员扫描包裹后将它们放在这些设备上。机器人在几十个滑槽之间选择包裹要运往的目的地城市，把包裹放进正确的滑槽中。在一楼，包裹被迅速从滑槽送上等待的货车。

亚马逊在物流领域对人工智能驱动的机器人的应用领先全球，但中国的企业家在速度方面具有优势。中国大陆的创新者拥有尖端发明，如面部识别软件。但他们同样擅长“节俭工程”，也就是把各种廉价解决方案胡乱拼凑在一起，比西方创新者青睐的那些精致的方案更快推向市场。

夏慧玲和丈夫共同创立了立镖公司。为了降低成本，她避开了那类能让每个机器人都完全自主的复杂的AI和导航系统。她的那些笨笨的机器人只是跟随着集中计算出来的路线移动。立镖也在通过它收购的美国供应链公司Tompkins尝试一种创新的商业模式。面临季节性需求高峰的零售商可以按需租用少量机器人。“它们是即插即用的。”夏慧玲说。

立镖是中国私营物流公司普洛斯（GLP）持股的颇具前景的创业公司之一。普洛斯的联席总裁莫志明（Victor Mok）正在推出物流园区，装有可加速货车通行的智能门和装卸码头，仓库内也实现自动化。通过投资于本地创业公司嬴彻科技，它也在开发自动驾驶卡车。

离中国邮政的仓库不远处是阿里巴巴的总部。这是按交易量计算全球最大的电商企业。在它绿树成荫的总部园区里有一家盒马鲜生超市——阿里巴巴持股的一家连锁店。它看起来像一家传统超市，里头的缅甸龙虾品种却异常丰富。再仔细看看，你会发现许多购物者好像既没有掏出现金，也没有刷卡或刷手机就离开了。架空输送带上，一包包食品杂货飞速掠过。

盒马投资了将线上和线下购物结合起来所需的技术。店内购物者可以使用面部识别付款（年轻人喜欢这种方式，老年人更倾向于传统支付方式）。在头上飞过的杂货奔向等候着的大批外卖员，他们在30分钟内在3公里的范围内免费派送在线订单。

阿里巴巴的物流平台菜鸟物流正投资1000亿元人民币升级物流，以确保次日送达全国各地和三天送达全球各地。“我们的仓储系统是世界上使用最多的。”菜鸟的王文彬说。去年的双十一购物盛典期间阿里巴巴卖出了价值300亿美元的商品。戴着虚拟现实头盔的购物者可以轻轻点头来下单购物。菜鸟在2.6天内交付了（10亿个订单中的）首批一亿个包裹，优于去年同期的2.8天。

亚马逊正在认真规划使用无人机和全自主机器人来完成最后一英里交付，它认为这是快速交付的瓶颈所在。6月，它推出了Prime Air无人机，这是一种混合动力飞机，将在“未来几个月”开启送货。让马登展望未来五年，

他预测产品选择会增加，交付速度会更快。多快？“30分钟。”他信心满满地说。再想了想，他调皮地笑笑说，“也许15分钟。”这个行业里的其他参与者如何能跟上亚马逊和阿里巴巴这样的高速超级明星的步伐？它们唯一的希望是把自己的供应链变得更加智能。■ ■



Security

Safe or sorry?

Companies must get ready for a riskier world

MULTINATIONAL FIRMS have come a long way in the decades since the emergence of supply-chain management. A sclerotic and retrospective set of disjointed processes has formalised into a proper discipline. Decisions based on gut instincts and relationships are increasingly made using data. As a result, supply chains are getting shorter, faster and smarter.

Unfortunately, they are not yet getting much safer. This matters because the world economy is becoming more dangerous for MNCs. Global supply chains are facing three immediate threats today: the Huawei problem, cyber-security attacks and tariff wars. Tomorrow's threats, which include climate change, could be worse.

What should firms do in response to American hostility towards Huawei? MNC bosses must balance security concerns and the need to follow American law against cost pressures and a desire to retain access to Chinese innovations and consumer markets. Though President Donald Trump indicated on June 29th that he would loosen restrictions on sales of American technology to Huawei, the Chinese firm remains a legal pariah. Its activities in America have been curtailed by executive order, and Congress has curbed its sales to defence contractors. The Eurasia Group, a risk consultancy, reckons that the truce agreed by Mr Trump and his Chinese counterpart, Xi Jinping, at the end of June does not provide "a sustainable solution for Huawei".

The Huawei blacklisting could be dropped completely as part of a final trade bargain. Last year Mr Trump decided to grant a lastminute reprieve to ZTE,

another Chinese telecoms-equipment firm. But even if that happens in this case, Huawei is likely to have an enduring effect on global supply chains.

For one thing, it has served as China's Sputnik moment. The current generation of Communist Party leaders came to power in the age of China's economic symbiosis with America. To their shock, Mr Trump's economic nationalism and attacks on China have won over America's corporate elite.

Now that faith in interdependence is shattered, Chinese leaders will invest heavily to accelerate "indigenous innovation", just as American leaders did following Russia's launch of the Sputnik rocket in 1957. They will push home-grown operating systems and technical standards, and direct vast resources and the country's sharpest minds to developing advanced technologies. Many bets will flop but others will pay off, even if they take decades (as is likely in the case of advanced semiconductors).

That points to another likely effect of the Huawei troubles. There is bound to be an acceleration in the slow unravelling that is already under way of the complex supply chains that linked China to America. For example, Mr Trump issued an executive order in May that restricted sales of some foreign telecoms-networking kit. This is part of a broader policy review that may ultimately require future communications technologies sold in America to be manufactured domestically.

The cost of ripping apart efficient supply chains (especially in electronics) and replacing them with more expensive substitutes would inevitably be paid by consumers, through higher prices and lost innovation, but also by firms and shareholders, through lower profits and reduced capacity to invest in future. There may also be macroeconomic costs. By the OECD's reckoning, the rise of hyper-efficient global value chains kept producer-price inflation and real-wage growth in check, and boosted productivity levels across advanced economies by nearly 0.6% per year.

Yet another effect concerns the rollout of 5G networks. This technology is the essential enabler of the internet of things, smart factories and digital supply chains. The Huawei fallout could lead to the bifurcation of global markets into two incompatible 5G camps (see map). Paul Triolo of Eurasia Group thinks it will “force countries and companies to choose sides between America and China in the tech cold war”.

In this scenario, Sweden’s Ericsson, Finland’s Nokia and South Korea’s Samsung would supply a pricier network comprised of kit made outside China to serve customers allied with the United States. For example, Australia’s government, which is close to American intelligence agencies, banned Chinese 5G kit last year. Huawei would build a cheaper network for those countries less worried about China. Mahathir Mohamad, Malaysia’s prime minister, declared in May that his country plans to use Huawei “as much as possible” even if there “may be some spying”.

As for cyber-security threats, they have gone from a distant danger to the enemy within. A single bit of Russian malware, known as NotPetya, in a Ukrainian office led to the shutdown of Maersk’s shipping operations at many ports in 2017, costing as much as \$300m. Research by Zac Rogers of Colorado State University and Thomas Choi of Arizona State University suggests that over 60% of the reported cyber-attacks on publicly traded American firms in 2017 were launched through the computer systems of suppliers or contractors, up from less than a quarter in 2010.

Stuart Madnick of MIT’s Sloan Business School believes that the rollout of 5G networks and the arrival of the internet of things could produce the next great cyber-crisis because firms are rushing suppliers to get whizzy devices onto the market without first incorporating proper cyber-security into the design. “The worst is yet to come,” he warns.

The biggest question for company bosses today is how firms should rethink supply chains in an era of protectionism. The conventional wisdom is to invest in “resilience” by diversifying suppliers, building additional manufacturing plants, keeping bigger stocks and so on. In practice, though, bosses need to weigh carefully the costs involved in complex hedging strategies against promised benefits. Flex’s Tom Linton rejects the notion of resilience, which he considers a euphemism for expensive redundancy, in favour of speed: “I could drive to work in a tank if I wanted to be resilient, but it would take me for ever.”

That is an extreme position. Others point to nuanced strategies that will require bosses to roll up their sleeves and learn by doing. Laurent Chevreux and colleagues at A.T. Kearney, a consultancy, argue that firms must be ready to pivot quickly, ensuring that modernisation of supply chains does not simply digitise old ways of thinking and hinder adaptability. Justin Rose and Martin Reeves of the Boston Consulting Group encourage firms to look at advanced manufacturing technologies, especially flexible robotics and automation, which might make supply chains safer by allowing firms to bring them closer to home.

In conclusion, the great convergence that produced a golden age for MNCs is now unravelling. This will force companies to ask hard questions about investment decisions taken in the past, and may undo some of the global supply chains developed over the past few decades. This reconsideration must be taken on as an urgent strategic task by the people occupying executive suites, rather than delegated to bean-counters in cubicles.

The traditional approach to building supply-chain resilience assumed that the threat would be a natural disaster that forced some capacity offline. So companies have mapped potential supply risks, run disaster scenarios and invested in “business continuity” solutions that generally involve duplicating capacity.

However, this mindset is inadequate for dealing with trade wars. Tariffs imposed today can be removed next month, but factories cannot be moved around so fast. The task now is to redesign supply chains so that they can respond to geopolitics more quickly. This will require many firms to speed up cycle times for inventory. They must also shift from a default bias for efficient global suppliers on the assumption of a low-tariff world towards more local (and possibly pricier) sourcing, which may provide a buffer during tariff battles. However, excessive concentration also brings risks, so managers must invest wisely.

Firms must also take steps to guard against cyber-risks, which are growing. Ryan Kalember of Proofpoint, an American cybersecurity firm, notes that this will be exacerbated by 5G, where many of the vendors involved have a history of shipping code with bugs in it. Mr Madnick recommends big firms conduct security audits of supply-chain partners, vendors and takeover targets to sniff out cyber-vulnerabilities.

Many companies will struggle with the question of what to do with legacy manufacturing assets and opaque supplier networks developed in a bygone era. Others may adopt a wait-and-see attitude, hoping that the current storms will pass and that the heady globalisation of yesteryear will return. The most dynamic firms will find creative ways to chart a path through today's challenging terrain and seize competitive advantage.

After all, as this special report has made clear, supply chains are no longer merely cost centres. The best firms are already wielding shorter, faster and smarter supply chains as potent weapons. The next challenge will be to make them safer as well. It would be foolish to venture onto this battlefield unarmed. ■ ■



安全

安全至上

企业必须准备好应对一个更危险的世界【专题报道《全球供应链》之七】

自供应链管理出现后的几十年里，跨国公司已取得了巨大的进步。一套僵化、向后看、支离破碎的流程已经被正规化为恰当的操作准则。基于直觉和关系做出的决策越来越多地转变成依赖数据。供应链由此正变得更短、更快，也更智能。

不幸的是，它们的安全性并没有很大提高。这一点很重要，因为世界经济对跨国公司来说正在变得更加危险。全球供应链如今面临三大直接威胁：华为问题、网络安全攻击、关税战。未来的威胁——包括气候变化——可能还会更糟糕。

企业应当如何应对美国对华为的敌意？跨国公司的老板们必须在两件事上做权衡：既要关切安全和遵守美国法律，又面对成本压力并且希望继续分享中国的创新成果和消费市场。尽管特朗普总统6月29日表示他将放宽对美国企业向华为供货的限制，但这家中国公司在法律上仍然是一个贱民。它在美国的活动受到行政令的限制，国会也已经限制了它对国防承包商的销售。风险咨询公司欧亚集团（Eurasia Group）认为，特朗普和习近平在6月底达成的休战协议并没有给华为提供“可持续的解决方案”。

最终达成的贸易协议可能会把华为从黑名单上完全撤下。去年，特朗普决定在最后关头解除对另一家中国电信设备公司中兴通讯的禁令。但这次即便发生同样的情形，华为也很可能对全球供应链产生持久的影响。

首先，它已经带来了中国的“斯普特尼克时刻”。当代中国共产党领导人是在中国与美国经济共生的时代上台执政的。令他们震惊的是，特朗普的经济民族主义和对中国的攻击已赢得了美国企业精英的支持。

现在，既然对相互依存的信念已经破灭，中国领导人将投入巨资加速“自

主创新”，就像美国领导人在1957年俄罗斯发射“斯普特尼克号”卫星后所做的那样。他们将推动研发本土操作系统和技术标准，并将巨量资源和最敏锐的头脑投入到研发先进技术中。许多赌注会失败，但其他一些会获得回报，即便可能需要花上几十年时间（在先进半导体上很可能就是如此）。

这就指向了华为问题另一个可能的影响：将中国与美国连接起来的复杂供应链的缓慢解体必然会加速。例如，特朗普在5月份发布了一项行政令，限制了一些外国电信网络设备的销售。这是更广泛的政策审查的一部分，最终可能会要求未来在美国销售的通信技术都在本国生产。

将高效的供应链（尤其是电子行业）拆解而代之以更昂贵的替代品，其中增加的成本将无可避免地由消费者承担。他们要支付更高的价格，一些创新成果也被浪费掉了。而企业和股东也要付出代价，他们赚取的利润少了，对未来的投资能力也下降。此外可能还有宏观经济成本。经合组织认为，超高效全球价值链的崛起使生产者物价指数和实际工资增长得到抑制，令发达经济体的生产率水平每年提高近0.6%。

还有另一个影响涉及5G网络的推行。这项技术是打造物联网、智能工厂和数字供应链的必备元素。华为事件的发酵可能导致全球市场分化为两个互不相容的5G阵营（见地图）。欧亚集团的保罗·特廖洛（Paul Triolo）认为，它将“迫使各国及企业在科技冷战中选边站——美国，还是中国？”

如果出现这种情况，瑞典的爱立信、芬兰的诺基亚和韩国的三星将提供一个更昂贵的5G网络，由在中国以外的地区制造的设备构建，服务美国的盟友客户。例如，与美国情报机构关系密切的澳大利亚政府去年下令禁用中国的5G设备。而华为将为那些不那么担心中国的国家打造一个成本更低廉的网络。马来西亚总理马哈蒂尔5月宣布，马来西亚计划“尽可能多”地使用华为，即使“可能会引入一些间谍活动”。

至于网络安全威胁，它们已经从遥远的危险变成了内部敌人。2017年，马士基乌克兰办事处的一个源于俄罗斯的恶意软件NotPetya导致该公司在许多港口的运输业务关停，损失高达三亿美元。科罗拉多州立大学的扎克·

罗格斯（Zac Rogers）和亚利桑那州立大学的托马斯·崔（Thomas Choi）的研究表明，2017年美国上市公司报称遭到的网络攻击中，有超过60%是通过供应商或承包商的计算机系统发起的，2010年时这一比例不到四分之一。

麻省理工学院斯隆商学院的斯图尔特·马德尼克（Stuart Madnick）认为，5G网络的推出和物联网的到来可能会制造下一次巨大的网络危机，因为企业都在催促供应商加速，以求尽快将新奇产品推向市场，而没有首先将适当的网络安全防范纳入产品的设计中。“最糟糕的情况还未到来。”他警告说。

今天企业老板们面临的最大问题是应该如何在一个经济保护主义的年代反思它们的供应链。传统的办法是投资于“韧性”——让自己的供应商变得更多元、开设额外的制造工厂、保持更大的库存，等等。然而在实践中，老板们需要认真权衡复杂的对冲策略的成本与其承诺的利益。伟创力的汤姆·林顿（Tom Linton）拒绝韧性的概念而偏好速度，他认为韧性不过是“昂贵的冗余”的委婉说法。“如果我想要韧性，我可以开着坦克去上班，但那得花多久呢。”

这是一种极端的看法。另一些人提出采用细致化的策略，这就要求老板卷起袖子，边干边学。科尔尼管理咨询公司（A.T. Kearney）的劳伦特·谢弗勒（Laurent Chevreux）及其同事认为，企业必须准备好快速转向，确保供应链的现代化不仅仅是把旧的那套思维做一番数字化而降低适应性。波士顿咨询集团的贾斯汀·罗斯（Justin Rose）和马丁·里夫斯（Martin Reeves）鼓励企业采用先进的制造技术，尤其是灵活的机器人和自动化手段，这样它们就能把供应链收回离本部更近的地点，从而可能让它们变得更加安全。

总之，带来了跨国公司黄金时代巨大趋同如今正在瓦解。这将迫使公司对过去采取的投资决策做出尖锐的追问，并可能抛弃它们在过去几十年中开发的部分全球供应链。这种反思必须被坐在高管办公室里的人当做紧急战略任务，而不是被扔给小隔间里的会计员。

为供应链创造韧性的传统方法假设所面临的威胁是某种自然灾害，会让部分产能陷入瘫痪。据此，企业罗列出了潜在的供应风险、推演了灾难场景，并投资于通常涉及重复产能的“业务连续性”解决方案。

但是，这种思维模式不足以应对贸易战。今天征收的关税可能在下个月撤销，但工厂却不能同样快速地改变运作。眼下的任务是重新设计供应链，让它们能更快地对地缘政治做出响应。这将要求许多公司加快库存周期。它们也必须从对高效率的全球供应商的默认偏好（基于对世界保持低关税贸易的假设）转向更本地化（可能也更昂贵）的采购，这可能会在关税战期间提供缓冲。但过度集中也会带来风险，因此主管们必须明智地开展投资。

企业还须采取措施防范正在上升的网络风险。美国网络安全公司Proofpoint的赖恩·卡伦贝尔（Ryan Kalembert）指出，5G网络会加剧风险，因为其中涉及的许多供应商都有交付有漏洞代码的“案底”。马德尼克建议大公司对供应链合作伙伴、供应商及收购目标展开安全审计以找出网络漏洞。

许多公司将面临的难题包括如何处理遗留的制造资产，以及在过去的时代开发的不透明供应商网络。其他人可能会采取观望态度，寄希望于目前的风暴终会过去，昔日的全球化盛景将重现。那些最具活力的公司将找到创造性的方法，开辟出一条穿越眼前高难度地形的道路，取得竞争优势。

毕竟，正如本专题报道已阐明的那样，供应链已不再仅仅是成本中心。最优秀的企业已经在挥舞这一威力强大的武器——更短、更快也更智能的供应链。接下来的挑战是把它们变得更安全。赤手空拳地闯入这个战场会是愚蠢的。 ■ ■



The trade war and America's economy

Under attack

How is the trade war affecting corporate investment?

"THERE'S TARIFFS on games and tariffs on toys—try explaining tariffs to your little boy. Santa's workshop is struggling, you'll find yourself saying. I think the reindeer are backed up with their sleighing." Wendy Lazar, who runs a company called I Heart Guts, submitted this peeved poem to the United States Trade Representative (USTR) in June. As an importer of children's toys from China, she was complaining about how the trade war could squeeze her firm.

She is not alone. In boardrooms across America, business people are scrambling to assess the impact of the latest escalation in the commercial confrontation between the two superpowers. For most firms the easy bit is calculating the immediate financial impact of more tariffs on demand, prices and costs. That can be done in a spreadsheet. Far harder is working out how to rejig your strategy and long-term investment plans to adapt to a new world of enduring trade tensions. Fund managers and Wall Street traders have begun to reach their own conclusion—that investment may slump, possibly triggering a recession. Hence the violent moves in markets since the first week of August, with a rush towards safe bonds and a sell-off in equities.

That sell-off picked up pace on August 1st when President Donald Trump's administration announced the imposition of tariffs on \$300bn of Chinese goods, at a rate of 10%, starting on September 1st. On August 13th the USTR announced a delay covering about two-thirds of the goods in question, including mobile phones, smartwatches and toys, which would be subject to duties starting on December 15th. As Mr Trump explained later that day,

the move would allow American shoppers to splurge in the run-up to Christmas. The press release announcing the delay arrived at 9.43am; between 9.40 and 9.45 shares in Apple rose by 3%, and the S&P 500 share index jumped by 1%. But by the following day the stockmarket—and the iPhone-maker's share price—slumped again as investors fretted that a global downturn might soon be on the cards.

America's expansion may be cooling as it enters its second decade, but GDP still grew at a respectable pace of 2.1% in the second quarter of 2019, and the unemployment rate is a brag-worthy 3.7%. The direct effect of the tariffs should be small: in 2017, before hostilities began, goods trade with China amounted to just 3.2% of GDP. Even including the additional levies planned for December, they represent a tax rise offsetting only a fifth of the cuts introduced by the Tax Cuts and Jobs Act of 2017.

What really matters, though, is the wider effects of the uncertainty created by the trade war on corporate behaviour. Most companies make plans over a five- to ten-year horizon and invest in assets with a life of 10-20 years. But with each new tariff announcement, the rules for trading their products become less stable. And the scope of the trade war has expanded beyond goods to technology and currencies. Perhaps the international banking system, shipping companies or foreign joint ventures could be next. The most sophisticated firms try to gauge such risks.

The high level of uncertainty is measurable. A study from 2016 by Scott Baker of Northwestern University, Nick Bloom of Stanford University and Steven Davis of the University of Chicago quantified policy uncertainty in America using newspaper reports. Their index of trade-policy uncertainty has soared in recent months (see chart). And such increases in uncertainty tend to have real effects. The researchers found that increases in their index were associated with dampened investment and slower hiring. More recently, Ryan Sweet of Moody's Analytics, a financial firm, finds that

changes in business confidence and economic-policy uncertainty appear to predict changes in managers' capital spending.

Given all this, how is investment in America holding up? In the second quarter non-residential business investment shrank at an annualised rate of 0.6%. The question is to what extent the trade war is the culprit, rather than industry-specific factors, domestic economic trends or the global manufacturing cycle. To get a sense of this *The Economist* has analysed around 2,400 listed American companies in 42 sectors, taking into account both their investment levels and how dependent their sector is on Chinese inputs.

Firms with a higher degree of Sino-reliance do seem to have scaled back investment. The 20 sectors most exposed to inputs from China accounted for a third of total investment by the 2,400 firms. In total these sectors saw aggregate capital spending drop by 1% in the past four quarters compared with the prior year. Meanwhile the other 22 sectors, which are less exposed to China, saw investment rise by 14%. The analysis is simple: other factors may well have played a role.

But business executives too report an effect on investment. A survey compiled by the Federal Reserve Bank of Atlanta in January found that trade tensions had crimped investment by 1.2%. Tariffs were mentioned in a quarter of all earnings calls among companies in the S&P 500 index in the second quarter of 2019, according to figures from FactSet, a data-analytics firm. One of the sectors most exposed to China is chemicals. In July Jim Fitterling, chief executive of Dow, a big producer, told investors on an earnings call that he would keep capital spending "tight" until he got "better visibility", adding that he thought a trade deal was needed to "get some confidence back in this market".

Wall Street economists are also crunching data on how trade-policy uncertainty is altering companies' behaviour. In June researchers at Goldman Sachs had been sceptical that the trade war was hampering investment, pointing out that overall policy uncertainty was low. But more recently they have altered their view, finding that, after adjusting for underlying trends, sectors that sell more to China (rather than those that buy from it) were seeing slower investment growth than those that were less exposed.

Goldman's economists also found that tariff announcements were associated with worsening financial conditions (higher borrowing costs, lower equity prices or a stronger dollar). Expectations of interest-rate cuts by the Federal Reserve have only offset half of the shift in financial conditions. Overall the analysts reckon that, including indirect effects, the hit to GDP would be 0.6%—material, but not enough to tip America into recession.

The overall picture, therefore, is that there is now good evidence that the trade war is leading some firms to crimp investment. Pessimists worry that the knock-on effect from this capital-spending stumble could be far-reaching and more painful than the likes of Goldman expect. In the long run it could sap productivity. In the short run it could cause firms to scale back hiring. That could then damage consumers' confidence.

Much depends on whether hostilities between America and China intensify. On August 13th Mr Trump said that he had a “very, very productive call” with China’s leaders. But few on the ground take seriously the prospect of a lasting reconciliation. Jake Parker of the US-China Business Council, a lobby group, reports that his members have realised that the threat of future levies would still lurk even if a deal were struck and tariffs lifted. Blows to China’s economy could also spill back to America.

And Mr Trump has plenty more ways of injecting fear into the economy. He must decide whether to reinstate onerous restrictions on American companies that do business with Huawei, a Chinese telecommunications giant, by August 19th. His labelling of China as a currency manipulator could ignite a currency war. If the sickness that is now visible in most trade-exposed sectors spills over to the rest of the economy, that would set off a downward spiral that not even lifting tariffs, and allowing in Ms Lazar's stuffed toys, would reverse. ■



贸易战与美国经济

受到攻击

贸易战如何影响企业投资？

“游戏机加税，玩具也加税——试试对你儿子解释关税。圣诞老人的作坊揭不开锅，最后你听到自己这么说。我想系着雪橇的麋鹿们排起了长队没事做。”I Heart Guts公司的老板温迪·拉扎尔（Wendy Lazar）气鼓鼓地写下了这首打油诗，在6月寄给了美国贸易代表办公室（以下简称USTR）。这位中国玩具进口商是在埋怨贸易战挤压了自己公司的生存空间。

不止她一人这么想。美国各地的公司董事会里，商务人士都在忙着评估近期中美两个超级大国间的贸易冲突升级带来的冲击。对于大多数公司来说，评估加征关税对需求、价格和成本的直接财务影响比较简单，用电子表格就能算出来。而调整战略和长期投资计划以适应一个贸易纷争长久持续的新局面则要难得多。基金经理和华尔街的交易员们开始得出自己的结论：投资也许会下滑，可能引发经济衰退。所以，自8月第一周以来市场波动激烈，投资者争相抛售股票，转投更安全的债券。

8月1日，特朗普政府宣布将从9月1日起对价值3000亿美元的中国商品加征10%的关税，此举更是令投资者加速抛售股票。13日，USTR宣布推迟对其中约三分之二的货物加征关税，包括手机、智能手表和玩具，这些货物的新关税将于12月15日开始执行。特朗普在当天稍后解释说，这一调整将能让美国人在圣诞节前尽情购物。推迟关税的新闻稿于上午9点43分发布，9点40分至9点45分间苹果公司的股价上涨了3%，标普500指数上升了1%。但到次日美股和苹果的股价已再次下跌，因为投资者担心全球经济可能很快会陷入衰退。

在美国经济扩张进入第二个十年之际，增长势头可能正在降温，但在2019年第二季度美国GDP仍保持了2.1%的可观增速，失业率达到了不起的3.7%。关税的直接影响应该不大：在贸易战开打之前的2017年，对华商品

贸易仅占美国GDP的3.2%。即使加上计划在12月加征的关税，带来的税收增长也只能抵消2017年的《减税和就业法案》（Tax Cuts and Jobs Act）减税额的五分之一。

不过，真正重要的是贸易战带来的不确定性对企业行为的更广泛影响。大多数公司通常会按五到十年的期限来制定规划，投资资产的周期一般是10到20年。但随着一次次宣布加征关税，产品的贸易规则变得不那么稳定。而且贸易战的范围已经超出商品，波及科技和货币。接下来受影响的可能是国际银行系统、航运公司或外国合资企业。最精明老练的公司会尽力计算这些风险。

这种高度不确定性是可以衡量的。2016年，美国西北大学的斯科特·贝克（Scott Baker）、斯坦福大学的尼克·布鲁姆（Nick Bloom）和芝加哥大学的史蒂文·戴维斯（Steven Davis）基于新闻报道来量化美国的政策不确定性。他们编制的“贸易政策不确定性指数”近几个月呈飙升之势（见图表）。而这样不确定性大幅上升的情况往往会产生实际影响。三位研究员发现，指数的上升与投资减少和招聘放缓相关。之后，金融公司穆迪分析（Moody's Analytics）的瑞恩·斯威特（Ryan Sweet）发现，商业信心的变化和经济政策的不确定性似乎可以预测管理者在资本支出上的变化。

既如此，美国目前的投资状况如何？第二季度，非居民商业投资按年化计算萎缩了0.6%。问题是这在多大程度上应归咎于贸易战，而非缘于行业因素、国内经济趋势或全球制造周期。为了解这一点，本刊对42个行业的约2400家美国上市公司做了分析，综合考虑了其投资水平及所在行业对中国进口的依赖程度。

对中国依赖程度较高的企业看起来确实缩减了投资规模。受中国进口影响最大的20个行业的投资占这2400家公司投资总量的三分之一。这些行业过去四个季度的总资本支出同比减少了1%。与此同时，对中国依赖程度较低的其余22个行业的投资增长了14%。分析结论很简单：其他因素很可能发挥了作用。

但企业高管也反映贸易战影响了投资。亚特兰大联储1月的调查发现，贸易紧张局势导致投资缩减了1.2%。据数据分析公司FactSet统计，2019年第二季度，标普500指数公司的所有财报电话会议中，有四分之一提到了关税问题。化学品是受中国影响最大的行业之一。7月，大型化学品公司陶氏化学的首席执行官吉姆·费特林（Jim Fitterling）在一次财报电话会议上向投资者表示将保持资本支出“紧缩”，直至前景“更明朗”，并认为中美需订立新的贸易协议，让“市场重拾一些信心”。

华尔街的经济学家也在研究数据，试图了解贸易政策的不确定性如何改变公司行为。6月，高盛的研究人员曾一度怀疑贸易战阻碍投资的说法，指出整体的政策不确定性较低。但近来他们改变了看法，发现除去固有趋势的因素，对华销售比重较大的行业（而非那些较多从中国进口的行业）的投资增长速度比不那么依赖中国市场的行业要低。

高盛的经济学家还发现，宣布加征关税的消息与金融状况的恶化（借贷成本上升、股价下跌或美元走强）相关联。对美联储降息的预期只抵消了金融状况恶化趋势的一半。总体而言，分析师认为，包括间接影响在内，贸易战对GDP的打击会达到0.6%，影响重大，但不足以令美国陷入衰退。

因此，整体而言，目前已经有可靠的证据表明贸易战正导致一些公司缩减投资。悲观主义者担心，这一资本支出下滑带来的连锁效应可能比高盛等公司预期的更深远、更痛苦。从长远来看，它可能会打击生产率。短期来看，它可能令公司减少招聘，继而损害消费者信心。

一切何去何从，很大程度上取决于中美矛盾是否加剧。13日，特朗普表示与中国领导人进行了“非常、非常富有成效的通话”。但没多少人看好双方能持久和解。游说团体美中贸易全国委员会（US-China Business Council）的杰克·帕克（Jake Parker）表示，其成员已意识到，即使此刻达成协议取消关税，未来再次征税的威胁仍挥之不去。对中国经济的打击也可能影响到美国自身。

要给美国经济注入恐慌，特朗普还有很多招式可用。他必须在8月19日前

决定是否恢复对那些与中国电信巨头华为有业务往来的美国公司的繁重限制。他把中国列为汇率操纵国可能引发货币战。如果最依赖贸易的那些行业目前出现的问题蔓延到其他经济部门，局势将每况愈下。到时，即便取消加征关税，让拉扎尔顺利进口毛绒玩具，局面也无法逆转。 ■



Killer insects

The itch of fate

Mosquitoes have shaped societies as well as decimating them, says Timothy Winegard

DURING THE second world war, American troops in the Far East were said to have two foes. The first was Japanese. One propaganda poster depicted an enemy's sabre, slick with blood. The second adversary had no sword but was terrifying all the same. Malaria-carrying mosquitoes infected around 60% of Americans stationed in the Pacific at least once. Drugs such as Atabrine could help, but nasty side-effects meant that some GIs shunned their daily dose—with predictable consequences. “These Men Didn’t Take Their Atabrine” warned a sign propped below a pair of human skulls in Papua New Guinea.

At least decent treatment was available. For most of human existence, says Timothy Winegard in his lively history of mosquitoes, “we did not stand a chance” against the insect and its diseases. That was partly because of ignorance. Earlier humans blamed malaria and its mosquito-borne cousins on “bad air” from swamps, even as the years passed and death kept whining at their ears. Malaria once killed over 20% of people in the Fens of eastern England. Yellow fever ravaged Memphis, Tennessee, deep into the 1800s. No wonder Mr Winegard calls the mosquito a “destroyer of worlds”, which may have dispatched around half of all humans ever born.

But his book is more than a litany of victims. Mr Winegard convincingly argues that the insect has shaped human life as well as delivering death. Mosquitoes helped save the Romans from Hannibal and Europe from the Mongols. And if malaria has changed history, so has resistance to it. Europeans believed that the relative immunity enjoyed by some Africans made them ideal slaves in the New World. Later, the tables were turned.

“They will fight well at first, but soon they will fall sick and die like flies,” predicted Toussaint Louverture of the Frenchmen sent to end his slave revolution in Haiti. He was right. About 85% of the 65,000 soldiers deployed to the colony died of mosquito-borne illnesses, and Haiti won its independence.

These dashes across time and distance could become exhausting, but Mr Winegard is an engaging guide, especially when he combines analysis with anecdote. One highlight relays a bizarre plot by a Confederate zealot to infect Abraham Lincoln with yellow fever; another passage explains the ancient Egyptian habit of fighting malarial fevers by bathing in urine. (A few of the witticisms fall flat. Calling the 18th-century Caribbean a “dinner-party buffet” for mosquitoes seems glib, for example; anthropomorphising the pests as a “guerrilla force” is a metaphor too far.)

But much of Mr Winegard’s narrative is thrilling—above all the concluding chapters in which he tackles the modern mosquito. Drugs and insecticides have helped slash malaria rates, but mosquitoes can quickly develop immunity themselves. In total, the insects still kill over 800,000 people every year. And though gene-editing might one day render them harmless, or even obliterate them altogether, mosquito-borne illnesses such as Zika have recently been spreading to new regions. The destroyer of worlds has not finished yet. ■



杀手昆虫

命运之痒

蒂莫西·怀恩加德说，蚊子夺去了很多人的性命，同时也塑造了人类社会【《蚊子》书评】

第二次世界大战期间，据说美军在远东地区有两个敌人。一个是日军，有一张宣传海报就画了一把染着鲜血的日本军刀。第二个敌人虽说没有刀，但同样令人恐惧。驻扎在太平洋地区的美军约有60%曾被携带疟疾的蚊子感染过至少一次。疟涤平这样的药物能起到作用，但副作用严重，所以一些美国大兵并没有每天按时按量服用——后果可想而知。当时在巴布亚新几内亚，一对人类头骨下面的一块标牌警告道：“这些人没有服用疟涤平”。

至少那个时候还可以获得像样的治疗。蒂莫西·怀恩加德（Timothy Winegard）在他对蚊子历史的生动叙述中写道，纵观人类历史，在蚊子及其携带的疾病面前，大部分时间“我们都不堪一击”。部分原因是无知。经年累月，死亡的嗡鸣不绝于耳，而早期人类却一直将疟疾及蚊子传播的其他疾病归咎于沼泽地释放出的“瘴气”。疟疾曾在英格兰东部的沼泽地带夺走了超过20%的人的性命。19世纪后期，黄热病摧毁了田纳西州的孟菲斯市（Memphis）。古往今来所有的人口中，可能约有一半是因为蚊子而没了命，难怪怀恩加德称蚊子是“世界毁灭者”。

但他的书可不仅仅是对受害者的记录。怀恩加德令人信服地论证了蚊子除了带来死亡，还塑造了人类生活。蚊子救罗马人于汉尼拔的大军，也让欧洲摆脱了蒙古人的铁蹄。如果说疟疾改变了人类历史，那么人类对疟疾的免疫力也一样。欧洲人认为那些对疟疾产生了一定免疫力的非洲人非常适合在新大陆做奴隶。后来风水轮流转了。“一开始他们战斗力会很强，但很快就会生病，一个接一个地死去。”杜桑·卢维杜尔（Toussaint Louverture）对被派到海地镇压他领导的奴隶革命的法国人做了这样的预测。他说中了。被派到这个殖民地上的6.5万名士兵中约有85%死于蚊子传播的疾病。海地赢得了独立。

这般穿梭于时空中的讲述读起来可能累人，但怀恩加德是一个很能抓住人心的向导，特别是他能把轶事和分析熔于一炉。其中有一个精彩片段讲述了一个离奇的阴谋：一名南方联盟的狂热支持者曾企图让林肯染上黄热病；另一个段落解释了古埃及人用尿液沐浴来对抗疟疾发烧的习惯。（不过有些抖机灵的话效果不怎么样。例如，将18世纪的加勒比地区称为蚊子的“自助晚宴”有点油嘴滑舌，把蚊子比作“游击队”也有点过分了。）

但怀恩加德的叙述大部分都扣人心弦，尤其是最后关于现代的蚊子那几章。药物和杀虫剂已使疟疾的发病率大幅降低，但蚊子本身也可以迅速产生免疫力，每年仍然夺去80多万人的性命。虽然有一天基因编辑可能会让蚊子变得无害，甚至能彻底消灭它们，但像寨卡这样由蚊子传播的病毒近来已经蔓延到新的地区。世界的毁灭者气数未尽。 ■



The Economist film

How to defeat malaria?

Malaria has killed more people than all wars throughout human history, combined.



经济学人视频

如何战胜疟疾？

疟疾导致的死亡人数超过了人类历史上所有因战争死亡人数的总和。



The world economy

Markets in an Age of Anxiety

A dozen years ago, investors were complacent about the risk of recession. Not any more

LOOKING FOR meaning in financial markets is like looking for patterns in a violent sea. The information that emerges is the product of buying and selling by people, with all their contradictions. Prices reflect a mix of emotion, biases and cold-eyed calculation. Yet taken together markets express something about both the mood of investors and the temper of the times. The most commonly ascribed signal is complacency. Dangers are often ignored until too late. However, the dominant mood in markets today, as it has been for much of the past decade, is not complacency but anxiety. And it is deepening by the day.

It is most evident in the astounding appetite for the safest of assets: government bonds. In Germany, where figures this week showed that the economy is shrinking, interest rates are negative all the way from overnight deposits to 30-year bonds. Investors who buy and hold bonds to maturity will make a guaranteed cash loss. In Switzerland negative yields extend all the way to 50-year bonds. Even in indebted and crisis-prone Italy, a ten-year bond gets you only 1.5%. In America, meanwhile, the curve is inverted—interest rates on ten-year bonds are lower than on three-month bills—a peculiar situation that is a harbinger of recession. Angst is evident elsewhere, too. The safe-haven dollar is up against many other currencies. Gold is at a six-year high. Copper prices, a proxy for industrial health, are down sharply. Despite Iran's seizure of oil tankers in the Gulf, oil prices have sunk to \$60 a barrel.

Plenty of people fear that these strange signals portend a global recession. The storm clouds are certainly gathering. This week China said that

industrial production is growing at its most sluggish pace since 2002. America's decade-long expansion is the oldest on record so, whatever economists say, a downturn feels overdue. With interest rates already so low, the capacity to fight one is depleted. Investors fear that the world is turning into Japan, with a torpid economy that struggles to vanquish deflation, and is hence prone to going backwards.

Yet a recession is so far a fear, not a reality. The world economy is still growing, albeit at a less healthy pace than in 2018. Its resilience rests on consumers, not least in America. Jobs are plentiful; wages are picking up; credit is still easy; and cheaper oil means there is more money to spend. What is more, there has been little sign of the heady exuberance that normally precedes a slump. The boards of public companies and the shareholders they ostensibly serve have played it safe. Businesses in aggregate are net savers. Investors have favoured firms that generate cash without needing to splurge on fixed assets. You see this in the vastly contrasting fortunes of America's high-flying stockmarket, dominated by capital-light internet and services firms that throw off profits, and Europe's, groaning under banks and under carmakers with factories that eat up capital. And within Europe's stockmarkets a defensive stock, such as Nestlé, is trading at a towering premium to an industrial one such as Daimler.

If there has been no boom and the world economy has not yet turned to bust, why then are markets so anxious? The best answer is that firms and markets are struggling to get to grips with uncertainty. This, not tariffs, is the greatest harm from the trade war between America and China. The boundaries of the dispute have stretched from imports of some industrial metals to broader categories of finished goods (see Finance section). New fronts, including technology supply-chains and, this month, currencies, have opened up. As Japan and South Korea let their historical differences spill over into trade, it is unclear who or what might be drawn in next. Because big investments are hard to reverse, firms are disinclined to press

ahead with them. A proxy measure from JPMorgan Chase suggests that global capital spending is now falling. Evidence that investment is being curtailed is reflected in surveys of plunging business sentiment, in stalling manufacturing output worldwide and in the stuttering performance of industry-led economies, not least Germany.

Central banks are anxious, too, and easing policy as a result. In July the Federal Reserve lowered interest rates for the first time in a decade as insurance against a downturn. It is likely to follow that with more cuts. Central banks in Brazil, India, New Zealand, Peru, the Philippines and Thailand have all reduced their benchmark interest rates since the Fed acted. The European Central Bank is likely to resume its bond-buying programme.

Despite these efforts, anxiety could turn to alarm, and sluggish growth descend into recession. Three warning signals are worth watching. First, the dollar, which is a barometer of risk appetite. The more investors reach for the safety of the greenback, the more they see danger ahead. Second come the trade negotiations between America and China. This week President Donald Trump unexpectedly delayed the tariffs announced on August 1st on some imports, raising hopes of a deal. That ought to be in his interests, as a strong economy is critical to his prospects of re-election next year. But he may nevertheless be misjudging the odds of a downturn. Mr Trump may also find that China decides to drag its feet, in the hope of scuppering his chances of a second term and of getting a better deal (or one likelier to stick) with his Democratic successor.

The third thing to watch is corporate-bond yields in America. Financing costs remain remarkably low. But the spread—or extra yield—that investors require to hold riskier corporate debt has begun to widen. If growing anxiety were to cause spreads to blow out, highly geared firms would find it costlier to roll over their debt. That could lead them to cut back on payrolls as

well as investment in order to make their interest payments. The odds of a recession would then shorten.

When people look back, they will find plenty of inconsistencies in the configuration of today's asset prices. The extreme anxiety in bond markets may come to look like a form of recklessness: how could markets square the rise in populism with a fear of deflation, for instance? It is a strange thought that a sudden easing of today's anxiety might lead to violent price changes—a surge in bond yields; a sideways crash in which high-priced defensive stocks slump and beaten-up cyclicals rally. Eventually there might even be too much exuberance. But just now, who worries about that? ■



世界经济

焦虑时代的市场

十几年前投资者对衰退的风险满不在乎。如今不再如此

在金融市场上寻找信号就如同在惊涛骇浪的海洋中寻找规律。市场上浮现的信息是人们买进卖出的结果，而买卖行为本身充斥着种种矛盾。价格是情绪、偏见和冷静算计等因素的混合呈现。不过，综合来看，市场多少反映出了投资者的情绪和时代的脾性。最常见被归咎的因素是自满：人们往往忽视风险，直到为时已晚。然而，与过去十年里大部分时间一样，如今市场的主导情绪不是自满，而是焦虑。而且这种焦虑还在与日俱增。

它最明显的体现是人们对政府债券这种最安全资产的惊人胃口。在德国，上周数据显示经济正在萎缩，而从隔夜存款到30年期债券的利率全部为负。购买并持有债券至到期日的投资者必将蒙受现金损失。在瑞士，连50年期债券也未能幸免于负收益率。即使在负债累累、危机易发的意大利，10年期债券的收益率也只有1.5%。与此同时，美国债券市场的收益率曲线出现了倒挂——10年期债券的利率低于三个月债券的利率，这种奇怪情形是经济衰退的前兆。焦虑在其他地方也很明显。避险货币美元对许多其他货币走强。金价处于六年来新高。作为工业健康状况指标的铜价大幅下跌。尽管伊朗在海湾地区扣押油轮，但油价已跌至每桶60美元。

许多人担心，这些异常表现是全球经济衰退的预兆。毋庸置疑，风暴的阴云正在集聚。上周，中国宣布其工业生产增速降至2002年以来的新低。美国经济扩张已达10年，是有记录以来持续最长的一次，因此不管经济学家怎么说，经济衰退似乎早该到来了。利率如此之低，已经无力对抗衰退。投资者担心世界正变得像日本一样，经济疲软，难以克服通缩，因而很容易倒退。

然而，到目前为止，经济衰退还只是一种担忧，并未成为现实。世界经济仍在增长，尽管增速不及2018年。经济的恢复力取决于消费者，尤其在美

国。职位很充足，工资在上涨，信贷仍宽松，更低的油价意味着有更多钱可以支出。更重要的是，经济衰退之前通常都会出现的那种冲动的泡沫尚未显现。上市公司的董事会以及他们貌似为之服务的股东们一直谨慎行事。总体来看，企业是净储蓄者。投资者青睐那些无需在固定资产上投入巨资却能产生收入的公司。这一点从美国股市和欧洲股市的巨大反差中就能看出来。高涨的美国股市主要由一些轻资本、能盈利的互联网和服务公司主导，而欧洲股市则被银行以及耗费巨资运营工厂的汽车制造商压得喘不过气来。在欧洲的股市中，相比戴姆勒等工业股，像雀巢这样的防守型股票溢价很高。

如果并没有经历繁荣，世界经济也尚未走向萧条，那市场为何如此焦虑呢？最好的解释是，企业和市场都在努力应对不确定性。这正是中美贸易战带来的最大伤害——而非关税。贸易争端的范围从一些工业金属的进口扩大到了更广泛的制成品。包括科技供应链在内的新战线已经拉开，本月又新添了货币战场。随着日本和韩国将其历史分歧扩大到贸易领域，目前尚不清楚接下来还有哪些国家或哪些商品会卷入其中。虑及船大难掉头，企业不愿意加紧推进巨额投资。摩根大通的一个间接指标显示全球资本支出正在下降。投资减少在很多方面都得到了证实，比如调查显示商业信心骤降；全球制造业产出停滞；以德国为代表的工业主导型经济体表现不佳等。

各国央行也深感焦虑，并因此放松了货币政策。7月，美联储10年来首次降息，以防经济陷入低迷。接下来可能还会继续降息。自美联储行动以来，巴西、印度、新西兰、秘鲁、菲律宾和泰国的央行都下调了基准利率。欧洲央行很可能恢复其债券购买计划。

尽管做了这些努力，但焦虑还是可能转变为恐慌，缓慢增长可能会沦为衰退。三个预警信号值得关注。首先是作为风险偏好晴雨表的美元。投资者越是转向美元以求安全，就越多地嗅到前方的危险。其次是美中之间的贸易谈判。上周，美国总统特朗普出人意料地推迟了8月1日宣布的对部分进口商品征收的关税，这增加了达成协议的希望。此举应该符合他的利益，因为强劲的经济对他明年能否连任至关重要。不过，他可能误判了经济衰

退的可能性。特朗普可能还会发现中国决意拖延时间，希望借此让他连任的机会泡汤，并与接替他的民主党总统达成更好的（或更可能陷入胶着的）协议。

第三个关注点是美国的公司债券收益率。融资成本目前仍非常低。但投资者持有高风险公司债券所要求的利差（即额外收益率）已经开始扩大。如果日益增长的焦虑导致利差过高，高负债的公司会发现债务展期的成本更高。这可能导致他们为支付利息不仅要缩减投资，还要削减工资。这样经济衰退就可能发生。

当人们回头看的时候，会发现如今资产价格的配置有很多矛盾之处。债券市场的极度焦虑可能会开始显得像一种无厘头般的胡来：比如，市场如何能在民粹主义的抬头与对通缩的担忧间取得协调一致？这就引发了一个奇异的想法：如果目前的焦虑突然得以缓解，可能会导致剧烈的价格变动，比如债券收益率飙升，再比如股市的横盘被打破，高价位的防守型股票暴跌，而遭到打压的周期性股票价格回升。最终甚至可能还会出现过度繁荣。但是，眼下谁又会担心这个呢？ ■



Free exchange

Into the woods

The world's monetary system is breaking down. What comes next is unclear

"THERE IS NO longer any need for the United States to compete with one hand tied behind her back," Richard Nixon, then America's president, told his countrymen in August 1971. With that speech, he heralded the end of the post-war economic order, suspending the convertibility of the dollar into gold and putting up tariffs on imports. The survival of today's order, which emerged from the chaos that followed, now also looks in doubt. In other circumstances, its demise might not have been mourned. But with each passing August day, the prospects for a happy shift from one global monetary regime to another look ever grimmer.

International trade is complicated by the fact that most countries have their own currencies, which move in idiosyncratic ways and can be held down to boost competitiveness. Governments' efforts to manage currencies are constrained by certain trade-offs. Pegging them to an external anchor to stabilise their value means either ceding control of domestic economic policy or restricting access to foreign capital flows. Systems of monetary order, which resolve these trade-offs in one way as opposed to another, work until they do not. The context for America's economic showdown with China is a system that worked once but no longer does.

Such things happen. The first great age of globalisation, which began in the late 19th century, was built atop the gold standard. Governments fixed the value of their currencies to gold, sacrificing some control over the domestic economy. This trade-off became untenable during the Great Depression, when governments reneged on their monetary commitments. As one after another devalued, angry trading partners put up tariffs, and the world

retreated into rival currency blocs. In 1944 Allied nations had another go at crafting a monetary order at a conference in Bretton Woods, New Hampshire. Participating countries fixed their currencies to the dollar (with some room for adjustment). The buck, in turn, was pegged to gold. The truce survived a mere quarter-century. As America's trade balance sagged and inflation rose in the 1960s and 1970s, faith in the dollar's peg to gold waned. Drastic fiscal and monetary belt-tightening might have restored its credibility abroad, but at great cost at home. Forced to choose between the domestic interest and the survival of the global monetary system, Nixon abandoned America's Bretton Woods commitments.

The present system, often described as Bretton Woods II, slowly emerged from the ashes of the post-war order. The dollar's dominance did not end. Much of the world's commerce trades in greenbacks. Changes in America's economic policy still echo around the world. A stronger dollar depresses global trade, research suggests, while tighter American monetary policy straitens global financial conditions. Through bitter experience, emerging economies learnt that protecting themselves against these gales meant accumulating large dollar reserves, which began to pile up in the 1990s and peaked in 2014. Emerging-market dollar purchases kept the greenback overvalued and boosted the competitiveness of emerging-market exporters. America began running large, persistent current-account deficits. In other words, its excessive consumption was funded by lending from the emerging world, which invested its dollars into American assets. This flow of money—from reserve-accumulating economies, China chief among them, to America, and from American consumers back to reserve-accumulating economies—defined Bretton Woods II.

The regime never looked particularly sustainable. America could not borrow from abroad for ever, and persistent current-account deficits ate away at its export industries. In the 2000s some economists worried that investors might lose faith in the greenback, precipitating a collapse in the dollar and

a global crisis. Fewer observers predicted that America might tire of its role in the system, or that damage done to American communities by deindustrialisation might make politicians across the spectrum sceptical of the gains from globalisation.

For a time, though, a benign end to Bretton Woods II seemed possible. As Europe's economies became more integrated and China grew, the prospect of a multipolar world, in which the dollar shared reserve-currency duties with the euro and the renminbi, loomed. European and Chinese consumers would play as important a role as American ones—and global imbalances would shrink. Alas, history has had other ideas. Amid the turmoil of the past decade, investors have clung to the safety of dollar assets, reinforcing America's monetary hegemony. Debt crises have undercut faith in the euro. Confidence in the renminbi's inevitable rise has been dimmed by China's slowing growth, and its diminished enthusiasm for reform. Meanwhile, the present system looks more vulnerable than ever. President Donald Trump's spiralling trade and currency wars threaten to topple Bretton Woods II, even as attractive alternatives to the system fade.

A minimally disruptive end to Bretton Woods II remains within the realms of possibility. Its fate might resemble that of Bretton Woods I, especially if Mr Trump loses office in 2020. Democrats are more economically nationalistic than they used to be, but still mindful of the value of global co-operation. President Bernie Sanders or Elizabeth Warren might seek a one-off depreciation of the dollar while recommitting America to a rules-based system of global trade. A recession in China could scare its leadership into offering concessions on trade that America would accept.

But the experience of the 1930s may prove a more apt guide. In the absence of a co-ordinated adjustment to exchange rates and a peaceful end to trade hostilities, the world could stumble into a cycle of competitive devaluations and tariff rises. As trading relationships unravel, countries may organise

themselves into rival economic blocs. It is hard to imagine the world repeating such an ugly era of history. But not as hard as it used to be. ■



自由交流

深入布雷顿森林

全球货币体系正在瓦解，前景不明

一九七一年八月，时任美国总统的尼克松在演讲中向他的同胞宣布：“美国再也不需要绑着一只手和别人竞争了。”他的这一讲话宣告了二战后世界经济秩序的终结——他宣布停止美元黄金兑换，并对进口产品加征关税。如今的世界经济秩序生于那之后的混乱之中，如今能否持续下去看起来存疑。换在其他情况下，可能不会有人哀悼它的终结。但是，这个8月每过一天，从一个全球货币体系向另一个体系愉快过渡的前景似乎就更严峻了一分。

大多数国家都有自己的货币，变动走势各不相同，可以人为让货币贬值以提高本国竞争力，因此国际贸易非常复杂。政府管理货币时要权衡各种利害得失。把货币与外部的锚挂钩以稳定其价值意味着要么放弃对本国经济政策的控制，要么限制外国资本流入。货币秩序体系会用非此即彼的方式来解决这些需要权衡的问题，直至体系失效。美国与中国经济对峙的背后就是一个曾经有效但如今已不再管用的体系。

这样的事情时有发生。全球化的第一个大时代始于19世纪后期，建立在金本位之上。政府把本国货币锚定黄金，牺牲了对国内经济的部分掌控。在大萧条期间，当政府背弃其货币承诺时，这种取舍就无法再维持了。随着一国又一国贬值本国货币，愤怒的贸易伙伴纷纷提高关税，世界又重新分裂为互相竞争的货币集团。1944年，同盟国在新罕布什尔州的布雷顿森林举行会议，再次尝试打造货币秩序。与会国将其货币与美元挂钩（留有一定的调整空间），美元则与黄金挂钩。风平浪静的日子仅持续了四分之一一个世纪。上世纪六七十年代，随着美国贸易失衡，通胀上升，对美元与黄金挂钩的信心逐渐减弱。激进的财政和货币紧缩政策可能在国外挽回了公信力，但国内却承担了巨大的代价。尼克松被迫在国内利益和维系全球货币体系之间做出选择。他选择了放弃美国的布雷顿森林承诺。

现行体系常被称作布雷顿森林体系2.0，是从战后秩序的灰烬中慢慢建立起来的。美元的主导地位仍未终结。全球大部分贸易都以美元结算。美国经济政策的变化仍然影响世界各地。研究表明，美元走强会抑制全球贸易，而美国收紧货币政策会令全球金融收紧。有了痛苦的经历，新兴经济体明白了要保护自己免受金融风暴的影响，就要积累大量美元储备。它们在上世纪90年代开始累积储备，到2014年达到了顶峰。新兴市场购进美元使美元被持续高估，并提高了本国的出口竞争力。美国开始出现持续的巨额经常账户赤字。换句话说，美国的过度消费是从新兴市场借钱支撑的，后者用美元投资美国资产。资金从以中国为主的一批累积储备的经济体流向美国，再从美国消费者的口袋流回这些经济体，这样的货币流动就是布雷顿森林体系2.0的根本。

这一体系从来都显得可持续性不佳。美国无法永远从国外借钱过日子，持续的经常账户赤字侵蚀了美国的出口行业。本世纪头十年，一些经济学家担心投资者可能会对美元失去信心，导致美元崩溃和全球危机。少数观察家预测美国可能会厌倦自己在该体系中扮演的角色，或者去工业化对美国社会的损害可能会让所有政治派别的政客都怀疑全球化的益处。

但是，布雷顿森林体系2.0一度看似可能“善终”。随着欧洲经济日益一体化和中国经济不断增长，一个美元与欧元和人民币共同承担储备货币责任的多极世界在靠近。欧洲和中国的消费者将扮演与美国消费者同样重要的角色，全球失衡将减轻。可惜，历史有它自己的轨迹。在过去动荡的十年中，投资者坚持紧握安全的美元资产，强化了美国的货币霸权地位。债务危机削弱了人们对欧元的信心。中国经济增长放缓及改革热情降温导致人们对人民币必然崛起的信心减弱。同时，目前的体系看似前所未有地脆弱。特朗普不断加剧贸易战和货币战，有可能会摧毁布雷顿森林体系2.0，而同时原本具吸引力的替代体系又渐行渐远。

布雷顿森林体系2.0仍有可能以破坏性最小的方式终结。它可能会有和布雷顿森林体系1.0相似的命运，尤其是如果特朗普在2020年落选的话。民主党的经济民族主义倾向强于以往，但仍然重视全球合作的价值。如果伯尼·桑德斯（Bernie Sanders）或伊丽莎白·沃伦（Elizabeth Warren）当选

总统，可能会寻求美元一次性贬值，同时让美国重回以规则为基础的全球贸易体系。中国的经济衰退可能会让其领导层惶惶不安，从而在贸易方面做出美国能接受的让步。

但是，上世纪30年代的历史可能更具参照意义。没有对汇率的协同调整，贸易战无法得到和平解决，世界可能会陷入竞争性贬值和关税上升的循环。随着贸易关系瓦解，各国可能结成相互竞争的经济集团。很难想象世界会重演那段丑陋的历史，但也已经不像从前那么难以想象。 ■



Free exchange

Close calls

Emerging-market dreams of rich-world incomes meet reality

FOR A RICH economy, a growth rate beginning with a five would be cause for ecstasy. For India, it is a huge disappointment. Its most recent quarterly growth figure translates into an annualised rate of only 5.8%, the fourth consecutive quarterly slowdown. That is slower than China (a 6.2% annualised rate in the second quarter of 2019, down from 6.4% in the first) and substantially slower than India believes itself capable of. Recent data suggest the swoon has since deepened (and an analysis published in June by a former adviser to the Indian government also suggests that the China-like growth rates posted in the recent past may reflect dodgy statistics). India is hardly doomed; if it might reasonably have expected to do better, experience elsewhere shows it could very easily have done worse. But the slowdown is yet another sign that the emerging-market narratives to which the world has grown accustomed are in need of serious revision.

During most of the 20th century advanced economies outgrew poorer ones. But around the turn of the millennium a dramatic shift occurred. In terms of real GDP per person, adjusted for purchasing-power parity, just 24% of the countries now classified as emerging markets by the IMF grew faster than America did across the 1980s as a whole. In the decade starting in 2000, by contrast, 76% did so. Then the BRICs—Brazil, Russia, India and China—were in their pomp. Poverty rates tumbled across developing countries and the world economic order was rewritten.

Convergence continues: over the past ten years about 60% of emerging economies have grown faster than America. But the geographic scope of catch-up growth is narrowing. Real output per person as a share of that in

America has fallen since 2011 in the Middle East and north Africa, since 2013 in Latin America, and since 2014 in sub-Saharan Africa. Estimates suggest decline this year in the emerging economies of Europe, leaving Asia as a last outpost of convergence—admittedly a big and important one. A wobble in India thus represents more than a blow to Indian pride.

There are two competing explanations for the slowing of convergence. One is that the good times were never going to last. Development is hard, which is why so few poor countries became rich during the 20th century. But around 2000 an unlikely combination of tailwinds temporarily suspended this age-old truism. The emerging world found itself swept along by the most astonishing experience of economic development in history: four decades of near-double-digit annual growth in the world's most populous country. Simultaneously, the world enjoyed an unprecedented expansion in global trade, boosted by technological changes that enabled firms to forge supply chains across dozens of national borders. And governments in the emerging world learned from past crises how best to manage foreign capital. That meant they were well placed when investors sought out better returns than the paltry ones on offer across the rich world.

But China could perform its miraculous rise only once. Supply chains are as disaggregated as they are likely to get. And it was only a matter of time before rich economies perked up and the post-crisis period of extraordinarily easy monetary conditions came to an end. Convergence is ending, yes, but in this story there is little for countries like India to do as growth rates fall, other than wish they had made more of the moment while it lasted.

The second theory offers the possibility that emerging markets still have room to grow. Poor countries catch up with rich ones when productivity rates and the amount of capital per worker rise towards levels in the rich world. Increasing productivity is partly about moving workers from sectors

where it is low to those where it is high (from subsistence farming to textile manufacturing, say), and partly about achieving steady growth in productivity within sectors. The second of these—sustained productivity growth—is the difference between a short-lived bout of catch-up that peters out and sustained progress towards high incomes.

During the growth spurt of the past two decades, many countries saw their stock of capital increase. Quite a few experienced periods of urbanisation and economic reform that helped pull workers into factory and office employment, at higher productivity levels. And in some economies the groundwork for sustained growth was also laid during the boom. The dense supply chains that grew up around China served as conduits for technological know-how, transmitting the elements of sustained innovation to underdeveloped economies. For India, exports of commercial services played something of the same role. India is the world's biggest exporter of information-technology services bar Ireland, where the figures are skewed by the tax-avoiding accounting antics of American tech firms.

If convergence is not dead, slowing rates of growth are nonetheless cause for concern. Governments may have become complacent, abandoning needed reforms and skimping on investments in productivity-enhancing things like education. India would like to overtake China, but its literacy rate, at about 70%, is lower than China managed 30 years ago. Worse, the decades-long march towards greater global openness may be ending. Amid rising economic belligerence, in particular from America, rich-world companies will naturally think twice before investing abroad. A serious breakdown in global trade, were it to occur, could harm emerging markets' prospects for a decade or more. Such delay would be made even more devastatingly costly by climate change, which poorer countries will find harder to manage than rich ones.

Still, there is hope. The obstacles that have sprung up in the way of

development might yet be cleared. President Donald Trump could be gone in 18 months. Governments unsettled by visions of economic mortality could discover a renewed zeal for reform, investment and liberalisation. But whichever theory is right, emerging-market dominance has been exposed as anything but inevitable. To put the developing world's billions back on the path to rich-world incomes will take heroic efforts by governments, firms and workers around the world—and a hefty dose of luck. ■



自由交流

胜负一线间

新兴市场追求富裕国家收入水平的梦想遭遇现实

对富裕经济体而言，五点几的经济增长率足以让人狂喜。对印度来说，这却是个让人大失所望的数字。印度上一季度的增长率按年化计算仅为5.8%，已经是连续第四个季度增长放缓。这一增长率低于中国（2019年中国第二季度的年化经济增长率为6.2%，低于第一季度的6.4%），也大大低于印度自认为能够实现的增速。最近的数据显示经济低迷业已加深。一名印度政府前顾问在6月发表的一份分析报告中也表示，近期公布的接近中国的增长率可能掺了水分。印度还远没到注定失败的地步——如果说它期望自己能做得更好也合情理，那么别国所发生的事告诉我们它其实也很容易做得更糟。但是，印度经济放缓再次表明，全世界已经习以为常的那套关于新兴市场的叙事需要认真修正。

在上世纪大部分时间里，发达经济体的增速都高于相对贫穷的经济体。但事情在进入新千年时发生了戏剧性的变化。就实际人均GDP（按购买力平价计算）而言，在目前被IMF列为新兴市场的国家中，只有24%总体而言在整个上世纪80年代的经济增速超过了美国。而在本世纪头十年里，却有76%的国家做到了这点。其时，巴西、俄罗斯、印度和中国这金砖四国正处于鼎盛期。发展中国家的贫困率大幅下降，世界经济秩序得以改写。

经济趋同仍在继续——过去十年里约60%的新兴经济体的增速超过了美国。但追赶式增长的地理范围正在缩小。以人均实际产出与美国的比对来看，中东和北非自2011年起下降，拉丁美洲的下降始于2013年，撒哈拉以南非洲地区始于2014年。今年欧洲新兴经济体的经济预计会下滑，这使得亚洲成为经济趋同的最后一块阵地——无可否认，这块阵地很大很重要。因此，印度经济的不稳定不仅仅是对印度尊严的打击。

对于趋同的放缓有两种互相抵触的解释。第一种认为“好景不长”。发展总

是困难重重，这就是20世纪鲜有穷国变成富国的原因。但在2000年前后，多个顺风顺水的因素难以置信地综合在一起，让这个古老的道理暂时失去了效力。新兴国家发觉自己被史上最惊人的经济发展洪流裹挟着前进——在中国这个世界上人口最多的国家，经济保持近两位数的年增速长达40年。与此同时，技术变革让企业能够打造出跨越几十个国家的供应链，推动全球贸易实现了前所未有的扩张。而新兴国家的政府从过去的危机中学到了管理外国资本的最好方式。这就意味着，当投资者谋求比富裕国家微不足道的投资回报更高的回报时，它们便处在了优势地位。

但中国崛起的奇迹不能重演。目前供应链断裂的情形很可能成为长久的事实。富裕经济体的反弹只是时间问题，货币环境异常宽松的后危机时期也结束了。是的，经济趋同就要结束，但在这种观点下，对于印度这样的国家来说，当增速下跌时，除了叹惋它们在尚有机会时未能做得更好，几乎无计可施。

第二种解释则认为新兴市场可能仍有增长的空间。当生产率和人均资本额上升到发达国家的水平时，穷国就会赶上富国。提高生产率既包括将工人从生产率低的行业转移到高的行业（例如从自给自足的农业到纺织制造业），也包括在行业内部实现生产率的稳步上升。而后者，也就是持续的生产率增长，就是短暂的且会逐渐消失的一轮追赶和向高收入持续发展之间的差异所在。

在过去20年的经济快速增长期内，许多国家的资本存量都增长了。不少国家经历了城市化和经济改革，使得工人进入工厂或办公室，从事生产率更高的工作。一些经济体在繁荣时期打下了经济持续增长的基础。围绕中国发展起来的密集供应链充当了技术知识的导管，向欠发达经济体传输方方面面的持续创新。对印度来说，商业服务出口也发挥了同样的作用。印度是除爱尔兰之外世界最大的信息技术服务出口国。在爱尔兰，美国科技公司荒唐的避税会计操作影响了数据的准确性。

就算经济趋同没有消亡，经济增速放缓仍然令人担忧。政府可能已经变得自满，中止必要的改革，舍不得在教育等提高生产率的事情上投资。印度

想要超过中国，但是它约70%的识字率还不如中国30年前的水平。更糟糕的是，长达数十年全球扩大开放的历程可能走到了终点。在经济好战性——尤其是来自美国的敌意——愈演愈烈的情况下，富裕国家的公司在到海外投资前自然会三思而后行。如果全球贸易出现严重崩溃，可能会在10年乃至更长时间内损害新兴市场的前景。这种延误会因气候变化而变得代价更为惨烈，因为穷国比富国更难应对气候变化。

尽管如此，希望尚存。发展道路上出现的障碍或许仍能被清除掉。特朗普18个月后可能卸任。对死气沉沉的经济前景感到不安的各国政府可能会重新燃起对改革、投资和自由化的希望。然而，不管哪种论调是正确的，事实已经表明，新兴市场的上位绝非必然。要让发展中国家的几十亿人口重回通往富裕国家收入的道路上，需要世界各国政府、企业和工人的不懈努力，同时还需要大把运气。 ■



WeWork's IPO

Risky business

WeWork, a much-ballyhooed property firm, unveils its prospectus

FAR FROM the soulless corporate offices of midtown Manhattan is a door in Greenwich Village wedged between a rowdy saloon and a burrito joint. The steady stream of hipsters and fashionistas passing in front of it is punctuated by professionals in “business casual” outfits with computer tote bags. Inside are stylish workspaces offering fruit-infused water and nitro coffee on tap. In one animated meeting, participants are sitting on beanbags and the floor. That would never happen at his firm’s conservative headquarters, says an executive at the technology giant that has leased this co-working space: “Younger workers want a more casual place to work, and WeWork helps us with recruitment and retention.”

The We Company (WeWork’s parent), a nine-year-old privately held firm, is controversial. The company’s chic co-working spaces and its flamboyant boss, Adam Neumann, clearly inspire passion among many customers and workers. Japan’s SoftBank has invested over \$10bn in the firm, boosting its valuation to \$47bn. Equally passionate are its critics, who argue that the firm is worth nothing like that kind of money. They point to IWG, which offers shared offices under the Regus and Spaces brands worldwide and which has a market capitalisation of just \$4.5bn (see chart).

So what is WeWork really worth? At last, investors will get the chance to make up their own minds. On August 14th the company unveiled its financial prospectus, which is expected to lead to a public flotation next month. The disclosures paint a picture of a firm in transition from overhyped property startup to a maturing corporation with diverse clients.

There are four main areas of concern about WeWork's viability. The first, and most glaring, is its lack of profits. The firm argues that this is explained by its huge investments needed to secure economies of scale. It says that mature locations are profitable. Revenues doubled during the first half of 2019 to \$1.5bn, from \$764m during the same period in 2018. Net losses rose more modestly to \$905m during the first half of this year, up from \$723m (though one-off gains from related-party transactions partly explain this).

The second concern is its obscene valuation. Happily, the firm is diversifying its funding sources. WeWork has reportedly arranged for some \$6bn in credit facilities from ten banks, led by JPMorgan Chase, that are tied to the successful completion of its IPO. That gives Mr Neumann a strong incentive to swallow his pride and lower the asking price for its shares.

The third concern is whether a recession will push the company to bankruptcy. This remains a risk, as the firm has taken on \$47bn in lease payments but has only \$4bn in committed future revenues from customers. Here, it has some hedges. Its leases are typically held in special-purpose entities specific to one property (so a blow-up insulates the parent firm). WeWork has entered into revenue-sharing leases with some landlords, which can offer countercyclical relief. Because it does its own construction, it can slow down the build-out of new offices as it did during London's Brexit-induced downturn.

More important, some 40% of its memberships are now held by big corporations, up from 20% a couple of years ago. These firms, which range from Amazon to HSBC, have deeper pockets and typically take out multi-year deals. Jeffrey Rayport of Harvard Business School argues that the firm's combination of low cost, flexibility and thoughtfully curated culture is attractive to big firms: "We have not reinvented office space in 50 years, so WeWork is moving into white space," he says. "It does make workers happier and more productive."

The final big worry is questionable corporate governance. WeWork will issue multiple classes of shares that give Mr Neumann control with a minority stake. He has a complex relationship with the firm because he leases space to it in buildings he owns, a practice it promises to end. His wife is a “strategic thought partner” and runs an unpromising education arm. Charles Elson, a governance expert at the University of Delaware, warns, “If you start with this culture, you can’t get rid of it.”

Mr Neumann’s claim that his firm will “elevate the world’s consciousness” is plainly silly. Even so, it is wrong to equate WeWork with Regus. CBRE, a property-management firm, estimates that the flexible-work niche has experienced “meteoric growth” of 25% in America’s top ten markets in 2018, with similar figures in big cities worldwide.

Mr Rayport believes that the firm’s business-model innovations have dramatically enlarged the total addressable market. Still, investing in WeWork remains an act of faith. ■



WeWork首次公开募股

风险投资

被炒上天的地产公司WeWork公布招股说明书

这里远离曼哈顿中城毫无生气的企业办公室。格林威治村一家闹哄哄的酒吧和一个墨西哥卷饼铺子中间开出了一扇门。门前鱼贯而行的潮人和时尚达人的人流时不时被挎着电脑包、穿着“商务休闲”装的职业人士打断。门内是新潮的工作区，有水果水和充氮咖啡供人们随时取用。在一场气氛活跃的会议上，与会者就坐在懒人沙发或地板上。一家技术巨头在这里租下了联合办公空间。该公司的一名高管表示，换做是在氛围保守的总部，永远也不会出现这种场景。“年轻员工想要更轻松随意的工作环境，WeWork帮我们招徕和留住了人才。”

WeWork的母公司We Company是一家成立了九年的私营公司，争议颇多。公司提供的时髦的联合办公空间加之它张扬潇洒的老板亚当·诺伊曼（Adam Neumann）显然在大批客户和员工中激发了热情。日本软银已向该公司投资超过100亿美元，将其估值推升至470亿美元。批评的声音同样激烈，认为这家公司根本不值那么多钱。批评者指出，IWG旗下的雷格斯（Regus）和Spaces这两个品牌也提供共享办公室，网点遍及全世界，市值仅为45亿美元（见图表）。

那么WeWork到底价值几何呢？投资者终于有机会自己下判断了。8月14日，该公司公布了财务招股说明书，预计会在下个月上市。据披露的文件描绘，它似乎要从一家过度炒作的房地产创业公司向一家日趋成熟、客户多元化的公司过渡。

关于WeWork的生存前景，主要有四个方面令人担忧。第一个最为显眼，就是利润不足。该公司辩称，这是因为要实现规模经济需要巨额投资。它表示成熟的办公地点还是有利可图的。2019年上半年其营收达到15亿美元，较2018年同期的7.64亿美元翻了一番。今年上半年净亏损的上升幅度

较为缓和，从7.23亿美元升至9.05亿美元（不过这有部分原因是从关联方交易中赚取的一次性收益）。

第二个问题是它高得离谱的估值。不过好在该公司正在让自己的筹资渠道多样化。据传摩根大通牵头十家银行将为WeWork提供约60亿美元的信贷额度，视WeWork能否成功完成IPO而定。这给了诺伊曼很强的激励，愿意放下骄傲，降低公司股票的要价。

第三个问题是经济衰退是否会将公司推至破产的境地。这个风险仍然存在，因为该公司已付出了470亿美元的租赁费，但目前已确定的能从客户那里获得的未来收入仅有40亿美元。在这方面它还是有一些对冲手段的。它的租赁合约一般都由专门针对一处地产设立的特殊目的实体持有，这样即使一家破产，母公司也不会受影响。WeWork还与一些业主签订了共享营收的租约，这可以充当某种反周期的解困手段。由于WeWork自己承担施工，它还可以放慢增建新办公室的速度，伦敦因脱欧而带来低谷时它就是这样做的。

更重要的是，WeWork现在大约有40%的会员是大公司，两三年前这一比例为20%。包括亚马逊和汇丰银行在内的各路大企业腰包更鼓，签下的通常都是长达数年的租约。哈佛商学院的杰弗里·雷波特（Jeffrey Rayport）认为，该公司将低成本、灵活性和精心打造的文化氛围相结合，对大公司来说颇具吸引力。“这50年来我们从没有重塑过办公空间，因此WeWork正在打入一片无人之境，鲜有敌手，”他说，“它确实让员工更快乐，也更富成效了。”

最后一大顾虑是公司的治理可能有问题。WeWork将发行几种类型的股票，诺伊曼即使仅持有少数股权，也仍掌握控制权。他与公司的关系也比较复杂，因为他把自己名下的建筑租给了公司开发办公空间。WeWork承诺将停止这种做法。诺伊曼的妻子是公司的“战略思想伙伴”，并经营着一个前景不佳的教育业务分支。特拉华大学的管理专家查尔斯·埃尔森（Charles Elson）警告道：“如果一开始就是这种文化，之后就没办法摆脱了。”

诺伊曼声称他的公司将“提升全世界的意识”，这显然是在说傻话。即便如此，将WeWork与雷格斯等量齐观也是错误的。物业管理公司世邦魏理仕（CBRE）估计，2018年居美国前十的市场中，灵活工作场所这一利基业务实现了25%的“飞速增长”，全球其他地方的大城市也录得类似的数据。

雷波特认为，WeWork在商业模式上的创新大大扩展了潜在市场范围。不过，投资WeWork仍然是对信仰的一种考验。■



Bartleby

Turn off and drop out

Holidays are good for both workers and their companies

THE SWIMMING trunks have been dug out of the chest of drawers. The beach shoes (still caked with last year's sand) have been retrieved from the shed. Like tens of millions of others, Bartleby is about to go on his annual holiday.

A vacation gives workers a chance to recharge their mental batteries. For Bartleby, this means reading books that do not have titles like "Beyond Performance 2.0" (sadly, a genuine example of a management tome). Heading to a new location allows employees to clear their thoughts. After all, there is more to life than spreadsheets and sales forecasts. To misquote Timothy Leary, the 1960s hippie guru, a holiday is time to "turn off and drop out".

It also means workers get more sleep by escaping the tyranny of the early-morning alarm. In addition, they no longer suffer the agonies of the daily commute: the cramped railway carriages or gridlocked roads. And best of all, there are no meetings to endure—no need to sit with a vaguely interested expression on your face while time seems to slow to a crawl. In short, holidays reduce stress. And in the long run, stress makes workers less likely to perform well.

That means going away for at least a week. An extended weekend break, favoured by many Americans, risks adding to the stress, as a high proportion of the vacation period is spent travelling to and from the desired destination. No sooner do you arrive than you have to think about packing for the trip back.

Although it does lead to congested traffic and crowded airports, there is something to be said for the European tradition of cramming everyone's holidays into August. The predictability of the season means that companies can adjust their plans accordingly. Even those people who are in the office can enjoy an easier pace of life. Most of their customers and suppliers are on a break so there is not much that anyone can do.

For those on vacation, the occasional work-related thought might occur when walking quietly along the beach, or through a wood. Often such ideas will be all the more original for being dreamed up in a moment of detachment. Returning to 3,000 unread emails is also not an appealing prospect, so five minutes deleting the detritus while the rest of the family is in the shower seems like a reasonable compromise. Some favour an "out of office" message but such devices can easily generate automated replies that subsequently clog up the in-box.

The one thing that workers certainly do not need is contact from their managers. Answering the phone to a work-related call should be a complete no-no. Just occasionally, a genuine crisis might require the company to be in contact. In 2007 Bartleby was paddling in the Atlantic next to an analyst from a credit-rating agency receiving frantic messages on his BlackBerry about the collapse of the credit system. But most of the time, executives should really be able to rely on staff who remain in the office.

Indeed, just as employees need a break from the workplace, companies sometimes need a break from their employees. After a trading scandal at Société Générale, a French bank, in 2008, Britain's then regulator, the Financial Services Authority, recommended that all traders take a two-week break at some point in the year. The aim was to ensure that any unusual dealing patterns would be discovered while the miscreant was away from their desk.

Senior managers can also benefit from seeing what happens when their juniors head to the beach. Does office morale improve as soon as a mid-level manager disappears? If so, this suggests that he or she is not running the department well. Does an underling impress when standing in for their boss? In that case, they may be overdue a promotion.

Some Americans are reluctant to take a long holiday for fear that their employer will find they can easily manage without them. None of that nonsense at *The Economist*. Ambitious young writers will be eager to fill the vacant space left by this column with insights into the business world. The business editor will be relieved of the need to remove some of this writer's questionable puns [much appreciated, ed.].

Work can be irritating but, as any unemployed person will tell you, it is better than the alternative. It gives purpose to people's days and, on occasion, can even be fun. But not every day. Some days it is better to be reading a paperback. By a pool, in the sunshine. Enjoy. ■



巴托比

静心，出离

休假对员工和公司都有好处

从抽屉里翻出泳裤，从棚屋里找出沙滩鞋（鞋底还沾着去年的沙子）。和几千万人一样，本专栏作者要去休年假啦。

度假让人在工作之余有机会为大脑充充电。对本专栏作者来说，这意味着拿来看的书不再是《超越绩效2.0》（Beyond Performance 2.0）这类标题（抱歉啊，这可是一本经典管理学著作）。去一个全新的地方旅行可以让员工放空大脑。毕竟，生活除了数据表和销售预测还有其他东西。把上世纪60年代的嬉皮士大师蒂莫西·利里（Timothy Leary）的话改一改，假期就是“静心，出离”的时候。

度假还能让人躲过清晨残酷的闹铃声，获得更多睡眠。此外，人们还可避过每日通勤中那拥挤的车厢或拥堵的道路。最重要的是，不用再忍受会议的煎熬——无需在简直度秒如年的会议上摆出饶有兴趣的表情。简而言之，度假可以减压。而从长远看，压力会导致工作表现不佳。

这就需要休至少一周的假。许多美国人喜欢过一个“大周末”，但这样反而可能增加压力，因为周末的很大一部分时间都花在了往返度假地的路上，感觉是刚到地方就得考虑收拾行李往回赶。

虽然集中放假确实会导致道路和机场拥挤，但欧洲把假期都安排在8月的传统还是有好处的。固定的休假季让公司可以相应地调整工作安排。即使是还在上班的人也可以轻松一些。大多数客户和供应商都休息了，所以也没多少事可做。

对于那些去度假的人来说，在海滩或林间静静地散步时，脑海中偶尔会蹦出与工作有关的想法。由于是在超然的状态下想出来的，这样的想法通常更有新意。休完假后要处理三千封未读邮件可不是件有意思的事情，所以

休假期间趁家人洗澡时花五分钟时间删除一些垃圾邮件似乎是个合理的妥协。有些人喜欢设置“不在公司”的自动回复邮件，但这样做很容易生成大量自动回复，堵塞收件箱。

休假期间最不想发生的事就是被上司找。接听工作电话应该是完全不可接受的。只有在很少的情况下，出现真正的危机时可能才需要公司与员工联系。2007年，本专栏作者在大西洋划船的时候，旁边一家信用评级机构的分析师的黑莓手机响个不停，净是关于公司评级系统崩溃的信息。但大多数时候里，公司高管真的应该做到能依赖留在公司上班的员工来解决问题。

事实上，正如员工需要离开公司休假一段时间，公司有时也需要让员工离开一段时间。2008年法国兴业银行的交易丑闻发生后，英国当时的监管机构金融服务管理局（Financial Services Authority）建议所有交易员都在这一年里找时间休息两周。这是为了确保能在有问题的员工离开办公室期间发现任何不寻常的交易模式。

高层管理者也可以趁下级管理者去海边度假期间观察公司里的情况。是不是中层管理者一离开，办公室士气马上就提高了？如果是，就表明该主管对部门管理不当。在上司度假期间，代理其职的下属是否表现不俗？如果是，他可能早该升职了。

有些美国人不愿意休长假，因为担心雇主会发现离开了他们公司照常转。在本刊可没有这样的荒唐事。雄心勃勃的年轻作者们将热切地用他们对商业世界的洞见填补本专栏留下的空白。商业版块的编辑也将不再需要费力删除本作者的某些未必合适的双关语（辛苦了，编辑）。

工作有时很烦人，但任何一个失业人士都会告诉你，烦人总比没工作强。工作让人的生活有了目的，有时甚至还会带来乐趣，尽管不是天天都如此。最好一年中能躲几天清净，在游泳池边，读本书，晒晒太阳。好好享受吧。 ■



A life in science

In praise of cyborgs

A distinguished centenarian scientist prophesies the future

“MY FATHER WAS, in many ways, a hunter-gatherer,” recalls James Lovelock on the patio of his cottage above Chesil Beach, on England’s south coast. In a poor household, the elder Lovelock not only scabbled to feed the family, but taught young Jim the virtue of respecting nature and Earth. As a scientist, Mr Lovelock went on to develop Gaia theory, the idea that Earth is a single, complex, self-regulating system. Though initially rejected by life scientists, it became the main way many people conceive of the planet.

That is just one of his many contributions to science. Mr Lovelock honed a method to look for life on other planets while at NASA in the 1960s. He found and quantified CFCs in the atmosphere in the 1970s, which led eventually to a ban on the harmful chemicals. His nomination to Britain’s Royal Society in 1974 cited a plethora of work in biology, chemistry and physics—all before the popularisation of the theory for which he is best-known (it is named after Gaia, the ancient Greek goddess of Earth).

To coincide with his 100th birthday, he has published a slim book on artificial intelligence (AI), written with Bryan Appleyard, a journalist. It is mind-stretching stuff. Mr Lovelock thinks the world is leaving the Anthropocene (ie, the current geological age, when human activity has a dominant impact on the planet), for the Novacene, in which “cyborgs” (AI systems) will play the central role.

This is the next step in natural selection, he argues, because cyborgs can reproduce and evolve. They can think thousands of times faster than humans: they are as cleverer than people as people are than plants. Don’t

panic, Mr Lovelock counsels, terrifying as this sounds. Cyborgs will have an incentive to conserve humans rather than wipe them out, since they will need life-forms to help cool the planet for their own survival—though mortals may be relegated to the status of pets and play-things. Cyborgs may “exhibit collections of live humans”, he writes, just as today people “go to Kew Gardens [in London] to watch the plants”.

In the end, AI systems may save humankind as well as themselves. Besides climate change, Mr Lovelock fears other natural ways that Gaia—the principle that maintains the balance in the planet’s climate—could be destroyed, such as a severe volcanic eruption. Keeping the planet cool will make it more resilient to such threats, he contends; so, as well as preserving organic life, the cyborgs will probably enact other kinds of geoengineering that lower Earth’s temperature. Hence the Novacene is to be welcomed, not feared. “Whatever harm we have done to the Earth, we have, just in time, redeemed ourselves by acting simultaneously as parents and midwives to the cyborgs. They alone can guide Gaia through the astronomical crises now imminent,” Mr Lovelock writes.

As a thinker, he defies categorisation. He adamantly favours nuclear energy and rejects the Green movement as utopian. He considers work on autonomous weapons to be as foolish as it is deadly. He attributes his originality to a decision to abandon academia for independent research, which allowed his curiosity to roam. In “Novacene”, his most impassioned argument is that humans are cursed by language because it forces causal, linear thinking at the expense of intuition, which is a truer way to understand the reality of the world.

He expands on this point on his seaside patio. Most of his own inventions came from intuition, he reflects on a warm summer day, not from following the logical steps from known science. A statue of Gaia stares back at him blankly from his garden. But it gets hot, and Mr Lovelock goes inside to

escape the sun. ■



科学人生

赛博格的赞歌

一位杰出的百岁科学家预测未来【《新星世：即将到来的超智能时代》书评】

在英国南海岸切希尔海滩（Chesil Beach）上一座小别墅的露台上，詹姆斯·洛夫洛克（James Lovelock）回忆道：“从很多方面来说，我父亲是个采猎者。”老洛夫洛克家境贫寒，在努力养家糊口之余，向儿子传授尊重自然和地球的美德。小詹姆斯后来成为了一名科学家，提出了盖娅理论。该理论认为地球是个单一、复杂，且能自我调节的系统。最初它不为生命科学家所接受，后来却成为很多人对地球的主要认知。

这只是他对科学的众多贡献之一。上世纪60年代，洛夫洛克在供职于NASA期间完善了一种在其他行星上寻找生命的方法。他在70年代发现并量化计算了大气中的氟利昂，最终使得这种有害化学物质被禁用。由于在生物学、化学和物理学方面的丰富建树，1974年他被提名为英国皇家学会院士。所有这些都发生在他最著名的盖娅理论（以古希腊大地女神盖娅的名字命名）普及之前。

他在百岁诞辰之际出版了一本有关人工智能（AI）的小书。该书由他和记者布莱恩·阿普尔亚德（Bryan Appleyard）合著，可谓让人脑洞大开之作。洛夫洛克认为，世界正从人类世向新星世（Novacene）过渡。前者是人类活动对地球产生决定性影响的当前地质时代；而在下一个时代中，“赛博格”（AI系统）将发挥主导作用。

洛夫洛克认为，这是自然选择的下一阶段，因为赛博格可以复制和进化。它们的思考速度比人类快千万倍——它们远比人类聪明，就像人类远比植物聪明一样。尽管骇人听闻，但洛夫洛克劝人们不要恐慌。赛博格有理由留存而非消灭人类，因为它们为了自身生存需要生物帮助地球降温——尽管人类可能被降级为宠物或玩具。他写道，赛博格可能“举办各色活人展”，就像今天的人们“去（伦敦的）邱园观赏植物那样”。

最后，AI系统也许不仅能拯救自己，还能拯救人类。除了气候变化，洛夫洛克还担心剧烈的火山爆发等其他自然活动可能毁坏维持地球气候平衡的盖娅机制。他认为，控制地球的温度会让它更能应对此类威胁；因此，除了保护有机生命，赛博格可能还会实施其他让地球降温的地球工程。所以，人类应该欢迎而不是畏惧新星世的到来。“无论我们给地球造成了怎样的伤害，我们都已经以赛博格的父母和助产士的双重身份，非常及时地完成了自我救赎。赛博格自己就能够引导盖娅度过眼下迫在眉睫的巨大危机。”洛夫洛克写道。

他是一位思想家，却很难被归为哪一类。他坚定不移地支持核能，视绿色运动为乌托邦而予以反对。他认为研制自动武器既愚蠢又致命。他离开了学术界去从事独立研究，并将自己的创造力归因于这个决定——这让他好奇心可以自由发展。在《新星世》中，他最富激情的论点是，人类深受语言之害，因为语言以牺牲直觉为代价，将因果与线性思维强加于人；而直觉才是认识现实世界的正道。

在海边的露台上，洛夫洛克进一步阐释了这一点。在一个温暖的夏日，他说自己的大部分创意都来自直觉，而不是遵循已知科学的逻辑步骤。花园里的盖娅雕像面无表情地回望着他。空气越来越灼热，他进屋去躲太阳了。 ■



Schumpeter

The Exxon Valdez of cyberspace

If data are the new oil, data breaches should be treated like oil spills

IN 1989 the thin-hulled *Exxon Valdez* supertanker ran aground in Prince William Sound, Alaska, pouring a quarter of a million barrels of oil into the surrounding waters. At the time, it was America's worst offshore spill, and a huge blow to the reputation of the ship's owner, Exxon. The firm paid \$3bn to clean up the area and settle legal claims, and to improve safety the American government ordered the phasing out of single-hull ships such as *Exxon Valdez*. All vessels used worldwide by Exxon's corporate descendant, ExxonMobil, are now double-hulled. But that is not all. The disaster gave rise to a cultlike culture of discipline within ExxonMobil that helped turn it into the profitmaking beast it is today.

Three decades later, as a result of a relentless surge in cybercrime, digital firms are floundering towards their own *Exxon Valdez* moment. The latest is Capital One, a big American bank with a market capitalisation of \$42bn, which on July 29th revealed that a hacker had stolen personal and financial details of 106m credit-card customers and applicants. Prosecutors allege that over four months Paige Thompson, a 33-year-old software developer, infiltrated a Capital One server hosted on Amazon's cloud-computing platform through a misconfigured firewall. Bizarrely, the bank did not notice even after the hacker pseudonymously boasted about the heist on social media—until it was tipped off. For a company hitherto seen as one of the most technologically adept in finance, this is a blow.

The incident has two parallels with the oil industry. Robert Knake, a former White House cyber-security adviser and co-author of “The Fifth Domain”, a new book on the subject, describes the way the hacker penetrated a layer

of security called a web-application firewall as a “perfect analogy” to the era of single-hulled oil tankers. Like *Exxon Valdez*, Capital One should have had more protection. Like the oil companies of old, the bank may have also lacked a culture of safety sufficiently strong to ensure that it relentlessly probed for new vulnerabilities. Both are a reminder that, if data are now more valuable than oil, data breaches bear an unhealthy resemblance to oil spills. Internet firms can learn a lesson or two from hoary old carbon-belchers like ExxonMobil on how to avoid them.

Exxon Valdez was a watershed moment for Exxon. In 1989 it had already been around for a century. But the disaster led to a full-blown overhaul of the firm’s safety and risk-management culture. In “Private Empire”, a book about ExxonMobil by Steve Coll, the author can barely disguise his astonishment at how far this went. In its offices, desk drawers had to be kept shut lest employees bump into them. Every meeting began with a “safety minute”, akin to a blessing before a meal. Cuts by office paper clips were monitored. Even today its 11-point Operations Integrity Management System—as detailed in its pursuit of safety nirvana as the Buddhist path to enlightenment—is drilled into new recruits, incorporated into performance assessments and shared with contractors and suppliers. For 27 years it has worked remarkably well.

Corporations can argue that data are trickier to manage than oil. Preventing data breaches is a fiendish game of cat-and-mouse. Companies do not know who their attackers are—criminals? state actors? lone wolves?—or what they want. The hacker only has to be right once to penetrate a system. Defenders have to parry every jab, all the time; one misstep and they lose. Many companies bridle at being held responsible for being the victims of crime or acts of war.

Still, the oil industry’s experience is instructive. First, the emphasis on ingraining safety in every employee can strengthen the weakest link in

cyber-security: the individual. In “The Fifth Domain” Mr Knake and Richard Clarke argue that companies deploying ever more sophisticated anti-hacking technology cannot eliminate “Poor Dave”, the guy in every organisation who can’t resist a phishing email. Studies show that employees are often, by accident or intentionally, the main cause of successful cyber-attacks. Wise firms fake phishing emails to flush out the Daves.

Oil firms’ insistence on their supply chains speaking the same language, and loudly, on safety is also worth emulating. Hackers increasingly infiltrate large corporations by first penetrating the defences of smaller suppliers and piggybacking on the communications systems which link the two. This is made easier by the fact that many firms treat hacks like gonorrhoea, an embarrassing affliction no one wants to admit even if speaking about it would stop its spread. Some call it a tragedy of the cyber-commons.

Third, the near-death experience suffered by BP after the Deepwater Horizon oil disaster in 2010 shows how data can turn from an asset into a crushing liability. It ended up costing the British firm more than \$50bn. Its reputation has yet to recover fully.

For now, the costs of a data breach look absurdly light by comparison. Capital One says its recent hack will cost it up to \$150m this year, mainly in extra customer support. Ignoring potential fines, that is less than \$1.50 per victim—and a tenth of the bank’s latest quarterly profits. Equifax, a credit-scoring firm, recently agreed to pay up to \$700m to resolve lawsuits and other claims after data of nearly 150m clients were hacked. IBM Security, a consultancy, puts the average cost of a data breach worldwide at \$150 per victim. Messrs Knake and Clarke think it should be more like \$1,000 to spur the investment needed to prevent losses.

Governments are indeed getting tougher. In July Britain’s proposed fining

British Airways £183m (\$222m) after data about 500,000 passengers were stolen. That marks the first big penalty linked to the EU's newish data-protection rules. The airline said it would appeal. It may yet convince regulators it is not to blame. But as with Exxon or BP, that argument may wear thin with regulators and consumers. Companies which trade in data—ie, most big ones these days—had better get ahead of the problem. ■



熊彼特

网络空间的埃克森·瓦尔迪兹号

如果说数据是新的石油，就应像处理石油泄漏那样处理数据泄露

一九八九年，单壳船体的埃克森·瓦尔迪兹号（Exxon Valdez）超级油轮在阿拉斯加的威廉王子湾（Prince William Sound）搁浅，向周围水域泄漏了25万桶石油。这是当时美国最严重的一起海上原油泄漏事故，重创了这艘油轮的所有者埃克森石油公司的声誉。该公司为清理水面和支付索赔花费了30亿美元。为了提高安全性，美国政府下令逐步淘汰埃克森·瓦尔迪兹号这种单壳船。现在，埃克森后来合并产生的埃克森美孚在全球使用的所有船只都是双壳船。但还不止于此。这场灾难令后来的埃克森美孚在内部形成了一种宗教般的纪律文化，正是这种文化帮助这家公司成为了今天的盈利巨兽。

30年后的今天，由于网络犯罪不断激增，数字企业都在费力应对自己的“埃克森·瓦尔迪兹时刻”。最近一家是市值420亿美元的美国大型银行“第一资本”（Capital One）。7月29日该银行透露，它被黑客窃取了1.06亿信用卡客户和申请人的个人信息及财务数据。检方声称，33岁的软件开发员佩奇·汤普森（Paige Thompson）在四个月的时间里突破配置错误的防火墙侵入了亚马逊云计算平台托管的“第一资本”的服务器。奇怪的是，甚至在这名黑客在社交媒体上匿名吹嘘此事之后，银行都没发现问题——直到有人暗中告知。对于一家一直以来被视为擅长技术的金融公司而言，这是一记重击。

这起事件与石油泄漏事故有两点相似之处。前白宫网络安全顾问罗伯特·克纳克（Robert Knake）与人合著了一本网络安全方面的新书《第五战争领域》（The Fifth Domain）。克纳克认为黑客对Web应用防火墙这一安全层的突破是单壳油轮时代的“完美类比”。和埃克森·瓦尔迪兹号一样，“第一资本”本应有更多保护。和从前的石油公司一样，该银行可能也缺乏足够的安全文化，无法确保自己不懈地寻找新的漏洞。这两起事件都提醒

人们，如果说数据如今比石油更有价值，那么数据泄露就有着类似于石油泄漏的不良后果。互联网公司可以从埃克森美孚这样的老牌碳排放大户那里汲取些经验，以避免这类泄露。

埃克森·瓦尔迪兹号事件对埃克森来说具有分水岭性的意义。1989年时，这家公司已经诞生百年，但这场灾难引发了对公司安全和风险管理文化的彻底变革。史蒂夫·科尔（Steve Coll）在他关于埃克森美孚的著作《私人帝国》（Private Empire）中对这项变革的深度难掩讶异之情。办公室里的桌子抽屉必须保持关闭，以免员工磕碰。每次会议开始前都会有类似于饭前祷告的“安全时刻”。公司还跟踪员工被纸夹割伤手的情况。包含11点要素的操作完整性管理系统（Operations Integrity Management System）如同佛教中追求开悟一般细致地追求安全涅槃。即使在今天，它还在向新员工反复灌输该系统，并将其纳入绩效评估，还将之与承包商和供应商共享。27年来，这套系统成效显著。

企业可能会争辩说数据比石油更难管理。防止数据泄露如同一场艰苦的猫鼠游戏。企业不知道攻击者是谁——犯罪分子？国家力量？独行黑客？也不知道攻击者想要什么。黑客只需要做对一次就可以进入系统。而系统捍卫者必须始终都能防住每一次攻击，一步走错，全盘皆输。许多企业自觉是犯罪或战争行为的受害者，却还要承担责任，因而愤懑不已。

尽管如此，石油行业的经验仍具指导意义。首先，重视加强每个员工的安全意识可以巩固网络安全中最薄弱的环节：个人。在《第五战争领域》中，克纳克和另一位作者理查德·克拉克（Richard Clarke）认为，企业部署再高级的反黑客技术也无法消除“可怜的戴夫”——每个组织中忍不住要打开网络钓鱼邮件的人。研究表明，无论有意无意，员工往往是网络攻击得逞的主要原因。明智的企业会发送假的钓鱼邮件来找出这些“戴夫”。

石油公司坚持要求其供应链在安全问题上与自己保持一致的态度并清楚说出存在的问题，这种做法也值得效仿。黑客在攻击大企业时越来越多地会先突破小型供应商的防御，然后再利用连接两者的通信系统侵入大企业的系统。许多企业对待黑客攻击就像对待淋病一样——即使只消说一声就能

防止疾病蔓延，也还是没人愿意承认有这种难言之隐，这就让给黑客更易得手。有人将这称为网络公地悲剧。

第三，英国石油公司（BP）在2010年的深水地平线漏油灾难后濒临破产的经历表明，数据也可能从资产变为沉重的债务。这起事件最终导致这家公司损失了500多亿美元，其声誉至今未完全恢复。

就目前而言，比起石油泄漏，数据泄露的成本看起来低得荒唐。“第一资本”表示，最近的黑客攻击会令它今年损失最多1.5亿美元，主要是用于提供额外的客户支持。如果不考虑可能会受到的罚款，这些钱平摊到每个受害用户头上还不到1.5美元，总数也只相当于这家银行上一季度利润的十分之一。征信公司Equifax在近1.5亿名客户的数据遭黑客攻击泄露后，最近同意支付最高7亿美元用于诉讼和其他索赔和解。咨询公司IBM Security将全球数据泄露的平均成本定为每位受害者150美元。克纳克和克拉克认为应该定为1000美元才能刺激公司投资来防止此类损失。

政府的态度确实越来越强硬。7月，英国政府拟对英国航空公司约50万名乘客数据被盗的事故开出1.83亿英镑（2.22亿美元）的罚单。这是与欧盟新的数据保护法规相关的第一张大罚单。英航表示将提出上诉。它或许仍有机会说服监管机构错不在己。但与埃克森或BP的经历一样，监管机构和消费者对这样的争辩可能越来越不会买账。交易数据的企业——如今多数大企业都在这么做——最好提前做好应对准备。 ■



Automotive engineering

Back to the future

Putting a car's propulsive systems directly into its wheels is a century-old idea whose time may at last have come

AT THE DAWN of the motor industry one of its pioneers, Ferdinand Porsche, caused a sensation at the Paris World Fair in 1900 with a vehicle driven by a pair of electric motors incorporated into its front wheels. This arrangement allowed the Lohner-Porsche (pictured above) to dispense with cumbersome belts, chains and gears. It was thus able to nip along at a heady 35kph for up to 50km after its lead-acid batteries had been charged up.

Porsche, like other carmakers of the time, eventually turned to the internal-combustion engine for greater range and flexibility. His eponymous firm went on to build some of the fastest sports cars around. But despite the fact that electric vehicles are now returning to the road with a vengeance, the idea of using “in-wheel” motors of the sort Porsche pioneered has failed to follow suit. Some vehicle manufacturers and their suppliers, including Michelin, a French tyremaker, and NSK, a Japanese component-producer, have developed modern versions of in-wheel drives for cars, but these have yet to make it into production models.

There are two reasons for this reluctance. One is that an in-wheel motor’s components and wiring are exposed to the elements rather than being snug inside a vehicle’s body. They must therefore be robust enough to handle the high voltages such motors normally require while simultaneously being protected against damage from road debris and the risk of shorting out when periodically soaked in water. The other concern is that the additional weight of the motors on each wheel increases a vehicle’s “unsprung” weight—the part of its mass not supported by its suspension. A high

unsprung weight results in a bumpy ride and poor handling.

All this means that most electric cars continue to use drivetrains that resemble those found in combustion-engined vehicles. They have an electric motor at the front or the rear (or, sometimes, both) which turns the wheels via shafts and gears. But if Indigo Technologies of Cambridge, Massachusetts has its way, all this will change. Since the firm was founded in 2010 by Ian Hunter, a professor of mechanical engineering at the Massachusetts Institute of Technology, Indigo's engineers have been developing an in-wheel drive system they call the T1. They believe that their system, a module that incorporates brakes, steering and an active suspension, as well as a motor, overcomes both the electrical problem and the unsprung-weight problem, thus paving the way for in-wheel drives to become mainstream.

To reduce the electrical difficulties, the T1 runs at 48 volts instead of the 400 volts or more used by the motors in existing electric cars. The choice of 48 volts is not arbitrary. That voltage is also rapidly becoming standard for the circuits which run things like lighting, climate control, entertainment systems and adjustable seats, even in conventional combustion-engine-driven cars. Lowering the voltage almost tenfold in this way does, though, make the T1's motor easier to protect and insulate, which in turn makes it cheaper to produce than higher-voltage motors, says Brian Hemond, Indigo's boss.

All this is possible because fitting T1s to all four wheels eliminates the need for driveshafts, transmissions, suspension parts and other weighty components. Those weight savings allow the size of the battery pack to be reduced, saving still more weight.

Reduced vehicle weight means also that the propulsive motors do not need to be as powerful as those of conventional electric cars—especially as the

task of propulsion is divided four ways between them. Nor are any gears involved, for the motors turn only as fast as the vehicle's wheels, which is a relatively low speed for an electric motor and further reduces its need to be powerful. That translates to a low voltage because the power of such a motor is a product of voltage and current ($P=V*I$, one of the fundamental equations in electricity). At a constant current, voltage can be reduced.

All this frees up space elsewhere in the vehicle, allowing an electric car to be designed from scratch to be more efficient and therefore cheaper to run. Other benefits also come from lightness. A smaller battery can be topped up more effectively by the regenerative braking built into the module, as well as being faster to recharge when plugged into the mains. Indigo has tried the T1 out on prototype cars redesigned to be more aerodynamic. It reckons these prototypes need only a tenth of the power required by a combustion-engined vehicle, even at highway speeds.

A combination of a lighter vehicle and lighter components in the T1 modules also reduces the amount of unsprung weight. As for ride and comfort, the active suspension and the ability to control separately the power applied to each wheel permit better grip and increased stability during braking and cornering.

Indigo is talking to carmakers and components firms and hopes, by the end of the year, to land its first production contract. Dr Hemond expects particular interest from firms developing ride-sharing and autonomous vehicles. The sort of small, sleek vehicles or personal-mobility pods which such in-wheel drive systems might inspire would be a world away from the perambulatory Lohner-Porsche. But they would have made Porsche himself wonder what might have been had he stuck with the electric motor. ■ ■



汽车工程

回到未来

将汽车的推进系统直接装进车轮的想法已有百年历史，现在可能终于要实现了

在汽车工业发展的初期，行业先驱之一费迪南德·波尔舍（Ferdinand Porsche）在1900年的巴黎世博会上推出了一辆由配备在前轮里的一对电机驱动的汽车，造成轰动。这种设计让“洛纳-保时捷”（Lohner-Porsche，如上图所示）这款车省去了笨重的皮带、链条和齿轮。它因而能在它使用的铅酸电池充满电后，以令人兴奋的每小时35公里的速度行驶长达50公里。

与当时其他的汽车制造商一样，波尔舍最终转用内燃机以获得更长的行驶里程和更大的灵活性。他的同名公司（保时捷）后来生产出了一些最快的跑车。但是，尽管电动汽车现在正强势回归，重新上路，但波尔舍开创的“轮内”电机的想法却并未随之复兴。一些汽车制造商及其供应商，如法国轮胎制造商米其林和日本零部件生产商精工（NSK），已开发出了汽车的现代版轮内驱动装置，但尚未将它们应用到量产车型中。

它们缺乏积极性的原因有两个。一个是轮内电机的部件和线路没有车身保护，直接暴露在外，经受日晒雨淋。因此，它们必须够结实才能承受电动机通常需要的高压，与此同时还要避免路面沙石的损坏以及经常浸水带来的短路风险。另一个原因是每个车轮上额外的电机重量增加了车辆的“簧下”重量——即不受其悬挂系统支撑的重量。簧下重量大会导致行驶颠簸，操控性差。

所有这些意味着大多数电动汽车将继续使用类似内燃机汽车的传动系统。电动汽车在车身的前部或后部有一个电机（有时前后都有），通过轴和齿轮驱动车轮。但如果马萨诸塞州剑桥市的Indigo Technologies公司能如愿所偿，这一切都会改变。自从麻省理工学院的机械工程教授伊恩·亨特（Ian Hunter）于2010年创立该公司以来，Indigo的工程师们就一直在开

发一种他们称之为T1的轮内驱动系统。他们相信这个整合了制动、转向和主动悬挂、以及电机的系统能克服电气和簧下重量的问题，为轮内驱动变成主流铺平了道路。

为了减少电气方面的难题，T1的运行电压设为48伏，而不是现有电动汽车电机中的400伏或更高。48伏不是随意选择的。即使在传统的内燃机汽车中，这个电压也正在迅速成为照明、空调、娱乐系统和可调节座椅等电路的标准电压。然而，将电压降低近十倍确实使T1电机更易保护和绝缘，而这反过来又让它比高压电机的成本更低，Indigo的老板布莱恩·埃蒙（Brian Hemond）说。

所有这一切都是可能的，因为将T1安装到全部四个车轮上就不再需要驱动轴、变速箱、悬挂部件和其他沉重部件。减轻了这些重量就可以减小电池组的尺寸，从而减少更多重量。

车身重量减轻也使得推进电机的动力不需要像传统电动汽车的电机那样强大——尤其是因为推进力被分配到了四个轮子上。而且也不需要任何齿轮，因为电机是按车轮的转速转动，而这个转速对于电机来说相对较低，更加降低了对动力的需求。这就可以降低电压，因为这种电机的功率等于电压和电流的乘积（ $P=V*I$ ，电学基本公式之一）。电流恒定时，电压可以降低。

所有这些都释放了汽车其他部位的空间，这就可以完全重新设计电动车以提高效率和降低行驶成本。车身减重还能带来其他好处。更小的电池可以使用内置在T1模块中的再生制动来实现更有效的充电，在插入电源时也能更快地充电。Indigo已经在一些经重新设计而优化了空气动力学性能的原型车上试装了T1。Indigo估计，这些原型车的功率只需要达到内燃机车辆的十分之一，即使在高速行驶时也是如此。

安装了T1模块的汽车的车身和零部件都比较轻，这也减轻了簧下重量。至于驾驶性能和舒适性，主动悬架和每个车轮上的动力可独立控制让车辆在制动和转弯时增强抓地力和稳定性。

Indigo正在与汽车制造商和零部件公司谈判，希望在今年年底前拿下第一份量产合同。埃蒙预期开发共享和无人驾驶汽车的公司会特别感兴趣。轮内驱动系统可能催生出小巧、外观时髦的汽车或个人出行舱，与当年那辆缓步巡游的“的“洛纳-保时捷”完全不同。不过它们会让波尔舍本人好奇，如果自己当初坚持使用电机，会是什么样的结果。■



Schumpeter

Lacking flexibility

The plastics business has yet to come to terms with a backlash against its products

AS WESTERN HOLIDAYMAKERS escape their daily grind and head to the beach this summer, a concern is likely to resurface—literally, if it washes up on the pristine sand in front of them. In the past two years plastic litter in the ocean seems to have eclipsed other environmental anxieties among rich-world consumers. Harrowing images of sea life ensnared in plastic bags, as depicted in “Blue Planet II”, a popular British television series from 2017 presented by Sir David Attenborough, would be enough to make anyone choke on the plastic straw in their piña colada—if, that is, you were offered one. Politicians everywhere are responding to voters’ demands by banning straws, stirrers and other single-use plastics. The UN says that last year 127 countries had restrictions on plastic bags. Last month Panama became the first Central American country to outlaw them. Britain is considering a tax on plastic packaging made with less than 30% recycled content. In March 560 members of the European Parliament backed a law that would require 90% of plastic bottles to be recycled by 2029. Just 35 voted against.

Given the environmental footprint of substitutes like cotton bags, aluminium cans or paper boxes—which often require more energy and water to make and transport than plastic equivalents—new regulations could in fact end up doing harm to the planet. Nonetheless the plastics industry can expect ever more curbs on its products, a trend that will force businesses involved to reshape. Bottles, boxes, films and the like consume nearly half of global output of the polymers on which they rely. Many companies in the \$375bn plastic-packaging value chain—which comprises producers of oil and gas (the main feedstocks), petrochemicals giants,

packaging firms and consumer brands—look ill-prepared.

Companies at either end of the chain are the least vulnerable. Beverage-makers will happily switch from oil-derived plastic to recycled stuff for their bottles—or to aluminium cans—so long as the numbers add up (which they do when high oil prices push up the cost of virgin plastic). Even so, ExxonMobil or Coca-Cola cannot relax. Seema Suchak of Schroders, an asset manager, estimates that fizzy-drinks firms that fail to reduce their reliance on virgin plastics could see annual profits shrink by 5% over the next decade or so because of regulations and taxes spurred by the consumer backlash. According to Paul Bjacek of Accenture, a consultancy, recycling all plastic packaging, rather than the 15% that is reused today, could cut annual growth in demand for oil and gas from 1% to 0.5% by 2040, as recycled materials gain market share.

Plastic-packaging firms could suffer more. Credit-raters at Moody's have warned that Britain's proposed tax on plastic bottles could hurt their makers by discouraging use by consumer-goods companies and driving up the cost of recycled plastic, a scarce raw material as recycling rates are low. Ms Suchak looked at five big makers of plastic packaging and found that the pre-tax profits of four of them could fall by 11-33% in the medium term if they stick with virgin plastics. Amcor, an Australian giant, lists environmental concerns as the number-one risk in its latest annual report.

Then there is the petrochemicals industry. In a much-cited analysis from 2016, consultants at McKinsey calculated that the value of plastic disposed after a single use is \$80bn-120bn a year. Reducing that number could benefit society but harm purveyors of the virgin materials. Last year Spencer Dale, chief economist of BP, a British oil giant, estimated that more plastics regulation could reduce demand for petrochemicals by a sixth in the next 20 years. Around a quarter of the revenues of Germany's BASF or DowDuPont of America come from plastics. Both could suffer. So could big oil firms,

hoping that their petrochemicals businesses can offset a looming decline in fossil-fuel sales from a shift to renewable energy and electric cars. ExxonMobil already derives 15-25% of profits from chemicals, twice the share a decade ago. Saudi Aramco, the world's oil colossus, agreed in March to buy 70% of SABIC, the kingdom's petrochemicals firm, for \$69bn. It plans to plough a further \$100bn into new plants over the next decade. A similar sum may be invested in Chinese facilities to convert coal to polymers.

These investments would add to abundant capacity. Wood Mackenzie, a research firm, estimates that \$200bn has been sunk into petrochemical businesses since 2010 in North America alone. Were the increase in supply to collide with a secular decline in demand, profits would suffer. The price of polyethylene, a popular polymer, has already fallen by a third since the start of 2018.

Asked shortly after the premiere of "Blue Planet II" if looming regulations preoccupy plastics companies, a senior European lobbyist for the industry confessed to Schumpeter that they were not really a topic of conversation in boardrooms. They are now. Consumer brands are vowing to retrieve more of their packaging and to make more with recycled materials. BASF has launched packaging for mozzarella cheese made from polymers chemically recomposed from used plastics, perhaps spooked by upstarts that are working on something similar, such as Loop Industries of Canada. BP describes such "chemical recycling" as a "game changer".

Firms are cagey about the extent of such efforts. Industry analysts suspect it is not large. Perhaps plastics executives are counting on the force of reason to prevail, or for Asian consumers not to succumb to plastic panic. This may be wishful thinking. People are easily persuaded that an eyesore despoiling their holiday paradise is intolerable; making them care about invisible, odourless carbon dioxide is tougher.

In a contest with the logic of trade-offs, the emotive power of Sir David's cinematography is likely to win. Hard-nosed polymer bosses should remember that. ■



熊彼特

欠缺弹性

面对抵制浪潮，塑料产业尚未找到和解之道

今年夏天，西方游客逃离日常工作奔往海滩度假时，一个问题很可能会再次浮出水面——是的，它真的有可能被冲到他们面前纯净的沙滩上。过去两年，海洋中的塑料垃圾似乎已成为最让富裕世界的消费者忧心的环境问题。正如2017年由大卫·爱登堡（Sir David Attenborough）解说的英国电视纪录片《蓝色星球2》（Blue Planet II）所呈现的那样，有许多海洋生物被塑料袋缠住，其惨状足以令叼着塑料吸管喝“椰林飘香”鸡尾酒的观众被呛到——如果店家提供了塑料吸管的话。应选民要求，各地政客都在推动立法禁用吸管、搅拌棒和其他一次性塑料制品。联合国称去年有127个国家限制了塑料袋的使用。上月，巴拿马成为首个禁用塑料袋的中美洲国家。英国正考虑对可回收塑料含量低于30%的塑料包装物征税。今年3月，欧洲议会有560名议员赞成通过一项法律，要求到2029年塑料瓶的回收率应达到90%。只有35人投了反对票。

但要知道，棉布袋、铝罐、纸箱等塑料替代品的“环境足迹”更重——它们的制造及运输过程通常比等量的塑料制品更耗能耗水，因此禁塑新规实际上也许最终会损害地球。尽管如此，塑料行业应该会面临越来越多的限制，迫使相关企业转型。塑料瓶、盒、薄膜等制品消耗了全球生产的近一半聚合物。价值3750亿美元的塑料包装价值链中的众多企业似乎都准备不足，包括石油和天然气生产商（油气是塑料的主要原料）、石化巨头、包装企业和消费品品牌。

位于这一价值链两端的企业最不容易受到冲击。只要成本仍合算，饮料制造商很乐意把产品包装从源自石油的塑料瓶换成可回收材料做成的瓶子或铝罐（当高油价推高原油塑料的成本时它们就是这么干的）。即便如此，埃克森美孚和可口可乐也都不能松懈。据资产管理公司施罗德（Schroders）的塞玛·苏沙克（Seema Suchak）估计，碳酸饮料公司如果

不降低对原生塑料的依赖，未来十年左右因消费者不满而引发的新法规及税收可能导致利润每年萎缩5%。咨询公司埃森哲的保罗·比亚切克（Paul Bjacek）表示，如果回收所有塑料包装，而不是像如今这样只回收15%，那么由于可回收材料的市场份额扩大，到2040年，石油和天然气的需求年增速将从1%降低到0.5%。

塑料包装公司的处境可能更糟。穆迪的评级人员警告称，英国拟对塑料瓶征税，这将促使消费品厂商转用其他包装，推高再生塑料的成本（由于回收率低而令再生塑料变成了一种稀缺原材料），令塑料瓶制造商的利益受损。苏沙克对五大塑料包装制造商的研究发现，如果它们坚持使用原生塑料，其中四家制造商的税前利润在中期内可能会下降11%到33%。澳大利亚包装业巨头安姆科（Amcor）在最新年报中将环境问题列为头号风险。

然后是石化行业。在一项2016年发表、被广为引用的分析中，麦肯锡的顾问计算出一次性塑料用品的价值每年达800亿至1200亿美元。减少这个数字会令社会受益，但会打击原生塑料供应商。去年，石油巨头BP的首席经济学家戴思攀（Spencer Dale）估计，更多对塑料的监管可能导致对石化产品的需求在未来20年减少六分之一。德国的巴斯夫和美国的陶氏杜邦均有约四分之一的收入来自塑料业务。这两家公司都可能有麻烦。大型石油公司也一样，由于市场转向再生能源及电动汽车，化石燃料销售走弱迫在眉睫，它们希望石化产品业务能抵消损失。埃克森美孚的石化业务利润占比已达到15%到25%，是十年前的两倍。世界石油巨头沙特阿美（Saudi Aramco）今年3月同意以690亿美元的价格收购沙特石化企业沙特基础工业公司（SABIC）70%的股权。沙特阿美计划在未来十年再投入1000亿美元建设新工厂。它还可能在中国投资差不多的金额，建造把煤转化为聚合物的工厂。

这些投资会让本已充足的产能进一步扩张。据研究公司伍德麦肯兹（Wood Mackenzie）估计，自2010年以来，仅在北美就已有2000亿美元投入到石化业务上。供应上升如若碰上需求长期下降，利润就会受损。自2018年初，常用聚合物聚乙烯的价格已经下降了三分之一。

《蓝色星球2》首映后不久，本专栏记者询问欧洲一名资深塑料业说客新法规来袭是否令塑料企业忧心忡忡，他坦白地说企业董事会上并没有讨论过这个。现在就不能不谈了。消费品牌企业承诺将回收更多自己的包装制品，并更多地使用再生材料制造产品。也许是被加拿大路普工业公司（Loop Industries）等正在开展类似工作的新兴公司吓到了，巴斯夫已经推出了用回收塑料化学再造而来的聚合物制成的马苏里拉奶酪包装。BP把这样的“化学回收”称为“规则改变者”。

企业对于把这类努力推进到何种地步态度谨慎。行业分析师怀疑它们并没有大规模实施。也许塑料企业高管指望理性的力量占据上风，或者希望亚洲的消费者不会受“塑料恐慌”的影响。但这可能是他们一厢情愿的想法。人们会轻易认定毁掉他们度假天堂的碍眼垃圾是要不得的，让他们关心无色无味的二氧化碳的危害是更难的。

在一场取舍权衡的较量中，大卫的电影艺术发散的感性力量更可能获胜。顽固的聚合物老板们应该记住这一点。 ■



The future of the Amazon

Deathwatch

Brazil has the power to save Earth's greatest rainforest—or destroy it

ALTHOUGH ITS cradle is the sparsely wooded savannah, humankind has long looked to forests for food, fuel, timber and sublime inspiration. Still a livelihood for 1.5bn people, forests maintain local and regional ecosystems and, for the other 6.2bn, provide a—fragile and creaking—buffer against climate change. Now droughts, wildfires and other human-induced changes are compounding the damage from chainsaws. In the tropics, which contain half of the world's forest biomass, tree-cover loss has accelerated by two-thirds since 2015; if it were a country, the shrinkage would make the tropical rainforest the world's third-biggest carbon-dioxide emitter, after China and America.

Nowhere are the stakes higher than in the Amazon basin—and not just because it contains 40% of Earth's rainforests and harbours 10-15% of the world's terrestrial species. South America's natural wonder may be perilously close to the tipping-point beyond which its gradual transformation into something closer to steppe cannot be stopped or reversed, even if people lay down their axes. Brazil's president, Jair Bolsonaro, is hastening the process—in the name, he claims, of development. The ecological collapse his policies may precipitate would be felt most acutely within his country's borders, which encircle 80% of the basin—but would go far beyond them, too. It must be averted.

Humans have been chipping away at the Amazon rainforest since they settled there well over ten millennia ago. Since the 1970s they have done so on an industrial scale. In the past 50 years Brazil has relinquished 17% of the forest's original extent, more than the area of France, to road- and

dam-building, logging, mining, soyabean farming and cattle ranching. After a seven-year government effort to slow the destruction, it picked up in 2013 because of weakened enforcement and an amnesty for past deforestation. Recession and political crisis further pared back the government's ability to enforce the rules. Now Mr Bolsonaro has gleefully taken a buzz saw to them. Although congress and the courts have blocked some of his efforts to strip parts of the Amazon of their protected status, he has made it clear that rule-breakers have nothing to fear, despite the fact that he was elected to restore law and order. Because 70-80% of logging in the Amazon is illegal, the destruction has soared to record levels. Since he took office in January, trees have been disappearing at a rate of over two Manhattans a week.

The Amazon is unusual in that it recycles much of its own water. As the forest shrivels, less recycling takes place. At a certain threshold, that causes more of the forest to wither so that, over a matter of decades, the process feeds on itself. Climate change is bringing the threshold closer every year as the forest heats up. Mr Bolsonaro is pushing it towards the edge. Pessimists fear that the cycle of runaway degradation may kick in when another 3-8% of the forest vanishes—which, under Mr Bolsonaro, could happen soon. There are hints the pessimists may be correct. In the past 15 years the Amazon has suffered three severe droughts. Fires are on the rise.

Brazil's president dismisses such findings, as he does science more broadly. He accuses outsiders of hypocrisy—did rich countries not fell their own forests?—and, sometimes, of using environmental dogma as a pretext to keep Brazil poor. “The Amazon is ours,” the president thundered recently. What happens in the Brazilian Amazon, he thinks, is Brazil's business.

Except it isn't. A “dieback” would directly hurt the seven other countries with which Brazil shares the river basin. It would reduce the moisture channelled along the Andes as far south as Buenos Aires. If Brazil were damming a real river, not choking off an aerial one, downstream nations

could consider it an act of war. As the vast Amazonian store of carbon burned and rotted, the world could heat up by as much as 0.1°C by 2100—not a lot, you may think, but the preferred target of the Paris climate agreement allows further warming of only 0.5°C or so.

Mr Bolsonaro's other arguments are also flawed. Yes, the rich world has razed its forests. Brazil should not copy its mistakes, but learn from them instead as, say, France has, by reforesting while it still can. Paranoia about Western scheming is just that. The knowledge economy values the genetic information sequestered in the forest more highly than land or dead trees. Even if it did not, deforestation is not a necessary price of development. Brazil's output of soyabeans and beef rose between 2004 and 2012, when forest-clearing slowed by 80%. In fact, aside from the Amazon itself, Brazilian agriculture may be deforestation's biggest victim. The drought of 2015 caused maize farmers in the central Brazilian state of Mato Grosso to lose a third of their harvest.

For all these reasons, the world ought to make clear to Mr Bolsonaro that it will not tolerate his vandalism. Food companies, pressed by consumers, should spurn soyabeans and beef produced on illegally logged Amazonian land, as they did in the mid-2000s. Brazil's trading partners should make deals contingent on its good behaviour. The agreement reached in June by the EU and Mercosur, a South American trading bloc of which Brazil is the biggest member, already includes provisions to protect the rainforest. It is overwhelmingly in the parties' interest to enforce them. So too for China, which is anxious about global warming and needs Brazilian agriculture to feed its livestock. Rich signatories of the Paris agreement, who pledged to pay developing ones to plant carbon-consuming trees, ought to do so. Deforestation accounts for 8% of global greenhouse-gas emissions but attracts only 3% of the aid earmarked for combating climate change.

If there is a green shoot in Mr Bolsonaro's scorched-earth tactics towards

the rainforest, it is that they have made the Amazon's plight harder to ignore—and not just for outsiders. Brazil's agriculture minister urged Mr Bolsonaro to stay in the Paris agreement. Unchecked deforestation could end up hurting Brazilian farmers if it leads to foreign boycotts of Brazilian farm goods. Ordinary Brazilians should press their president to reverse course. They have been blessed with a unique planetary patrimony, whose value is intrinsic and life-sustaining as much as it is commercial. Letting it perish would be a needless catastrophe. ■



亚马孙雨林的未来

临终看护

巴西有能力拯救地球上最大的雨林——或者摧毁它

尽管人类源起稀树草原，但长期以来一直依仗森林获得食物、燃料、木材和崇高的灵感。现在仍有15亿人靠森林为生，是森林维持着地方和地区的生态系统。对其余的62亿人来说，森林为气候变化提供了缓冲——虽然很脆弱而且正在失灵。现在，干旱、山火和其他人为的变化正在加重砍伐林木所造成的损害。在有着全球一半森林生物量的热带地区，自2015年以来林木覆盖面积减少的速度加快了三分之二。如果把热带雨林看作一个国家，这种面积收缩令它成为仅次于中国和美国的世界第三大二氧化碳排放国。

亚马孙流域的热带雨林面临的风险最高——不仅是因为它占到地球雨林面积的40%，而且是世界上10%至15%的陆地物种的家园。亚马孙雨林可能已濒临临界点，一旦过界，即使人们放下斧头，也无法停止或逆转南美洲这一自然奇观逐渐转变成像干草原那样的地方。巴西总统博索纳罗正在加速这一进程——他声称这是为了发展。他的政策可能引发的生态崩溃将在他自己国家的境内造成最严重的影响，因为亚马孙流域有80%都在巴西境内。但受影响的地区将远不止巴西。这一进程必须被遏止。

早在一万多年前人类在亚马孙定居以来，就一直在蚕食着当地的雨林。上世纪70年代以来，人们开始大规模采伐。过去50年里，巴西已将雨林原始面积的17%（超过法国国土面积）用于修道路和水坝、伐木、采矿、种大豆和畜牧。政府曾花费七年时间来减缓这种破坏，但因执法力度减弱和对过去毁林行为的赦免，到2013年破坏又重新加速。经济衰退和政治危机进一步削弱了政府的执法能力。现在博索纳罗兴高采烈地向雨林举起了圆锯。虽然国会和法院已经阻止了他取消亚马孙流域部分保护区的一些尝试，但他已经明确表示违规者不必担心，尽管选民选他是为了恢复法律和秩序。由于亚马孙流域七八成的砍伐都是非法的，造成的破坏已飙升至创

纪录水平。自博索纳罗1月上任以来，每周消失的森林面积超过两个曼哈顿。

亚马孙的不寻常之处在于它大部分的水资源可以自循环。随着雨林不断萎缩，自循环的规模也变小了，到了某个阈值会导致更多森林枯萎，所以几十年后萎缩的过程就不再需要外力推动了。气候变化导致雨林温度不断上升，使阈值每年都在降低。博索纳罗正在把雨林推向这一绝境。悲观主义者担心，如果雨林再消失3%至8%，失控退化的循环可能就会启动——而在博索纳罗当权之下这可能很快就会发生。有迹象表明悲观主义者可能没错。过去15年中，亚马孙遭受了三次严重的干旱。雨林火灾次数正在上升。

巴西总统对这些发现不予理会，就像他对待其他科学研究一样。他指斥外人虚伪——富国就不砍伐森林了吗？有时他也指责他们用环境教条作借口让巴西陷于穷困。“亚马孙是我们的。”这位总统近期大吼道。他认为如何处置巴西境内的亚马孙雨林是巴西自己的事。

但事实并非如此。在巴西之外，“森林死亡”还将直接伤害亚马孙流域的其他七个国家。它将减少沿安第斯山脉向南移动的空气中的水分，最远可影响到布宜诺斯艾利斯。如果巴西是在建坝拦堵一条真正的河流，而不是堵塞一条空中河道，下游国家可能视之为宣战。随着大量储存着碳的亚马孙雨林被焚烧和腐烂，到2100年全球可能会升温 0.1°C 。你可能会觉得这并不是很多，但《巴黎协定》的首选目标只允许进一步升温 0.5°C 左右。

博索纳罗的其他论点也经不起推敲。是的，富国已经将森林夷为平地。但巴西不应重蹈覆辙，而应该吸取它们的经验教训，比如说法国就已经在亡羊补牢，重新造林。猜疑西方腹黑仅仅是妄想症而已。知识经济中，隔离在森林里的遗传信息的价值远高于土地或枯木。即使不是如此，砍伐森林也不是发展的必然代价。2004年至2012年，巴西的森林砍伐放缓了80%，而其大豆和牛肉产量却有所增加。事实上，除了亚马孙雨林自身，巴西的农业可能是森林砍伐的最大受害者。2015年的干旱导致巴西中部马托格罗索州（Mato Grosso）种植玉米的农户损失了三分之一的收成。

鉴于所有这些原因，世界应该让博索纳罗明白他破坏公共资源的行为不会被容忍。在消费者施压之下，食品公司应该像在2005年前后那样，弃用在非法采伐的亚马孙土地上生产的大豆和牛肉。巴西的贸易伙伴应以其良好行为为条件与其开展交易。欧盟和以巴西为最大成员国的南方共同市场

(Mercosur) 6月达成的协议已经包含了保护热带雨林的条款。执行这些条款绝对符合各方利益。对全球变暖感到焦虑并需要巴西农业来喂养其牲畜的中国也该如此。《巴黎协定》的富裕签约国承诺向发展中国家付费来种植树木吸碳，它们也应履行承诺。森林砍伐占全球温室气体排放的8%，但对此的援助仅占全球气候变化援助的3%。

如果说博索纳罗对热带雨林的焦土战术中还有一丝希望的话，那就是它让亚马孙的困境更难被忽视——而且不仅仅是对外人。巴西农业部长敦促博索纳罗继续履行《巴黎协定》。如果导致其他国家因巴西不加控制地砍伐森林而抵制其农产品，最终可能会伤害巴西农民。巴西民众应该敦促他们的总统改变方向。他们有幸拥有地球上这独一无二的遗产，它不仅有商业上的价值，也有其本身内在的价值以及维系生命的价值。任其衰朽将带来一场不必要的灾难。 ■



Fooling Big Brother

Face off

As face-recognition technology spreads, so do ideas for subverting it

POWERED BY advances in artificial intelligence (AI), face-recognition systems are spreading like knotweed. Facebook, a social network, uses the technology to label people in uploaded photographs. Modern smartphones can be unlocked with it. Some banks employ it to verify transactions. Supermarkets watch for under-age drinkers. Advertising billboards assess consumers' reactions to their contents. America's Department of Homeland Security reckons face recognition will scrutinise 97% of outbound airline passengers by 2023. Networks of face-recognition cameras are part of the police state China has built in Xinjiang, in the country's far west. And a number of British police forces have tested the technology as a tool of mass surveillance in trials designed to spot criminals on the street.

A backlash, though, is brewing. The authorities in several American cities, including San Francisco and Oakland, have forbidden agencies such as the police from using the technology. In Britain, members of parliament have called, so far without success, for a ban on police tests. Refuseniks can also take matters into their own hands by trying to hide their faces from the cameras or, as has happened recently during protests in Hong Kong, by pointing hand-held lasers at CCTV cameras to dazzle them (see picture). Meanwhile, a small but growing group of privacy campaigners and academics are looking at ways to subvert the underlying technology directly.

Face recognition relies on machine learning, a subfield of AI in which computers teach themselves to do tasks that their programmers are unable to explain to them explicitly. First, a system is trained on thousands of examples of human faces. By rewarding it when it correctly identifies a

face, and penalising it when it does not, it can be taught to distinguish images that contain faces from those that do not. Once it has an idea what a face looks like, the system can then begin to distinguish one face from another. The specifics vary, depending on the algorithm, but usually involve a mathematical representation of a number of crucial anatomical points, such as the location of the nose relative to other facial features, or the distance between the eyes.

In laboratory tests, such systems can be extremely accurate. One survey by the NIST, an America standards-setting body, found that, between 2014 and 2018, the ability of face-recognition software to match an image of a known person with the image of that person held in a database improved from 96% to 99.8%. But because the machines have taught themselves, the visual systems they have come up with are bespoke. Computer vision, in other words, is nothing like the human sort. And that can provide plenty of chinks in an algorithm's armour.

In 2010, for instance, as part of a thesis for a master's degree at New York University, an American researcher and artist named Adam Harvey created "CV [computer vision] Dazzle", a style of make-up designed to fool face recognisers. It uses bright colours, high contrast, graded shading and asymmetric stylings to confound an algorithm's assumptions about what a face looks like. To a human being, the result is still clearly a face. But a computer—or, at least, the specific algorithm Mr Harvey was aiming at—is baffled.

Dramatic make-up is likely to attract more attention from other people than it deflects from machines. HyperFace is a newer project of Mr Harvey's. Where CV Dazzle aims to alter faces, HyperFace aims to hide them among dozens of fakes. It uses blocky, semi-abstract and comparatively innocent-looking patterns that are designed to appeal as strongly as possible to face

classifiers. The idea is to disguise the real thing among a sea of false positives. Clothes with the pattern, which features lines and sets of dark spots vaguely reminiscent of mouths and pairs of eyes (see photograph), are already available.

An even subtler idea was proposed by researchers at the Chinese University of Hong Kong, Indiana University Bloomington, and Alibaba, a big Chinese information-technology firm, in a paper published in 2018. It is a baseball cap fitted with tiny light-emitting diodes that project infra-red dots onto the wearer's face. Many of the cameras used in face-recognition systems are sensitive to parts of the infra-red spectrum. Since human eyes are not, infra-red light is ideal for covert trickery.

In tests against FaceNet, a face-recognition system developed by Google, the researchers found that the right amount of infra-red illumination could reliably prevent a computer from recognising that it was looking at a face at all. More sophisticated attacks were possible, too. By searching for faces which were mathematically similar to that of one of their colleagues, and applying fine control to the diodes, the researchers persuaded FaceNet, on 70% of attempts, that the colleague in question was actually someone else entirely.

Training one algorithm to fool another is known as adversarial machine learning. It is a productive approach, creating images that are misleading to a computer's vision while looking meaningless to a human being's. One paper, published in 2016 by researchers from Carnegie Mellon University, in Pittsburgh, and the University of North Carolina, showed how innocuous-looking abstract patterns, printed on paper and stuck onto the frame of a pair of glasses, could often convince a computer-vision system that a male AI researcher was in fact Milla Jovovich, an American actress.

In a similar paper, presented at a computer-vision conference in July, a

group of researchers at the Catholic University of Leuven, in Belgium, fooled person-recognition systems rather than face-recognition ones. They described an algorithmically generated pattern that was 40cm square. In tests, merely holding up a piece of cardboard with this pattern on it was enough to make an individual—who would be eminently visible to a human security guard—vanish from the sight of a computerised watchman.

As the researchers themselves admit, all these systems have constraints. In particular, most work only against specific recognition algorithms, limiting their deployability. Happily, says Mr Harvey, although face recognition is spreading, it is not yet ubiquitous—or perfect. A study by researchers at the University of Essex, published in July, found that although one police trial in London flagged up 42 potential matches, only eight proved accurate. Even in China, says Mr Harvey, only a fraction of CCTV cameras collect pictures sharp enough for face recognition to work. Low-tech approaches can help, too. “Even small things like wearing turtlenecks, wearing sunglasses, looking at your phone [and therefore not at the cameras]—together these have some protective effect”. ■



愚弄“老大哥”

变脸

人脸识别技术在普及，颠覆它的办法也在增加

人工智能（AI）的发展推动了人脸识别系统四处开花，不断扩展。社交网络Facebook利用这种技术在用户上传的照片中标记人物。新型智能手机可以刷脸解锁。一些银行用这项技术验证交易。超市用它防范未成年人买酒。广告商评估消费者看到广告牌内容时的反应。美国国土安全部（DHS）估计，到2023年，97%的出港航空乘客将通过人脸识别验证身份。人脸识别摄像头网络是中国在新疆建立的警察统治的一部分。英国一些警察部门已经在测试用这一技术开展大规模监视，在街头发现罪犯。

然而，对这项技术的强烈反对情绪也在发酵。包括旧金山和奥克兰在内的一些美国城市的政府已禁止警察等机构使用它。在英国，议员呼吁禁止警察测试该技术，但尚未成功。抗议者也可以自己动手解决问题，比如在摄像头面前遮掩面部，或者像最近香港的抗议活动那样，用激光笔照射并迷惑摄像头（见图）。与此同时，人数不多但不断壮大的隐私倡导者和学者正在寻找能直接颠覆底层技术的方法。

人脸识别依赖于机器学习，这个AI的子领域让计算机自己教自己执行程序员无法明确解释的任务。首先，用成千上万张人脸训练系统，在系统正确识别出人脸时予以奖励，未能识别时予以惩罚，以此教会系统区分包含和不包含人脸的图像。一旦明白了人脸是什么样的，系统就可以开始区分不同的面孔。具体方法因算法而异，但通常是用数学方法来表示面部的关键解剖特征点，例如鼻子相对于其他面部特征的位置，或两眼间距。

这类系统在实验室测试中可以实现极高的准确率。美国标准制定机构国家标准与技术研究院（NIST）的一项调查发现，2014年至2018年间，人脸识别软件将一个已知人物的图像与数据库中此人的图像相匹配的能力从96%提高到了99.8%。但因为机器是自学的，它们得到的视觉系统是定制的。

换句话说，计算机视觉与人类视觉完全不同，这使得算法中存在大量漏洞。

例如，2010年，美国研究员、艺术家亚当·哈维（Adam Harvey）在纽约大学做硕士学位论文时，创建了“计算机视觉迷惑”（CV Dazzle），就是用化妆来愚弄人脸识别系统。它会用鲜艳的色彩、高对比度、渐变阴影和不对称的造型来混淆算法对何为人脸的假设。对于人来说，化妆后的脸显而易见还是人脸。但计算机——或者至少是哈维的研究针对的算法——就被迷惑了。

夸张的妆容能糊弄机器，但很可能会更多地吸引其他人的关注。“超级脸”（HyperFace）是哈维的最新研究项目。CV Dazzle主要是改变脸部特征，而HyperFace是要将人脸隐藏在数十张假脸中。它用块状、半抽象和相对看似平常的图案来尽可能地吸引人脸识别软件的注意。原理就是在大量“假阳性”中隐藏真实面孔。现在市场上已经可以买到带线条和黑点、有点像嘴巴和双眼的图案的衣服了（见照片）。

香港中文大学、印第安纳大学伯明顿分校（Indiana University Bloomington）和中国大型信息技术公司阿里巴巴的研究人员在2018年发表的一篇论文中提出了一个更精妙的想法。这里用到的是一个配有微型发光二极管的棒球帽，可将红外线光点投射到佩戴者的脸上。人脸识别系统中使用的许多摄像头对部分红外线光谱很敏感。而红外线对人眼没有影响，因此是理想的隐蔽手段。

在针对谷歌开发的人脸识别系统FaceNet的反识别测试中，研究人员发现适量的红外线照明可以有效地防止计算机发现它所看到的是人脸。更复杂的反识别手段也可能实现。研究人员搜索出在数学上与一位同事的面孔相似的人脸，对二极管进行精细控制，就能让FaceNet把这位同事认成另一个人，成功率达70%。

训练一种算法来欺骗另一种算法被称为对抗性机器学习。这是一种富有成效的方法，所创造出来的图像在人眼看来并无意义，却能误导计算机视

觉。在2016年发表的一篇论文中，匹兹堡的卡内基·梅隆大学和北卡罗来纳大学的研究人员把看似平常的抽象图案打印在纸上，然后粘贴在眼镜架上，就能经常让计算机视觉系统以为戴上镜架的一位男性AI研究人员是美国女演员米拉·乔沃维奇（Milla Jovovich）。

在7月举行的一次计算机视觉会议上发表的一篇类似的论文中，比利时鲁汶天主教大学（Catholic University of Leuven）的一组研究人员骗过的是人体识别系统而非人脸识别系统。他们描述了一种由算法生成的40厘米见方的图案。在测试中，一个人只要拿着一块带有这种图案的纸板就足以令计算机监视系统对他视而不见——在人类保安看来当然还是清清楚楚。

研究人员自己也承认，所有这些方法都有局限性。特别是大多数方法只针对特定的识别算法，这限制了它们的实用性。哈维说，令人高兴的是，虽然人脸识别正在普及，但它还没有无处不在，也并非无懈可击。埃塞克斯大学（University of Essex）的研究人员在7月发表的一项研究中发现，尽管在伦敦的一次警方测试中标记了42次可能匹配，但只有8次是准确的。哈维表示，即使在中国，也只有一小部分监控摄像头能够搜集到清晰度可满足人脸识别要求的图像。没太多技术含量的对抗方法也有用处。“即使是像穿高领毛衣、戴太阳镜、看着手机（这样就不会望向摄像头）这些小细节，结合起来也有一定的保护作用。”■



Innovation in insurance

Run for cover

The insurance industry is stuck in the 20th century. That leaves swathes of the economy dangerously unprotected

EVERY MORNING, from a room in Birmingham, some of the world's largest firms are briefed by phone on the weather in store. As continents, arrows and weather fronts flicker across their screens, meteorologists at The Weather Company (TWC) help British grocers decide whether to stock soups or salads, and Chinese energy firms when to operate wind turbines. Yet such sessions are getting rarer. Computed by 172 models crunching 400 terabytes of data—33 times the amount Twitter stores every 24 hours—most of TWC'S 25bn daily forecasts now feed directly into customers' computer systems.

Big data has turned weather into a big business. TWC, which was bought by IBM in 2016, serves governments, media channels and 40% of the world's airlines. But many property insurers, whose fortunes rely on forecasting climate-induced losses, are still learning how to use the information, says Leon Brown of TWC. Their cluelessness is symptomatic of a problem for all insurance lines, including casualty, life and health. Reinsurance firms (which insure the insurers) and Asian insurance champions are almost the only innovators in an industry that is moving at a glacial pace.

Meanwhile the risks insurers are meant to cover are becoming more severe and unpredictable. Since the 1980s average annual losses from natural disasters have more than sextupled in real terms (see chart). Other risks are variations on old themes, such as pandemics or the fallout from increasing protectionism. And new ones have emerged. Ageing populations push up health-care costs. Cyber-attacks can shut power plants, paralyse firms and siphon fortunes from banks' coffers.

Insurable assets are becoming harder to value and protect, too. In 2018 “tangibles”, such as buildings and equipment, accounted for just 16% of the value of the S&P 500. “Intangibles”, such as intellectual property and reputation, accounted for the other 84%. Meanwhile insurers’ products and processes are losing touch with 21st-century life, from the way populations work to the way they drive. A generation born digital expects speed and style, which do not come naturally to the centuries-old trade.

Insurers say they have read the memo. AXA, the world’s second-largest by premiums written, has earmarked millions for tech upgrades and designing services that complement its policies, says Guillaume Borie, its innovation chief. But the sector comes second to last in an innovation ranking by BCG, a consultancy. No insurer ranks among the world’s top 1,000 public companies by amount invested in research and development. Insurers allocate an average of 3.6% of their revenue to computing technology—about half the share that is typical for banks. In a study of 500 innovation topics across 250 firms Ninety, a consultancy, finds that many insurers are working on the same narrow set of ideas. Some of the noisiest, such as blockchain, are the least productive.

Digital entrepreneurs have spied an opening. The first quarter of 2019 saw a record 85 “insurtech” deals totalling \$1.42bn, according to Willis Towers Watson, a broker. Some focus on the consumer, aiming to simplify quotations, make policies clearer and develop snazzy apps. Some seek to make internal processes cheaper, faster and fairer, from pricing risks to paying compensation. The most ambitious craft policies that insure against new threats, match modern lifestyles or do more than just make payouts.

Slice, a startup in New York, offers policies to flat- or ride-sharers that cover single items for a few days. Brooklyn-based Trupo provides disability insurance to “gig” workers, from makeup artists to Uber drivers. Bought by Many, a British startup, caters to people with niche possessions, for example

model railways or exotic pets.

Small and specialist incumbents are seeking to insure businesses against new risks, such as environmental liability or terrorism. In April a group led by Beazley, a 33-year-old British firm, launched a policy covering reputational damage. Using share-price drops as the trigger, it provides compensation and a crisis-management package. It prices risk by scraping information from social media and analysing the impact of past meltdowns. On June 25th a group of underwriters at Lloyd's of London launched a £53m (\$66m) facility designed to speed up product development.

But spotty innovation does not make up for a stagnating core. In theory, startups should provide valuable additions to insurers' toolbox. Yet incumbents often dismiss insurtechs as "cute" little things that fail to grasp complexities, says Heidi Lawson of Cooley, a law firm. Administrative costs absorb 20-50% of incumbents' premiums. A quote for home coverage is often a multiple-choice hell, with cascading options depending on such matters as whether you own a shed or keep bees. Businesses can wait months for a policy's final wording. "It's just so depressing," says an industry veteran.

The growing abundance of data means customers increasingly think they can do without insurance altogether. The portion of the economy that is covered is shrinking. In developed countries total non-life insurance premiums have grown by 1.2% a year on average since 2008; life has seen an average decline of 0.5%. Despite increased take-up by rising middle classes in emerging markets, global premiums grew in real terms by only 1.3% annually over the period, to \$5.2trn. The world economy managed twice that.

The result is a "protection gap". On average, over the past ten years, only 30% of catastrophe losses were covered by insurance, according to Swiss

Re, a reinsurer. The balance, worth some \$1.3trn, was borne by individuals, firms and governments. According to Capgemini, a consultancy, less than a quarter of businesses feel their insurance coverage is adequate. That fell below 15% for personal lines, and even further for health, cyber- and political risks.

A central reason for insurers' caution is the fear that regulators will punish them for unwittingly taking on bad risks—or because some new, AI-powered underwriting method is found to be rejecting or overcharging consumers from certain ethnic groups or neighbourhoods. That creates a culture of “trying not to change anything, not to break things”, says Dan White of Ninety. Moreover, waves of consolidation mean insurers have disconnected datasets and computer systems, making it hard to innovate or to absorb successful startups.

Other weaknesses are less excusable. Mr White describes a typical sequence. Starting from the premise that innovation is good, insurers try to make it “part of the DNA”. Facing internal resistance, those pressing for change shift to an “arm’s-length model”. Many insurers have set up innovation “labs”, “studios” or “garages” where pricey data scientists are told to come up with cool new pilots. Located separately, they operate under different rules: they have beer fridges and pool tables, and staff wear jeans and commute on scooters.

Then staff at the parent firm get disgruntled with their rule-breaking peers—who, for their part, have not been given the budget to build anything sizeable. So the parent firm’s return on investment is poor. Eventually the labs are closed or mothballed. Firms then give their money to venture-capital funds, run internally or by third parties. But these are designed to bet on startups, not to perfect processes at lumbering giants. Three of Europe’s top six insurers have recently frozen or shrunk their main technology-investment arms.

Insurers' apathy is energising reinsurers to innovate in their stead. As the primary insurers that do their distribution lose touch with the market, the reinsurers feel cut off. Reinsurers are also less strangled in red tape. Munich Re, the world's largest, is in front. It has hired 200 data scientists and trained over 100 experts internally, and crowdsources ideas from staff. Good ideas are fast-tracked; duds are killed quickly, says Tom Van den Brulle, its innovation chief. Last year it paid \$250m for relayr, a startup in Berlin that uses sensors to extract data from industrial machinery.

Reinsurers' greatest breakthrough so far is probably "parametric insurance". Rather than compensating for losses reported ex-post, such policies pay out a pre-agreed sum when a clearly defined parameter, such as rainfall or seismic magnitude, reaches a pre-agreed threshold. Since debuting in the 1990s, parametric insurance has mostly been confined to the reinsurance of catastrophic events. But the spread of internet-connected objects creates the potential for it to be applied to previously uninsurable risks. Gerry Lemcke of Swiss Re, which offers parametric insurance against pandemics, flight delays and hurricane damage to coral reefs, sees it as working rather like derivatives in finance, which have a strike price. Customers receive their payouts straight away; insurers save the time and cost of adjusting claims.

Reinsurers could soon shake up the market further. In recent years third-party capital providers such as pension and sovereign-wealth funds have sought to deploy vast sums in reinsurance markets. That has prompted reinsurers to set up money-management platforms, akin to betting interfaces, where investors can punt on various classes of risk. As a result reinsurers are keen to take on a broadening range of risks directly, by seeking to work with insurtechs and cutting primary insurers out altogether. "They're calling us," says Ms Lawson. "They're looking for deals."

Asian giants are also pulling ahead of Western peers. Pia Tischhauser of

BCG reckons they are “15 years ahead” on innovative ways to price risk. In China Ping An, which in the 30 years since its founding has become the world’s most valuable insurer, employs 23,000 researchers, spends 1% of revenue on innovation and has over 12,000 patent applications. Its average underwriting time has fallen from five days to 15 minutes; it uses AI to recruit and train its 1.5m-strong army of agents, who are 50% more efficient than the competition. Yet in November its chief executive ruled out major international acquisitions, preferring to focus on domestic expansion.

For Western incumbents, the greater risk may lie closer to home. Rumours are growing that Big Tech is gearing up to enter insurance. Amazon, Apple and Google have troves of data and idle capital; they lack underwriting skills but can easily lure talent. And they can hope for handsome profits: BCG calculates that the top quarter of insurance firms returned a median 24% to shareholders in 2018. Scaremongering, sceptics say. But an adviser to tech titans is adamant. “We’re seeing what’s happening behind the scenes. They’re on the path.” ■



保险业创新

寻求庇护

保险业的脚步还停留在20世纪，导致众多经济领域没有保障，风险高涨

每天早晨，在伯明翰的一间屋子里，全球最大的一些公司通过电话会议来了解未来的天气状况。气象公司（The Weather Company，以下简称TWC）的气象学家根据面前屏幕上闪烁各大洲、各种箭头和天气锋面的情况，帮助英国食品连锁店决定是否增加汤品或沙拉的备货，帮助中国能源公司决定何时启动风力发电机。不过，这样的电话会议越来越少了。

TWC的172个模型每天处理400TB的数据（是推特每24小时数据存储量的33倍），做出250亿次天气预测，其中绝大部分现在都直接输入客户的计算机系统。

大数据已将气象变为一门大生意。TWC于2016年被IBM收购，为政府、传媒和全球40%的航空公司提供服务。但TWC的利昂·布朗（Leon Brown）表示，众多财产保险公司——其命运有赖于对气候引发的损失的预测——还在学习如何利用这些信息。它们的毫无头绪显现出包括意外险、寿险和健康险在内的所有险种都存在的一个问题。保险行业变化就像冰川移动那样缓慢，再保险公司（为保险公司提供保险的公司）和亚洲的知名保险公司几乎是这个行业中唯一的创新者。

与此同时，保险公司要承保的风险正变得更严峻、更不可预测。上世纪80年代以来，自然灾害造成的年均损失的实际价值增长了五倍多（见图表）。其他风险是传统险源的变体，如流行病或保护主义的不良影响。同时还出现了新的险源。人口老龄化推高了医疗保健成本。网络攻击可以关停发电厂，让企业瘫痪，并从银行金库里转走财富。

可投保资产也越来越难估值和保护。2018年，建筑和设备等“有形资产”仅占标准普尔500指数价值的16%。知识产权和声誉等“无形资产”占到84%。与此同时，保险公司的产品和流程正在与21世纪人们的生活脱节——从大

众的工作方式到驾车方式都是如此。出生于数字时代的一代人既要速度又要格调，而这两者都不是几百年历史的保险行业天生就具备的。

保险公司说它们已经注意到这些变化。保费收入居全球第二的安盛集团（AXA）的首席创新官纪尧姆·波利（Guillaume Borie）表示，安盛已经拨款数百万美元用于技术升级和设计保单相关服务。但保险业在波士顿咨询公司的创新排名中位居倒数第二。研发投入排名全球前1000位的上市公司中没有一家是保险公司。保险公司对计算技术的投入平均占其收入的3.6%——大约是银行平均投入的一半。在一项针对250家公司的500项创新课题的研究中，咨询公司Ninety发现众多保险公司的创新集中在少数几个方面。区块链等一些最热闹领域的成效是最差的。

数字企业家已经发现了契机。保险经纪公司韦莱韬悦（Willis Towers Watson）表示，2019年第一季度共达成了85笔“保险科技”交易，交易总额14.2亿美元，创历史新高。其中一些交易专注于消费者，目标是简化报价，让保单更清晰，并开发时髦的应用。另一些交易力求让从定价风险到理赔的内部流程变得更便宜、快捷和公平。最雄心勃勃的交易打造新型保险产品，投保新型威胁、适应现代生活方式，或是实现赔付之外的其他功能。

纽约的创业公司Slice为合租公寓或拼车的人提供可在几天内保障单项风险的产品。总部位于布鲁克林的Trupo公司为化妆师和优步司机等“零工”工人提供残障险。英国创业公司Bought by Many专门满足拥有铁路模型或另类宠物等特殊财产的人的需求。

既有的小型、针对专门领域的保险公司正在努力为企业提供应对新风险的保障，如环境责任或恐怖主义等。今年4月，已成立33年的英国公司Beazley为首的一些小型保险公司推出了一个涵盖名誉损失保障的产品。这个产品以股价下跌为触发条件，提供补偿和危机管理成套方案。它通过从社交媒体上捕获信息并分析过去股价大跌的影响来为风险定价。6月25日，伦敦劳合社（Lloyd's）的一些保险商推出了一个5300万英镑（6600万美元）的基金以加速产品开发。

但是，质量参差不齐的创新无法弥补核心的停滞不前。从理论上讲，创业公司应该为保险公司的工具箱提供有价值的补充。但是，律师事务所 Cooley 的海蒂·劳森（Heidi Lawson）表示，既有保险公司经常把“保险科技”视为只是“好玩”的小打小闹而不能解决复杂问题。行政费用占到了既有保险公司保费收入的20%至50%之多。房屋险的报价单上通常有一大堆多项选择题，从院子里有没有小棚屋到有没有养蜜蜂等各种问题扑面而来，令人抓狂。要确定一份保单的最终条款和措辞，企业有时要等上几个月。“这真是令人沮丧。”一位业内资深人士表示。

越来越丰富的数据让客户越来越认为他们可以完全不上保险。经济中投保的部分正在萎缩。2008年以来，发达国家非寿险保费总额平均每年增长1.2%；寿险平均每年下降0.5%。尽管新兴市场中产阶级人数的增长起到了拉动作用，但这一时期全球保费收入实际年增长率仅为1.3%，总额5.2万亿美元，而全球经济增速是其两倍。

结果出现了“保障差距”。根据瑞士再保险公司（Swiss Re）的数据，过去十年中，平均只有30%的巨灾损失有保险承保。其余价值约1.3万亿美元的损失由个人、企业和政府承担。据咨询公司凯捷（Capgemini）称，只有不到四分之一的企业认为它们有足够的保障。在个人保险上，这一比例降至不到15%，而健康、网络和政治风险保障不足的情况还更严重。

保险公司谨慎行事的一个主要原因是担心受到监管机构的惩罚——可能是因为无意之中承担了不良风险，或者因为一些人工智能驱动的新承保方式被指摘把来自某些少数族裔或社区的消费者排除在外或对他们收费过高。Ninety的丹·怀特（Dan White）说，这创造了一种“不做改变、不打破常规”的文化。此外，合并浪潮导致保险公司拥有相互隔离的数据集和计算机系统，让创新或收购成功的创业公司变得更难。

其他方面的因循守旧则缺乏充分的理由。怀特描述了一个典型的过程。保险公司从创新是好的这个前提出发，试图将创新“融入其DNA”。在遭遇内部阻力后，那些迫切要求变革的企业转向“独立模式”。许多保险公司建立了创新“实验室”、“工作室”或“车库”，让拿着高薪的数据科学家做出酷炫

的新研究项目。这些创新机构与母公司设在不同地点，按照不同的规则运作。前者有啤酒冰箱和台球桌，员工穿着牛仔衣裤、踩着滑板车上下班。

然后，母公司的人对他们那些不守规矩的同事感到不满，而这些同事又没有拿到足够的预算来做什么大事。因此母公司的投资回报很差。最终实验室被关闭或暂停。然后，公司将资金投入风险投资基金，由内部或第三方运作。但这些都是在对创业公司下注，而不是为了给行动迟缓的大企业完善流程。欧洲六大保险公司中有三家最近暂停或缩小了它们的主要技术投资部门。

保险公司的无动于衷促使再保险公司挺身创新。由于负责分销的原保险公司与市场脱节，再保险公司也感到自己与市场隔绝。再保险公司受繁文缛节的束缚也更少。世界上最大的慕尼黑再保险公司（Munich Re）就走在最前面。它雇用了200名数据科学家，在内部培训了100多名专家，并从员工那里集思广益。好的想法得到快速实施；无效的哑弹很快被弃之不用，公司的创新主管汤姆·范登布鲁尔（Tom Van den Brulle）说。去年，它斥资2.5亿美元收购了柏林一家使用传感器从工业机械中提取数据的创业公司relayr。

到目前为止，再保险公司的最大突破可能是“参数保险”。这种保单不是在事后赔付报称的损失，而是在明确定义的参数（如降雨量或地震震级）达到预先商定的阈值时支付预先约定的金额。参数保险在上世纪90年代首次推出，主要限于灾难事件的再保险。但联网物品的普及让它可能被应用于以前无法承保的风险。瑞士再保险针对流行疾病、航班延误和飓风破坏珊瑚礁事件提供参数保险，该公司的格里·勒莫克（Gerry Lemcke）认为参数保险的运作方式与约定了履约价格的金融衍生品相似。客户可以立即收到赔付，保险公司则节省了评定赔偿的时间和成本。

再保险公司可能很快会进一步撼动市场。近年来，养老基金和主权财富基金等第三方资本提供者试图在再保险市场上配置巨额资金。这促使再保险公司建立了类似于投注界面的资金管理平台，投资者可以在这种平台上投资各类风险。因此，再保险公司非常希望完全抛开原保险公司，与保险科

技公司合作，直接承保更广泛的风险。“他们主动打电话找我们，”劳森说，“他们正在寻求合作。”

亚洲保险巨头也跑到了西方同业的前面。波士顿咨询的皮亚·蒂什豪瑟（Pia Tischhauser）认为，亚洲巨头在风险定价的创新上“领先了15年”。在中国，成立30年的平安已成为全球最具价值的保险公司，拥有2.3万名研究人员，把1%的收入用于创新，有1.2万多项专利申请。它的平均承保时间从五天减少到15分钟；它用AI来招募和培训其150万之众的庞大代理人队伍，他们的效率比竞争对手高出50%。然而在去年11月，其首席执行官表示没有计划进行重大国际收购，而更倾向于关注国内扩张。

对于西方既有保险公司来说，更大的风险可能在家门口。大型科技公司准备进入保险市场的传言愈演愈烈。亚马逊、苹果和谷歌拥有大量数据和闲置资金；它们缺乏承保技能，但很容易吸引人才。而且它们能指望从中获得可观的利润：据波士顿咨询计算，2018年排名前四分之一的保险公司的股东回报率中位数为24%。怀疑论者认为这是危言耸听。但科技巨头的一名顾问态度坚定。“我们已经看到幕后发生的事。它们已经在朝这个方向走了。”■



Free exchange

Keynes and gains

Should egalitarians fear monetary stimulus?

JOHN MAYNARD KEYNES once fantasised about a world of permanently low interest rates. In the final chapter of “The General Theory” he imagined an economy in which abundant available capital causes investors’ bargaining power, and hence rates, to collapse. In such a world markets would reward risk-taking and entrepreneurial talent, but not the mere accumulation of capital. The result would be the “euthanasia of the rentier”.

That low rates could feature in a leftish Utopian vision might come as a surprise today. It is commonly argued that a decade of monetary-policy stimulus has filled the pockets of the rich. Low rates and quantitative easing (QE) are said to have sent stock and bond markets soaring, thereby exacerbating wealth inequality. They have also boosted house prices, adding to intergenerational tension. A glance at financial markets suggests more of the same is coming: long-term rates have tumbled this year in anticipation of monetary easing, while stockmarkets have boomed.

Central bankers have defended their policies by arguing that, without loose money, unemployment would have been much higher, badly hurting the poor. That is true. But the effect of monetary stimulus on financial markets has nonetheless angered left and right alike. Judy Shelton, one of President Donald Trump’s new picks for the board of the Federal Reserve, has blamed central banks for “exacerbating income inequality”. She has called for a return to the gold standard. The left, meanwhile, prefers fiscal loosening such as giving money to the poor, or fiscal-monetary hybrids such as the “people’s QE” once advocated by Jeremy Corbyn, the leader of Britain’s Labour Party, under which the central bank would finance government

investment.

Who is right? Do low rates spell euthanasia or euphoria for those who live off capital? And should concerns about inequality determine which policy lever to pull in a downturn?

A starting-point is that falling interest rates make all streams of future income more valuable. That includes dividends from stocks, coupons on bonds and homeowners' privilege of being able to occupy their houses without paying rent. But the resulting increases in asset values can be captured easily only by people who are willing to change their plans. Imagine a homeowner. A higher house price is of little benefit to him if he has no desire to sell and move. Similarly, a bondholder about to retire may need the steady stream of coupon payments the bond provides. A capital gain from selling bonds today might fund a lavish around-the-world cruise, but blowing through retirement funds is unlikely to be prudent.

Now consider a penniless millennial. She sees no capital gain when low rates boost asset prices. But she does have assets that will yield income in the future: education and skills. Were this human capital valued on financial markets, it too would rise in value when interest rates fall. She too could change plans and spend more today, but by borrowing cheaply rather than selling assets.

A recent paper by Adrien Auclert of Stanford University sets out a framework for judging who wins and who loses from changes in monetary policy. Three channels must be considered. One concerns the impact of lower rates on the macroeconomy—the effect trumpeted by central banks. Another concerns the higher inflation that lower rates might cause. That hurts creditors and benefits debtors, who see the real value of their obligations shrink.

The third channel concerns asset prices. It is wrong to claim that asset-

holders generally benefit when rates fall, says Mr Auclert. What matters is the full picture of an individual's assets and liabilities. The latter he defines to include future consumption plans (such as whether the homeowner wants to stay in his house, or whether the retired person seeks to maintain a steady standard of living). Only by looking at an individual's balance-sheet in full can you judge whether he wins or loses from low rates—or whether, in the jargon, he has “unhedged interest-rate exposure”.

The crucial question is whether someone's assets and liabilities mature at different points in time. People with short-dated assets but long-dated liabilities—for example a saver with lots of cash in the bank to fund a purchase ten years hence—do badly when rates fall. They are the euthanised “rentiers”, who must save more to fund spending later (a rare example of lower rates depressing consumption). But those who wish to spend today and hold long-dated assets, such as long-term government bonds, do well.

What does this framework imply for rich and poor? Mr Auclert presents some evidence that Americans who are older, or whose incomes are higher, tend to be on the losing end of asset-price effects when rates fall. But he says it is hard to measure the effect precisely. A recent working paper by Panagiota Tzamourani of the Bundesbank finds that within the euro area, average unhedged interest exposure varies a lot between countries, seemingly in line with the prevalence of floating-rate mortgages. But Ms Tzamourani also finds that younger households and those with low net wealth benefit from lower rates almost everywhere.

That seems to turn conventional wisdom on its head. Far from helping the well-heeled, the changes to financial markets induced by low rates could be hurting them, just as Keynes argued. Some might object that they do not deserve the hit: surely those who save in cash for future consumption are more responsible than those who wish to borrow and spend? Keynes would have retorted that in a world awash with capital, extra saving does

not benefit society. In a slump it is harmful. In any case, if fiscal stimulus is preferred to low interest rates, taxpayers would end up with debts instead.

Monetary stimulus may not help the poor as much as deficit-financed welfare or progressive tax cuts. Structural problems in the economy, such as market power, may allow the rich to earn high returns even as rates fall. But egalitarians—and those without wealth—probably need not fear doveish central banks. ■ ■



自由交流

凯恩斯与收益

平均主义者应该担心货币刺激措施吗？

凯恩斯曾幻想有一个永远低利率的世界。在其著作《通论》的最后一章，他设想一个经济体拥有充足的资本，导致投资者丧失议价能力，进而令利率保持在低位。在这样的世界中，市场会奖励有冒险和创业精神的人才，而非仅仅积累资本的人。结果将是“食利者的安乐死”。

低利率竟然出现在左派乌托邦式愿景中，在今天看来可能出人意料。人们普遍认为，十年的货币政策刺激已经让富人大发其财。据称，低利率和量化宽松（QE）令股票和债券市场飙升，加剧了财富不平等。房价也因此被推高，导致社会代际矛盾加深。看一看金融市场，似乎会感觉这种情况将愈演愈烈：由于预期会出台货币宽松政策，长期利率今年已大幅下跌，而股票市场则兴旺蓬勃。

各国央行官员为自己的政策辩护，称如果没有宽松的资金，失业率会高很多，令穷人的处境更糟糕。的确如此。但货币刺激政策对金融市场的影响却仍然同时触怒了左右两派。特朗普拟提名出任美联储理事的朱迪·谢尔顿（Judy Shelton）指责各国央行“加剧了收入不平等”。她呼吁重返金本位制。与此同时，左派主张财政宽松政策，例如向穷人提供补助，或者财政与货币并举的措施，如英国工党领袖杰里米·科尔宾（Jeremy Corbyn）曾提倡的“人民的量化宽松”，让英国央行为政府投资提供资金。

孰对孰错？对于靠资本过活的人来说，低利率是安乐死还是兴奋剂？对不平等的忧虑是否该左右在经济低迷时期该使用何种政策杠杆？

首先要考虑的是，利率下降令所有未来的收入来源更有价值。这包括股票分红、债券息票利息，以及房主无需支付房租便可占用房屋的特权。但是，只有愿意改变计划的人才能轻易获取由此带来的资产增值。想象有一位房主，如果他不想出售物业并搬出去，房价上升对他并没多少实际好

处。同样，即将退休的债券持有人可能需要债券稳定支付息票利息。现在出售债券的资本收益可能够支付一趟豪华邮轮环球旅行，但挥霍退休资金可不明智。

接下来，想象有一位一贫如洗的千禧世代女士。当低利率推高资产价格时，她并没有任何资本收益。但她拥有未来可产生收入的资产：教育和技能。假如金融市场对这种人力资本做估值的话，当利率下降时其价值也会上升。她也可以改变计划，增加眼下的开销，但途径是低息借款而非出售资产。

斯坦福大学的阿德里安·奥克莱特（Adrien Auclert）近期在论文中提出了一个框架，来判断货币政策转变中的输家和赢家。他认为必须考虑三个方面。第一个涉及利率下降对宏观经济的影响，这也是央行大肆宣扬的。另一个关系到利率下降可能导致的通胀上升。这对债权人不利但对债务人有利，后者可以看到自己负担的债务的实际价值缩水。

第三个方面涉及资产价格。奥克莱特表示，认为资产持有人通常会在利率下降时受益的看法是错的。重要的是个人资产与负债的整体状况。按他的定义，个人负债包括未来的消费计划（例如房主是否想住在自有房产中，或退休人士是否想努力维持稳定的生活水平）。只有通过整体考察个人的资产负债表，才能判断此人因低利率受益还是受损——或者用行话来说，是否有“未对冲的利率风险敞口”。

关键问题是个人资产和负债是否在不同时间点到期。对于拥有短期资产而背负长期负债的人来说，比如在银行存有大量现金要为十年后的一宗购买做准备的储蓄者，利率下降是不利的。他们是被实施安乐死的“食利者”，他们必须为日后的支出存更多钱（这是一个少有的低利率抑制消费的例子）。但那些想现在花钱而持有长期资产（如长期政府债券）的人则能从低利率中获益。

这个框架对富人和穷人各有什么意义？奥克莱特提供了一些证据，证明年龄较大或收入较高的美国人在利率下降影响资产价格时往往是输家。但他

表示很难准确衡量冲击有多大。德国央行的帕娜吉奥塔·赞莫拉尼（Panagiota Tzamourani）最近发表的一篇工作论文发现，在欧元区内，各国的平均未对冲的利息风险差异很大，似乎与浮动利率抵押贷款的普遍程度对应。但是，赞莫拉尼又发现，几乎在所有国家，年轻家庭和净财富较低的家庭都会因低利率获益。

这似乎有违传统的观点。正如凯恩斯所言，低利率给金融市场带来的变化根本不利于富裕阶层，反而可能伤害他们。有些人可能会抗议说，他们不该受到这样的伤害：存钱以备未来消费的人难道不比那些想借钱花的人更有责任感？而凯恩斯会反驳说，在一个资本充沛的世界里，过多储蓄对社会并无好处，在经济衰退时更是有害。无论如何，假如决策者倾向使用财政刺激措施而非低利率，纳税人最终会负债累累。

相比用赤字财政支撑的福利或累进减税措施，货币刺激政策对穷人的帮助可能没那么大。经济中的结构性问题，如市场支配力，可能令富人即使在利率下降时也能获得高回报。但平均主义者以及穷困阶层或许并不需要害怕鸽派的央行。 ■



Free exchange

Terminal degrees

The meaning of a debate about the cost of higher education

IN MANY WAYS the flood of bold, progressive policy proposals coursing across America's political landscape began in 2015, when Bernie Sanders, an independent senator from Vermont, put a plan to make higher education at public universities free at the centre of his upstart campaign for the presidency. Then the idea seemed radical, even gimmicky. Now it is noteworthy when leading Democrats oppose the notion. Yet some do, for example Pete Buttigieg, the mayor of South Bend, and their arguments still pack a punch. Why indeed should taxpayers' money be spent on the children of the rich rather than more generous financial aid for the poor? The Democratic debate over free college is in fact part of a deeper disagreement about how best to structure a welfare state.

Across much of the rich world, a public-university education is free or nearly free, apart from the cost of books and living expenses. (Danish students even receive a stipend to help pay for such things.) But those in America and Britain pay tuition fees which are high and growing higher. In Britain, a change in the law in 1998 allowed public universities to begin charging. The average tuition fee at four-year public universities in America has roughly tripled over the past three decades after adjusting for inflation. Rising fees represent an evolution towards a means-tested approach to covering the rising cost of higher education, which has gone up steadily all around the world. Places like America and Britain pass some of this increase on to students in the form of higher fees, with the understanding that poorer students will receive financial aid while richer ones will bear the full tuition bill.

To many politicians in these places, this seems just. Unlike primary or secondary education, university is a minority pursuit in most advanced economies. Across the OECD, a club of mostly rich countries, only about 45% of adults aged 25 to 34 have some post-secondary education. Those people tend to come from richer families and to earn more than the population as a whole. A universal programme that mostly benefits a well-off not-quite-half of the country would seem a strange aspiration for egalitarian-minded politicians (though less strange for those desiring young people's votes). Better to target aid at those from poorer families.

An economic approach points in a similar direction. A post-secondary education represents an investment in a person's future earning power, thanks to the skills obtained in school, the connections and credentials gathered along the way, and the signal a tertiary degree provides to employers. Since students reap most of the benefit, they should bear the cost (borrowing against future earnings if need be), lest subsidies encourage people to spend years at university that might be better allocated elsewhere.

Against this, supporters of free university marshal a number of practical arguments. University attendees are more likely to come from wealthier families precisely because university is not free, they say. There is something to this. Higher tuition charges do push some people away from post-secondary education. Several analyses of the introduction of tuition fees in Britain found a negative effect on university attendance. A report produced by the Institute for Fiscal Studies, a think-tank, estimated that an increase of £1,000 (\$1,243) in tuition fees is associated with a decline of 3.9 percentage points in the rate at which recent school-leavers choose to go on to university. Work by Thomas Kane of Harvard University found a response of similar magnitude in America. And research by Susan Dynarski of the University of Michigan and Judith Scott-Clayton of Columbia University concludes that both attendance and completion rates are higher when education is more affordable. Their work also suggests that the tangle of

eligibility rules and application processes students must navigate to get financial aid can lessen its benefits.

Free tuition, by contrast, is simple to administer and easy to understand. The rich, furthermore, can pay for their privilege later in life through systems of progressive taxation. (Mr Sanders would pay for his plan through a tax on financial transactions; his Democratic rival, Senator Elizabeth Warren, would fund a free-college programme with a tax on multi-millionaires.) In any case, many young people from well-off households will attend pricey private universities rather than free public ones.

But the most powerful arguments for free university are about values rather than economic efficiency. To politicians like Mr Sanders, a post-secondary education is a part of the basic package of services society owes its members. There are broad social benefits to a well-educated citizenry, because new ideas allow society as a whole to prosper and cultivating an informed population in an increasingly complex world probably takes more than 12 or so years of schooling. Amid constant technological change, a standing offer of free higher education may represent an important component of the social safety-net. Universality reinforces the idea that free education is not an expedient form of redistribution, but part of a system of collective insurance underpinning an egalitarian society. To progressive politicians, means-tested services send the message that government programmes are for those who cannot help themselves, whereas universal programmes are a means by which society co-operates to help everyone.

Ironically, such values-based arguments, however one feels about them, are undercut by rising inequality. As the rich pull away from the rest, their increased political power may stymie tax rises needed to fund universal public services. Meanwhile for progressive politicians the need to target available funds at the worst-off in society grows more urgent; in America,

the argument that the children of billionaires should not receive a government-funded education takes on greater moral as well as practical weight. It is probably no coincidence that tuition fees are lowest in places with the most equal income distributions (see chart). Strong safety-nets compress the income distribution. But inequality may also make the sorts of comprehensive public services that underpin egalitarian societies ever harder to sustain. ■



自由交流

最高学位

高等教育成本之辩的意义

从很多方面来说，这一席卷美国政治舞台的大胆、进步的政策建议的洪流始于2015年。当时来自佛蒙特州的独立参议员伯尼·桑德斯（Bernie Sanders）在他夺人眼球的总统竞选活动中，将一项公立大学免费高等教育计划作为自己的核心纲领之一。当时这个想法听起来很激进，甚至像个噱头。现在，民主党领袖们反对这种提议，这让它变得更值得关注。有些人确实不认同它，比如南本德市（South Bend）的市长皮特·布蒂吉格（Pete Buttigieg），而且他们的论点仍然很有说服力。为什么纳税人的钱应该花在富人的孩子身上，而不是更慷慨地资助穷人？民主党关于免费上大学的辩论实际上关系到如何最好地构建福利国家的更深层分歧。

在许多发达国家，公立大学教育是免费或几乎免费的——书本费和生活费除外（丹麦学生甚至还能拿到一笔津贴来贴补这部分开销）。但美国和英国的学生要支付高额学费，而且越来越高。英国在1998年修订了法律，允许公立大学开始收费。经通胀调整后，美国四年制公立大学的平均学费在过去30年里增加了约两倍。全球的高等教育成本都在稳步上升，而学费上涨体现了一种趋势：按对收入的调查结果来提供补贴以负担成本的增长。像美国和英国这样的地方通过提高学费将部分增加的成本转嫁给学生，它们认为贫困学生会获得助学金，而富裕学生将承担全部学费。

在这些地方的许多政客看来，这是公平的。与小学或中学教育不同，在大多数发达经济体，大学是少数人的追求。在成员主要为富裕国家的经合组织（OECD）中，年龄在25岁到34岁之间的成年人中只有约45%接受过高等教育。这些人往往来自较富裕的家庭，收入高于总体水平。对于推崇平等主义的政客来说，一项普及计划主要惠及的是不到全国人口一半的富裕人群，似乎是个奇怪的愿望（尽管对于那些渴望获得年轻人投票的人来说不怎么奇怪），最好把援助给予那些来自贫困家庭的人。

经济上的考量也指向了类似的方向。高等教育是对一个人未来赚钱能力的一种投资，好处是他在学校获得的技能、一路走来收获的人脉和证书，以及大学学位向雇主发出的信号。既然学生获得了大部分的好处，他们理应承担成本（如果需要的话，用未来的收入做抵押贷款），而不是因为有补贴，而把本来用来做别的事可能更好的几年时间花在大学里。

对此，支持免费大学教育的人提出了一些实用的论据。他们说，上大学的人更有可能来自富裕家庭，原因正是大学不是免费的。这有些道理。更高的学费确实把一些人推离了高等教育的大门。对英国公立大学征收学费的几项分析发现，学费对大学入学率有负面影响。据智库英国财政研究所（Institute for Fiscal Studies）的一份报告估算，学费每上涨1000英镑（1243美元），近期高中毕业生选择继续上大学的比例就下降3.9个百分点。哈佛大学的托马斯·凯恩（Thomas Kane）的研究发现美国的情况也类似。密歇根大学的苏珊·戴纳斯基（Susan Dynarski）和哥伦比亚大学的朱迪思·斯科特-克莱顿（Judith Scott-Clayton）的研究得出的结论是，当教育成本更低时，入学率和毕业率都更高。他们的研究还表明，助学金申请资格和申请程序的混乱会弱化它的好处。

相比之下，学费全免实施起来简便又易于理解。此外，富人可以在日后通过累进税制为自己得到的好处买单。（桑德斯将通过对金融交易征税来为他的计划提供资金；他的民主党对手、参议员伊丽莎白·沃伦[Elizabeth Warren]将对千万富翁征税以资助一项大学免费计划。）无论如何，许多来自富裕家庭的年轻人将就读昂贵的私立大学，而不是免费的公立大学。

但支持免费念大学最有力的论据关乎价值观，而非经济效益。在桑德斯这样的政客看来，高等教育是社会应给予其成员的基本服务的一部分。受过良好教育的公民可以带来广泛的社会效益，因为新思想会让整个社会繁荣发展；而在一个日益复杂的世界中，要培养出具备足够学识的人群，只上12年左右的学可能不够。在不断的技术变革中，长期提供免费高等教育可能是社会安全网的一个重要组成。“普及”强化了这样一种观点，即免费教育不是一种再分配的权宜之计，而是支撑起平等主义社会的集体保障系统的一部分。对进步的政客来说，以收入为准提供服务所传递的信息是政府

项目是为那些无法自助的人服务的，而全民项目则是整个社会协作以帮助所有人的手段。

讽刺的是，无论人们如何看待这些基于价值观的论点，它们都被日益加剧的不平等这一现状削弱了。随着富人与其余人群拉开差距，他们日益增长的政治权力可能会阻碍为全民公共服务提供资金的增税措施。与此同时，对于进步政客来说，将可用资金用于社会最贫困人群的需求变得更迫切了。在美国，认为亿万富翁的子女不应接受政府资助的教育的观点在道德上和实践中都更有影响力。收入分配最平等的地区学费最低，这可能并非巧合（见图表）。强有力的安全网压缩了收入分配差异。但不平等也可能使支撑平等主义社会的综合公共服务越来越难维持。■



Social care

Club 18-108

A Dutch care home experiments with housing students with the old

SORES DUMAN is a normal 29-year-old. He goes to the cinema, follows the Champions League attentively, parties occasionally and talks about life and love with his friends. Later in the week he will see an action movie with his mate Piebe. Before that, he may go to McDonald's with Martey, another chum. It might take more time than usual for his friends to get ready for these activities. Piebe is 79 and Martey a sprightly 94. Does Sores think his weekend plans are odd? "No, I do similar things with friends my own age. I don't see the difference in age as an obstacle."

Mr Duman lives at the Humanitas care home in Deventer, in central Holland. His housemates' average age is over 85. He has been there for three years, along with five other students from nearby universities and around 150 elderly residents. They are part of a scheme started in 2012 that provides them with free housing in exchange for 30 hours per month of their time living as a "good neighbour". Only one activity is mandatory: preparing and serving a meal on weekday evenings.

Both parties appear to benefit from the programme. Mr Duman estimates that he has saved over €10,000 (\$11,200) in rent. He claims that living in a care home has not impinged on his university experience. "We have big parties here," he says, pointing to a room for hire that sits empty at night. "We host everything from beer-pong tournaments to yoga classes." In a promotional video, one resident calls the initiative *gezellig*, a Dutch word that roughly translates as cosy: "Now and then they put me into the walker and race me through the hall," she explains.

Onno Selbach, the first student to move in, says he learnt to be more patient as a result of the experience; the pace of life is slower at the home. The scheme has helped attract prospective residents. The home now has a waiting list, which it previously did not. And students are queuing up. When two left the home in April, 27 applied to replace them.

Humanitas is not the first institution to urge old and young people to live together. Municipalities across Spain and care homes in Lyon, France, and Cleveland, Ohio, have also experimented with the idea. A team from Finland visited Deventer and was inspired to start a similar scheme.

Such initiatives could help combat loneliness, an increasing problem across the rich world. The very old, migrants, the sick or disabled, and singletons are most at risk of feeling lonely. It goes hand in hand with social isolation. About 18% of adult EU citizens—some 75m people—see friends or family at most only once a month. Nearly half of Britons over the age of 65 say that television or pets are their main form of company. Loneliness is also reckoned to have serious health consequences: a study from 2015 found that lonely people had on average a 26% higher risk of dying in its seven-year study period than those who were not lonely. And the problem may only get worse. The share of people who are aged over 80 will more than double in the EU by 2080. Social isolation is becoming more common partly because people are marrying later. Creating a space for the elderly to mingle with youngsters can lift spirits—and help cash-strapped millennials. ■



社会关怀

18-108俱乐部

荷兰一家护理院尝试让学生和老人同住

舍雷什·迪曼（Sores Duman）是个29岁的普通年轻人。他去电影院，是欧冠迷，偶尔参加聚会，和朋友们谈论生活和爱情。本周晚些时候，他要和伙伴毕比（Piebe）去看一部动作片。在这之前，他可能会和另一个朋友马蒂（Martey）一起去麦当劳。他的这两位伙伴出门要花的时间可能更多些。毕比79岁了；马蒂94岁，仍然精神矍铄。迪曼会不会觉得自己的周末安排有些另类呢？“不会，我和我这个年纪的朋友们做的事也差不多。我不觉得年龄差异是个障碍。”

迪曼住在荷兰中部代芬特尔（Deventer）的“人文”（Humanitas）护理院里。他室友的平均年龄超过85岁。迪曼已经在这里住了三年。与他同住的还有附近大学的其他五名学生，以及约150位护理院里的老人。他们都是2012年启动的一项计划的参与者。该计划为年轻人提供免费住宿。作为交换，他们每月要花30个小时充当老人们的“好邻居”。只有一项活动是必须的，那就是在工作日为老人们做顿晚饭并照顾他们用餐。

双方似乎都因该计划受益。迪曼估计自己已经省下超过1万欧元（1.12万美元）的房租。他说住在护理院里并没有妨碍自己的大学生活。“我们在这里举办大型派对。”他指着一个晚上没人住的待出租房间说。“我们举办各种活动，有投杯球赛，瑜伽课，等等。”在宣传视频中，护理院的一名老人认为该计划很“贴心”。她解释说：“他们有时会帮我架上助行架，在大厅里跟他们比赛谁跑得快。”

奥诺·塞尔巴赫（Onno Selbach）是第一个搬到护理院的学生。他说，这里的生活节奏比较慢，这段经历让他变得更有耐心。该计划已成功帮助护理院吸引来了老人。现在入住这里需要排队了，以前是不用的。学生也一样。今年4月两名学生离开护理院时，有27人申请接替。

“人文”护理院并不是首个倡导老人和年轻人同住的机构。西班牙的众多城市，以及法国里昂、美国俄亥俄州的克利夫兰的多家护理院也都践行了这一想法。芬兰的一个团队访问了代芬特尔并受到启发，准备启动一个类似的计划。

这些举措有助于防止在富裕世界里日益严重的孤独问题。高龄老人、移民、病人、残疾人以及单身人士最容易感到孤独。它与社会隔绝相伴相生。大约18%的成年欧盟公民（7500万人左右）一个月最多只见一次朋友或亲人。近一半65岁以上的英国人称陪伴自己最多的是电视机或宠物。孤独也被认为会严重影响健康。2015年的一项研究表明，在其七年研究期内，孤独者的死亡风险比不孤独者平均高出26%。而且这个问题可能只会愈演愈烈。到2080年，欧盟80岁以上人口的比例将增加一倍以上。社会隔绝日益普遍的原因之一是晚婚。为老年人创造一个与年轻人打成一片的空间可以振奋他们的精神，同时也帮助了手头拮据的千禧一代。 ■



Apps for the old

Silver screens

The next big growth market for China's tech firms

SOON AFTER dinnertime, Xiangyang Park in central Shanghai transforms into a ballroom. Loudspeakers pump out old pop songs as elderly folk sway under the plane trees. A picture of geriatric nostalgia—until you meet Ms Shi and Mr Zhou, a couple in their 70s whose enthusiasm for the waltz is matched only by that for their smartphones. Mr Zhou reads online novels. Ms Shi watches far-flung Chinese parks come alive with their own group dancing on Huoshan, a short-video app favoured by teens. Both love WeChat, a messaging app. “I can go without food, but not without my smartphone,” Ms Shi confesses.

She and her husband remain unusual. Less than one in three Chinese over 50 reported owning a smartphone in 2016, the latest year for which the Pew Research Centre, a think-tank, has data, half the share in America. A survey by the Chinese Academy of Social Sciences and Tencent, which owns WeChat, found that only 17% frequently paid for purchases with mobile phones; close to half had never done so.

Tech companies want to lure more Ms Shis and Mr Zhous online—and take a bigger slice of the 7trn yuan (\$1trn) that Chinese seniors are expected to spend on consumer goods in 2020. To tech firms, the disconnectedness of China’s 250m-odd old, or 18% of the population, is an opportunity. Unlike the young, whose fragmented attention is fought over by thousands of apps, retirees are up for grabs. And once on the internet, they splurge. In 2017 JD.com, a big e-commerce firm, found that they spent 2.3 times as much as the average user. Their typical deposit in Yu’E Bao, an online cash-management service controlled by Alibaba, a giant internet firm, is 7,000

yuan compared with 4,000 yuan across all ages.

Early adopters may be better-off than a typical senior, rattled when shops refuse cash. But startups see rich pickings. “I Have A Partner”, a grey-dating app, debuted last year with bold fonts and voice messaging for slow typists. Tangdou Guangchang Wu (“Jelly Bean Square Dance”), which started out posting dance videos (with filters to iron out wrinkles), aspires to be a one-stop shop for the old. It reports over 200m downloads since its launch in 2015.

The big generalists hope to lock the oldies in early. The over-60s use four-fifths of their mobile data on WeChat, against 7% for those aged 18-35. In 2017 Tencent made a video of old-timers rapping about their confusion over tech to encourage children to set their parents up with WeChat Helper, an app assistant. People over 55 are now WeChat’s fastest-growing cohort. Last year Taobao, Alibaba’s online emporium, introduced a “pay-for-me” option for elderly customers to use with family members. The site broadcasts daily over 1,000 live-streaming shows aimed at them. Ele.me, a food-delivery service bought by Alibaba last year, is trialling meal and medicine deliveries for the elderly, and one-off help with things like changing light bulbs. With the over-60s’ share of the population expected to double to one-third by 2050, there is wisdom in this strategy. ■



面向老年人的应用

银屏

中国科技公司的下一个广阔的增长型市场

晚饭时间刚过，位于上海市中心的襄阳公园就变成了一个舞池。喇叭里高声放着过去的流行歌曲，上了年纪的人们在法桐树下翩翩起舞。这全然是一幅老年人怀旧的场面，直到你遇见石女士（音译）和周先生（音译）。这对七旬夫妇对华尔兹的热爱唯有一样东西可匹敌——智能手机。周先生在手机上看小说，石女士在火山小视频（一个青少年喜欢的短视频应用）上看人们在中国某个遥远地方的公园里跳起广场舞。两人都喜欢微信。“我可以不吃饭，但不能不用智能手机。”石女士坦承。

这对夫妇仍是少数派。在2016年（智库皮尤研究中心有数据可查的最近年份），50岁以上的中国居民中拥有智能手机的不到三分之一，是美国这一比例的一半。中国社会科学院和腾讯（微信是其产品）的一项调查发现，这些人当中只有17%的人在购物时经常用手机支付，将近一半的人从未用手机支付过。

科技公司想吸引更多像石女士和周先生这样的人上网，想从老年人增长的消费品支出中分得更大一杯羹——预计到2020年这一支出将达到七万亿元人民币。对它们来说，中国超过2.5亿未接入互联网的老人（占全国人口的18%）是个机遇。年轻人支离破碎的注意力有成千上万个应用在争抢，老年人则不同，大可放开手脚去争取他们。而且老年人一到了网上，花起钱来毫不手软。2017年，大型电商公司京东发现老年人的消费额是一般用户的2.3倍。而在互联网巨头阿里巴巴旗下的在线现金管理服务余额宝中，他们存放的金额一般是7000元，相比之下，所有年龄段的用户人均持有份额为4000元。

最早使用智能手机的老年人也许经济状况相对较好，而一般老年人到了不收现金的商店里容易紧张无措。不过创业公司还是觉得大有油水可捞。去

年推出的老年婚恋交友应用“我有伴”使用了加粗字体，打字慢的人还可以用语音发消息。“糖豆广场舞”以发布舞蹈视频起步（可以加滤镜抹平皱纹），想发展成面向老年人的一站式商店。自2015年推出以来，它报称下载量已超过两亿。

大型综合平台希望能尽早锁定老年人。60岁以上的人将自己五分之四的移动数据都用在了微信上，而18岁到35岁的人这一比例仅为7%。2017年腾讯制作了一条视频，里面的老年人用说唱的形式表达自己对科技的困惑。腾讯想以此来鼓励子女为父母设置“微信使用小助手”这一应用辅助工具。如今55岁以上的人已成为微信增长最快的用户群体。去年，阿里巴巴的在线集市淘宝推出了亲情账号功能，供年长的用户与家庭成员共用。淘宝每天还会做1000多场针对老年人的直播。阿里巴巴去年收购的外卖服务饿了么正在试验为老年人送餐送药，以及换灯泡这类一次性帮助。鉴于中国60岁以上人口占比预计到2050年将翻一番达到三分之一，这类战略有其高明之处。 ■



The Economist film

What moon rocks reveal about the universe?

It turns out that the earth and the moon are chemically very similar indeed, as if twins.



经济学人视频

月球岩石解释了哪些宇宙秘密？

地球和月球的化学成分原来十分相似。



The aerospace industry

Tick tock

As newly built 737s pile up in factories and car parks, the aerospace industry waits for Boeing's bestselling plane to return to the skies. Fingers crossed

BOEING HAS long been a central cog of America's industrial machine. Each year it sells \$100bn-worth of aerospace equipment and services around the world and pays \$45bn to other American firms. It is the world's largest aircraft-maker and America's largest manufacturing exporter. Its commercial jets, which account for 60% of revenues, ferry millions of passengers. One in 100 American workers toils either directly for Boeing, whose workforce numbers 137,000 in its home country, or one of its 13,600 domestic suppliers, which employ a further 1.3m people in mostly well-paid jobs. In short, what is good for Boeing is good for corporate America.

The flipside is also true, as has become obvious in the wake of two crashes of Boeing's 737 MAX aircraft, in October and March, which have been linked to a malfunctioning flight-software system, and which killed 346 people. The human cost is immeasurable. The financial blow to Boeing itself, its suppliers and its airline customers is more tangible—and mounting.

The company has continued to churn out the troubled aircraft since its grounding by regulators in March. But it has not been able to deliver them to customers. As a result Boeing's inventories have grown by \$6bn so far this year. The flightless planes fill all free space at its facilities, including car parks. Add the knock-on cost for airlines and for the supply chain and a rough estimate is that every quarter that the best-selling airliner remains on the ground costs \$4bn. As the bill spirals an entire industry is now willing the plane to be back in the air by the end of the year.

Start with the airlines. Pressure on carriers to cut costs made the fuel-

efficient MAX Boeing's fastest-selling model ever. Around 5,000 have been ordered since its launch in 2011 and nearly 390 delivered. Southwest, an American carrier with 34 such planes, has cancelled thousands of flights. In July it revealed a \$175m hit to pre-tax profits in the second quarter. American Airlines, which has scrapped 115 or so flights a day, reckons that full-year profits will be \$350m lower as a result. OAG, an airline-data firm, estimates that, globally, the grounding will cost airlines \$4bn in sales by November. Many airline bosses would agree with Michael O'Leary, chief executive of Ryanair, Europe's second-biggest carrier with 135 MAXes on order, who has told Boeing to "get their shit together".

Some airlines have put the plane back in their schedules for November, on the assumption that once Boeing submits fixes to the faulty software in September, America's Federal Aviation Administration (FAA) and its counterparts in other countries will allow a return to service before the end of the year. This looks optimistic. Even if regulators approved the new software, it would take six to eight weeks to get planes out of storage and in the air. And as Jose Caiado of Credit Suisse, a bank, points out, it is unclear if pilots require retraining in flight simulators, adding more delays. Southwest, which aims to get the MAX in the air by January, seems to admit as much.

In the meantime, airlines are plugging gaps with other planes. Southwest is retiring seven fewer older, thirstier 737s from its fleet this year than it originally planned. United Airlines is pressing into service wide-bodied jets, which are costlier to run than single-aisle jets like the 737 and so generally reserved for long-haul routes.

Affected airlines can expect compensation in kind from Boeing, in the form of bigger discounts and better deals on other services. The same cannot be said of Boeing's suppliers. It has relentlessly squeezed their profit margins

in recent years in search of efficiency. Many have invested in extra capacity to supply parts for 57 MAX planes a month, Boeing's original production target for this year. Instead, Boeing cut monthly output back from 52 to 42.

Spirit AeroSystems, which gets around half its revenues from supplying fuselages for the 737 MAX, saw margins slip and is cutting overtime and putting workers on unpaid leave to cut costs after "disruption in a complex production system", says its boss, Tom Gentile. It has lost 28% of its market capitalisation, or around \$3bn, since March. Allegheny Technologies, which makes composite materials used in the aircraft, has been similarly clobbered. General Electric, America's troubled engineering giant which supplies MAX engines in a joint venture with Safran, a French aerospace company, faces a bigger bill. It is paid only when planes are delivered. It estimates that its cashflow could be reduced by as much \$1.4bn in 2019, adding to its woes. Safran's results for the first half of 2019, due on September 5th, will be pored over for signs of trouble.

Most aerospace firms do not live by Boeing alone. That, and Boeing's decision to maintain production, has insulated them from a bigger fallout. UTC, an American conglomerate which makes electronics, seats, wheels and brakes for the MAX, reckons the delays will have only a small impact on profits. The situation for suppliers is summed up neatly by David Squires, boss of Senior, a British firm that makes high-tech components not only for Boeing but also for GE and Spirit. The grounding has not been devastating, he insists. That said, his firm will now be where it hoped to be in April 2019 only by the start of 2021.

Then there is Boeing itself. The 737, the first of which took to the air half a century ago, has been a huge seller for the company—the 10,000th rolled off the production line in 2018. In March Goldman Sachs, a bank, estimated that the MAX may account for a third of Boeing's overall revenues (including its defence business) in the next five years. Although no MAX orders have been

cancelled so far, Boeing has not booked any new ones either. Further delays, Boeing has admitted, may force it to cut production further—or even shut it down altogether.

The fiasco has already led the planemaker to postpone plans to develop a new twin-aisle plane to replace the ageing 757. Its share price has dropped by 25% in the past five months, wiping \$62bn from its stockmarket value. It reported a record quarterly loss of \$2.9bn in the three months to June, after it set aside \$4.9bn for compensation for angry airlines. It may need to allocate more towards other contingencies. Southwest's pilots have already sued Boeing for lost wages resulting from cancelled flights. Crash victims' families are also preparing lawsuits.

Boeing can endure the financial pain for a while longer. Its duopoly with Airbus means that, in the short run, airlines and suppliers have little choice but to bear the costs stoically. Boeing's chief executive, Dennis Muilenburg, appears confident that the MAX will be flying again before its commercial partners and investors run out of patience.

Many in the industry seem to share this conviction—regulators will not, the thinking goes, jeopardise Boeing's future because the company is too big to fail. Perhaps. But the FAA, roundly criticised for being slower than other regulators to ground the plane, and earlier granting Boeing wide-ranging powers of self-certification, is in no mood to prove them right. ■



航空航天业

时钟嘀嗒响

新造好的737积压在工厂和停车场，航空业等待着波音的畅销机型重返天空。但愿如此

波音一直是美国工业机器的中心齿轮。它每年在全球销售价值1000亿美元的航空航天设备和服务，并向其他美国公司支付450亿美元。它是世界上最大的飞机制造商和美国最大的出口制造企业。它的商用喷气飞机占其总收入的60%，每年运送数以百万计的乘客。每一百名美国劳动者中就有一名要么直接为波音工作（它在美国雇有13.7万名员工），要么为其1.36万家国内供应商工作（供应商又雇用了130万人，大部分都是高薪岗位）。简而言之，波音公司好，美国企业就好。

负面影响也一样。去年10月和今年3月两架波音737 MAX飞机失事后，这一点清晰显现。两次事故都与飞机软件系统故障有关，共造成346人死亡。逝者生命的价值无法估量。波音公司自身、其供应商和航空公司客户遭受的经济打击则更容易计算，并且还在上升。

自3月各国航空监管机构禁飞737 MAX以来，波音还在继续大量生产该问题机型，但无法向客户交付。因此，今年迄今为止波音的库存增长了60亿美元。这些不能起飞的飞机停满了波音工厂里的所有空地，包括停车场。加上对航空公司和供应链造成的连锁损失，粗略估计这一最畅销客机每禁飞一个季度的成本为40亿美元。账单越积越多，现在整个行业都希望这款飞机能年底前重新升空。

先从航空公司说起。航空公司面临降低成本的压力，这让高燃油效率的MAX成为波音最抢手的机型。自2011年该机型推出以来，波音已接受了约5000架的订单，已交付近390架。拥有34架该机型飞机的美国西南航空(Southwest)取消了数千次航班，7月它公布的第二季度税前利润减少了1.75亿美元。美国航空公司(American Airlines)每天取消了115次左右的航班，估计全年利润将因此减少3.5亿美元。航空数据公司OAG估计，截至

今年11月，禁飞将导致全球航空公司的销售额减少40亿美元。欧洲第二大航空公司瑞安航空（Ryanair）订购了135架MAX飞机，其首席执行官迈克尔·奥利里（Michael O'Leary）让波音“把烂摊子收拾好”。许多航空公司的老板应该都会附和他。

一些航空公司已计划在11月复飞MAX飞机，它们假定一旦波音在9月提交修复软件故障的方案，美国联邦航空管理局（以下简称FAA）及其他国家的航空管理机构就将允许MAX在年底之前复飞。这看起来过于乐观了。即使监管机构批准了新软件，也需要六到八周的时间才能让飞机到位开始飞行。正如瑞信银行（Credit Suisse）的何塞·卡亚多（Jose Caiado）指出的那样，目前尚不清楚飞行员是否需要在飞行模拟器中接受再培训，而这将进一步推迟复飞时间。西南航空似乎也认识到这一点，其目标是在明年1月前复飞MAX。

与此同时，航空公司正在用其他飞机填补空缺。西南航空今年相比原计划少淘汰了七架机型更旧、油耗更高的737。联合航空（United Airlines）正在增加宽体喷气飞机的班次，这种飞机比737等单通道喷气飞机的运营成本更高，因此通常用于长途航线。

受影响的航空公司可以期待波音将在其他服务上提供更多折扣、更优惠的条件来实际补偿它们。但波音的供应商就不行了。近年来，为追求效率，波音不断挤压供应商的利润空间。波音今年原订目标每月生产57架MAX，许多供应商已投资扩大产能为其供应零部件。但波音将月产量从52架减少到了42架。

Spirit AeroSystems公司约一半的收入来自供应737 MAX机身。老板汤姆·詹提利（Tom Gentile）表示，公司利润下滑，在“复杂的生产系统被扰乱”之后，正在削减加班时间，并让工人休无薪假以削减成本。3月以来其市值已蒸发了28%（约30亿美元）。生产用于737MAX的复合材料的阿勒格尼技术公司（Allegheny Technologies）也遭到了类似打击。美国工程巨头通用电气（GE）本就已陷入困境，它与法国航空航天企业赛峰集团

(Safran) 的合资公司为MAX飞机供应发动机，由于只能在飞机交付后才能回款，因此面临更大的财务压力。据估计，2019年通用电气的现金流可能会减少14亿美元之多，可谓雪上加霜。赛峰2019年上半年的业绩将在9月5日发布，市场将会细细研究，寻找出现麻烦的迹象。

大多数航空航天企业并不只依靠波音过活，再加上波音公司决定维持生产，这让它们免于受到更大的影响。美国企业集团联合技术公司（UTC）为MAX生产电子设备、座椅、机轮和制动系统，它估计延迟复飞对其利润只会产生很小的影响。为波音、GE和Spirit公司生产高科技元件的英国公司Senior的老板大卫·斯夸尔斯（David Squires）言简意赅地总结了供应商的状况。他坚持认为禁飞的打击并非毁灭性的。不过，他的公司要到2021年初才能达到计划在2019年4月实现的目标。

然后就是波音自身的问题。737系列的第一架飞机在半个世纪前升空，自那以来一直是波音的热门系列（2018年第一万架737飞机诞生）。3月，高盛估计在未来五年内MAX机型可能会贡献波音总收入（包括其军火业务）的三分之一。虽然到目前为止还没有MAX订单被取消，但波音也还未收到任何新订单。波音承认，进一步延迟复飞可能迫使其进一步减产，甚至完全停产。

这次重挫已导致波音推迟开发新的双通道飞机以取代老化的757系列。其股价在过去五个月中下跌了25%，市值蒸发了620亿美元。波音季报称，截至6月的三个月里，由于波音拿出49亿美元准备用于赔偿愤怒的航空公司，公司亏损达29亿美元，创下新高。它可能还需要划拨更多资金准备应对其他紧急情况。西南航空的飞行员已经因航班取消导致收入受损而状告波音。遇难者家属也在准备诉讼。

面对这样的财务困境，波音还能再扛一段时间。它与空客公司的双头垄断意味着在短期内航空公司和供应商都别无选择，只能咬着牙承担成本。波音的首席执行官丹尼斯·穆伦堡（Dennis Muilenburg）似乎确信，在其商业合作伙伴和投资者失去耐心之前，MAX将再次升空。

航空业里的许多人似乎都有这样的信心。大家认为波音大到不能倒，因此监管机构不会做什么去危及波音的未来。也许吧。但FAA因为晚于其他航空监管机构禁飞MAX，并在之前给予波音广泛的自我认证权而受到各界严厉批评，因此没心情去证明大家的想法是正确的。■



International tax

Trading blows

France has borrowed a tactic from America's president. Expect fireworks

"DON'T TAX you, don't tax me, tax that fellow behind the tree." Historically, this rhyme has poked fun at the tax-shy American public. Today it reflects complaints against the French government, which on July 25th introduced a tax on digital services. American companies such as Amazon, Facebook and Google are protesting that they are being treated like the fellow behind the tree. President Donald Trump is itching to hit back. Unilateralism is a language he can understand.

At the heart of the dispute lies a mismatch between where companies make their profits and where those profits are booked for tax purposes. Governments wail that as data and ideas can zip across borders, taxable profits can slip between their tax-collectors' fingers. The solution requires international co-ordination, to avoid everyone trying to tax the same stuff at once. But negotiations overseen by the OECD, a club of mostly rich countries, are taking too long for the French.

Hence their levy of 3% on the revenues generated from French users of online platforms and digital advertising. The tax is blunt, but that is part of the point. It is meant as an interim measure, to be ditched once an international agreement is reached. It could even make a deal more likely. Affected companies may prefer that to unilateral taxes, and lobby for it.

Not surprisingly, the Trump administration has taken umbrage. It has begun an investigation into the French tax under Section 301 of the Trade Act of 1974 (the same law by which it justifies tariffs on China). On August 19th eight officials heard the companies' formal complaints. "We cannot absorb

this expense,” claimed Amazon’s representative.

No one likes new taxes, of course. But the companies do have a point. International trade rules are supposed to stop governments treating foreign companies differently from their own. And the French seem to have singled out America’s big technology firms. The tax will only hit companies with at least €750m (\$830m) in global revenue from the relevant digital services and at least €25m derived from French users. Those thresholds conveniently exclude most French companies. Further clues lie in the French nickname for the levy, “the GAFA tax”—a reference to Google, Apple, Facebook and Amazon.

The French appear to have defined the taxed services selectively too. Subscription-based digital services are spared, along with crowdfunding websites and digital payment services. More broadly, Hosuk Lee Makiyama of the European Centre for International Political Economy, a think-tank in Brussels, notes the inconsistency of the French position. France is keen to grab a slice of America’s digitally derived corporate profits, but is loth to agree to new rules that would allow the Chinese tax authorities to share in the spoils from French-owned luxury brands.

The administration seems almost certain to end up finding fault with the French. America could then complain to the World Trade Organisation. But Mr Trump is more likely to fight unilateralism with unilateralism, by raising taxes on French individuals or firms, or by imposing tariffs. The president appears particularly keen to raise duties on French wine.

If this happens, free-traders will surely grumble that Mr Trump has again chosen commercial conflict over co-operation. But the irony is that behind closed doors, his officials had been acting constructively in the multilateral talks at the OECD. Whereas Barack Obama’s administration had resisted further reforms, particularly those that could affect America’s technology

companies, Steven Mnuchin, Mr Trump's treasury secretary, was much more open to them.

It may seem that the French are giving Mr Trump a taste of his own medicine—using unilateral action to put pressure on a negotiating partner. But they may have made tricky discussions more difficult. Admittedly, Mr Mnuchin might not have been able to get Mr Trump's approval for any OECD reform. But now the dispute is playing out on the presidential Twitter feed. And for once, Mr Trump will be able to deny that he started it. ■



国际税务

你一拳我一脚

法国借用了美国总统的一项策略。纷争将至

“别收你的税，别收我的税，去收树后那人的税。”这句朗朗上口的话历来都是用来取笑不爱交税的美国大众的。如今它表达出对法国政府的不满，因为法国政府在7月25日开始征收一项数字服务税。亚马逊、Facebook和谷歌等美国企业抗议它们被当成了“树后的人”。特朗普跃跃欲试，准备回击。单边主义是他拿手的事。

争议的核心是企业的盈利产生地和利润登记缴税地不匹配。各国政府担心，由于数据和创意可以跨越边界，应税利润可能会从它们的税务机构指间溜走。要解决这一问题需要国际协作，才能避免各国对同一笔盈利重复征税。但以富裕国家为主要成员的经合组织（OECD）管理的谈判对法国人来说太慢了。

因此，法国政府开始就在线平台和数字广告从法国用户身上获得的收入征收3%的税。这项税来得很生硬，但要的就是这效果。它原本就是个临时措施，一旦达成国际协议就会废止。它甚至可能会让谈判更有可能达成协议。比起单边的数字服务税，受影响的企业可能更愿意接受谈判协议，并为此展开游说。

不出所料，特朗普政府很是光火。它已开始根据1974年《贸易法》第301条对法国的数字税展开调查（对中国征收关税也是根据这一条款）。8月19日，八位官员听取了几大公司的正式投诉。“我们无法承担这笔开支。”亚马逊的代表称。

当然没人喜欢新增税项。但这些企业的抱怨确实有其道理。国际贸易规则应该阻止政府差别对待外国企业和本国企业。而法国政府似乎是专门挑出了美国的科技巨头。这项税收针对的是在相关数字服务收入上至少有7.5亿欧元（8.3亿美元）的全球收入、并且来自法国用户的收入至少为2500

万欧元的企业。这些门槛恰巧将大多数法国企业排除在外。从法国人给这项税收起取的别名“GAFA税”（谷歌、苹果、Facebook和亚马逊的首字母缩写）上也能看出端倪。

法国政府似乎也有选择地界定了可征税服务。基于订阅的数字服务以及众筹网站、数字支付服务被免于征税。布鲁塞尔智库欧洲国际政治经济中心（European Centre for International Political Economy）的霍素克·李-牧山浩石（Hosuk Lee Makiyama）指出了法立场更广泛的“双标”之处。法国渴望从美国源自数字经济的企业利润中切一块蛋糕，却不愿意接受新规则，让中国税务部门从法国奢侈品牌的利润中分一杯羹。

美国政府最终几乎一定会找法国政府的碴。然后美国人就可以向世贸组织投诉了。但特朗普更有可能用单边主义手段来对抗单边主义，比如增加对法国个人或企业的税率或开征关税等。他似乎特别热衷于提高法国葡萄酒的关税。

果真如此的话，自由贸易主义者肯定会抱怨特朗普在商业冲突和合作之间再次选择了前者。但具讽刺意味的是，关起门来，特朗普的官员在经合组织的多边会谈中一直都表现得富有建设性。虽然奥巴马政府拒绝进一步改革，特别是那些可能影响到美国科技企业的改革，但特朗普的财政部长史蒂芬·努钦（Steven Mnuchin）表现出了更开放的姿态。

法国政府似乎正对特朗普以其人之道还治其人之身——用单边行动向谈判对手施压。但这可能让原本就棘手的谈话难上加难。不可否认，努钦也许没能让特朗普批准任何经合组织的改革。但现在，纷争在总统的推特上上演。而这次，特朗普终于能否认是他挑的头了。■



What companies are for

Big business shareholders and society

Competition, not corporatism, is the answer to capitalism's problems

ACROSS THE West, capitalism is not working as well as it should. Jobs are plentiful, but growth is sluggish, inequality is too high and the environment is suffering. You might hope that governments would enact reforms to deal with this, but politics in many places is gridlocked or unstable. Who, then, is going to ride to the rescue? A growing number of people think the answer is to call on big business to help fix economic and social problems. Even America's famously ruthless bosses agree. Last month more than 180 of them, including the chiefs of Walmart and JPMorgan Chase, overturned three decades of orthodoxy to pledge that their firms' purpose was no longer to serve their owners alone, but customers, staff, suppliers and communities, too.

The CEOs' motives are partly tactical. They hope to pre-empt attacks on big business from the left of the Democratic Party. But the shift is also part of an upheaval in attitudes towards business happening on both sides of the Atlantic. Younger staff want to work for firms that take a stand on the moral and political questions of the day. Politicians of various hues want firms to bring jobs and investment home.

However well-meaning, this new form of collective capitalism will end up doing more harm than good. It risks entrenching a class of unaccountable CEOs who lack legitimacy. And it is a threat to long-term prosperity, which is the basic condition for capitalism to succeed.

Ever since businesses were granted limited liability in Britain and France in the 19th century, there have been arguments about what society can expect

in return. In the 1950s and 1960s America and Europe experimented with managerial capitalism, in which giant firms worked with the government and unions and offered workers job security and perks. But after the stagnation of the 1970s shareholder value took hold, as firms sought to maximise the wealth of their owners and, in theory, thereby maximised efficiency. Unions declined, and shareholder value conquered America, then Europe and Japan, where it is still gaining ground. Judged by profits, it has triumphed: in America they have risen from 5% of GDP in 1989 to 8% now.

It is this framework that is under assault. Part of the attack is about a perceived decline in business ethics, from bankers demanding bonuses and bail-outs both at the same time, to the sale of billions of opioid pills to addicts. But the main complaint is that shareholder value produces bad economic outcomes. Publicly listed firms are accused of a list of sins, from obsessing about short-term earnings to neglecting investment, exploiting staff, depressing wages and failing to pay for the catastrophic externalities they create, in particular pollution.

Not all these criticisms are accurate. Investment in America is in line with historical levels relative to GDP, and higher than in the 1960s. The time-horizon of America's stockmarket is as long as it has ever been, judged by the share of its value derived from long-term profits. Jam-tomorrow firms like Amazon and Netflix are all the rage. But some of the criticism rings true. Workers' share of the value firms create has indeed fallen. Consumers often get a lousy deal and social mobility has sunk.

Regardless, the popular and intellectual backlash against shareholder value is already altering corporate decision-making. Bosses are endorsing social causes that are popular with customers and staff. Firms are deploying capital for reasons other than efficiency: Microsoft is financing \$500m of new housing in Seattle. President Donald Trump boasts of jawboning bosses

on where to build factories. Some politicians hope to go further. Elizabeth Warren, a Democratic contender for the White House, wants firms to be federally chartered so that, if they abuse the interests of staff, customers or communities, their licences can be revoked. All this portends a system in which big business sets and pursues broad social goals, not its narrow self-interest.

That sounds nice, but collective capitalism suffers from two pitfalls: a lack of accountability and a lack of dynamism. Consider accountability first. It is not clear how CEOs should know what “society” wants from their companies. The chances are that politicians, campaigning groups and the CEOs themselves will decide—and that ordinary people will not have a voice. Over the past 20 years industry and finance have become dominated by large firms, so a small number of unrepresentative business leaders will end up with immense power to set goals for society that range far beyond the immediate interests of their company.

The second problem is dynamism. Collective capitalism leans away from change. In a dynamic system firms have to forsake at least some stakeholders: a number need to shrink in order to reallocate capital and workers from obsolete industries to new ones. If, say, climate change is to be tackled, oil firms will face huge job cuts. Fans of the corporate giants of the managerial era in the 1960s often forget that AT&T ripped off consumers and that General Motors made out-of-date, unsafe cars. Both firms embodied social values that, even at the time, were uptight. They were sheltered partly because they performed broader social goals, whether jobs-for-life, world-class science or supporting the fabric of Detroit.

The way to make capitalism work better for all is not to limit accountability and dynamism, but to enhance them both. This requires that the purpose of companies should be set by their owners, not executives or campaigners. Some may obsess about short-term targets and quarterly results but that is

usually because they are badly run. Some may select charitable objectives, and good luck to them. But most owners and firms will opt to maximise long-term value, as that is good business.

It also requires firms to adapt to society's changing preferences. If consumers want fair-trade coffee, they should get it. If university graduates shun unethical companies, employers will have to shape up. A good way of making firms more responsive and accountable would be to broaden ownership. The proportion of American households with exposure to the stockmarket (directly or through funds) is only 50%, and holdings are heavily skewed towards the rich. The tax system ought to encourage more share ownership. The ultimate beneficiaries of pension schemes and investment funds should be able to vote in company elections; this power ought not to be outsourced to a few barons in the asset-management industry.

Accountability works only if there is competition. This lowers prices, boosts productivity and ensures that firms cannot long sustain abnormally high profits. Moreover it encourages companies to anticipate the changing preferences of customers, workers and regulators—for fear that a rival will get there first.

Unfortunately, since the 1990s, consolidation has left two-thirds of industries in America more concentrated. The digital economy, meanwhile, seems to tend towards monopoly. Were profits at historically normal levels, and private-sector workers to get the benefit, wages would be 6% higher. If you cast your eye down the list of the 180 American signatories last month, many are in industries that are oligopolies, including credit cards, cable TV, drug retailing and airlines, which overcharge consumers and have abysmal reputations for customer service. Unsurprisingly, none is keen on lowering barriers to entry.

Of course a healthy, competitive economy requires an effective government—to enforce antitrust rules, to stamp out today's excessive lobbying and cronyism, to tackle climate change. That well-functioning polity does not exist today, but empowering the bosses of big businesses to act as an expedient substitute is not the answer. The Western world needs innovation, widely spread ownership and diverse firms that adapt fast to society's needs. That is the really enlightened kind of capitalism. ■



公司的目的

大企业股东与社会

要解决资本主义的问题，答案是竞争而非社团主义

纵观整个西方，资本主义并未按其理想的模式运行。尽管就业机会充足，但经济增长乏力，社会不平等严重，环境日渐恶化。你可能希望政府通过改革来解决问题，但许多地方的政治不是陷入僵局就是纷乱不稳。那么，谁会来充当救星呢？越来越多的人认为应该让大企业来帮助解决经济和社会问题。甚至连以冷酷无情著称的美国老板们也深以为然。上月，包括沃尔玛和摩根大通在内的180多名企业老板一改30年来的常态，承诺自己的公司不再只考虑所有者的利益，还要为客户、员工、供应商和社区服务。

CEO们的这种转变一方面是一种策略。他们希望先声夺人，防范民主党左翼对大企业的攻击。但另一方面也是因为大西洋两岸对企业的看法发生了剧变。年轻一代希望为那些在当今的道德和政治问题上表明立场的公司工作。形形色色的政客都希望企业让职位和投资回流国内。

不管本意多好，这种新式集体资本主义最终将会弊大于利。它可能会造就一批不配其位又无须担责的CEO。并且它还会对长期繁荣构成威胁，而长期繁荣是资本主义成功的基本条件。

自19世纪英国和法国的企业被赋予有限责任以来，关于社会该期望从中获得何种回报的争论一直未曾平息。上世纪五六十年代，美国和欧洲试行了管理资本主义——巨头企业与政府、工会合作，为员工提供工作保障和津贴。但经历了70年代的经济停滞后，股东价值开始大行其道，公司追求其所有者的财富最大化，从而（在理论上）实现效率最大化。工会影响式微，股东价值先在美国盛行，继而征服了欧洲和日本——在那里仍在不断壮大。从利润来看，它已经取得了胜利——在美国，企业利润占GDP的比重从1989年的5%上升到了现在的8%。

正是这种利润至上的机制遭受了抨击。部分原因是人们意识到了商业道德

的滑坡——从银行家一手要红利一手要纾困资金，到向瘾君子出售数十亿阿片类药片，等等。但主要的不满还是缘于股东价值带来了不良经济后果。上市公司被控恶行累累，它们一心追求短期收益，疏于投资，剥削员工，压低工资，并且没有为自己造成的灾难性的外部效应（尤其是污染）买单。

这些批评并不全然正确。在美国，投资占GDP的比重与历史水平相当，而且还高于上世纪60年代。从长期利润占公司价值的比率看，美国股市的投资时限和以往一样长。像亚马逊、Netflix这类“投资买明天”的公司风头正盛。但有些批评不无道理。员工在公司创造的价值中所占的份额确实下降了。消费者往往受到不公正的待遇，社会流动性也减弱了。

无论如何，民众和学术界对股东价值的抵制已经在改变企业的决策。老板们开始支持深受消费者和员工欢迎的社会事业。企业在配置资本时也不再只考虑效率，比如微软正出资五亿美元在西雅图新建保障性住房。特朗普夸耀自己能影响老板们为工厂选址。一些政客希望更进一步。民主党总统竞选人伊丽莎白·沃伦（Elizabeth Warren）希望公司由联邦政府特许管理，如果公司损害员工、客户或社区的利益，就可以吊销其执照。所有这些都预示着这样一个体系的到来：大企业制定并追求广泛的社会目标，而不是狭隘地关注自身利益。

这听上去不错，但集体资本主义存在两大隐患：缺乏问责，缺少活力。先说问责。CEO们该如何知晓“社会”希望其公司做什么呢？答案并不清楚。很可能发生的情形是政客、竞选团体和CEO们会自行决定，而普通民众并无选择。过去20年里，工业和金融业已被大公司主导，因此最终结果将是并不代表民意的少数企业老板拥有巨大的权力，为社会制定远超过自己公司当前利益范围的目标。

第二个问题是活力。集体资本主义倾向于墨守成规。在一个有活力的体系中，企业必须至少抛弃一部分利益相关者。也就是说，为了把资产和劳动者从过时的行业重新分配到新兴行业，需要缩减一些队伍。比如说，要解决气候变化的问题，石油公司就得面对大规模裁员。推崇上世纪60年代管

理资本主义时代那些企业巨头的人常常忘了AT&T宰客、通用汽车制造过时且有安全隐患的汽车的往事。这两家公司秉承的社会价值即使在当时都极为保守。它们之所以受到庇护，部分原因是它们履行了更广泛的社会目标，比如终身雇佣、世界一流的科研、支持底特律的社会结构等。

要让资本主义更好地为所有人运作，不能限制问责和活力，而是要强化它们。这就要求公司的目标应由其所有者而非高管或活动家来制定。有些公司可能会沉迷于短期目标和季度业绩，但这通常是因为它们经营不善。还有些公司可能会选择慈善目标，我们应该祝它们好运。但大多数所有者和公司会选择将长期价值最大化，因为这才是为商正道。

此外，它还要求公司适应不断变化的社会偏好。如果消费者想要公平贸易的咖啡，就理应遂他们的心意。如果大学毕业生对无良公司敬而远之，雇主就必须变规矩些。要让公司反应更积极、更能承担责任，一个好办法是扩大所有权。美国家庭直接或通过基金投资股市的比例仅为50%，而且这些股份高度集中在富人手中。税收制度应鼓励更多人持有股权。退休金计划和投资基金的最终受益人应在公司选举中拥有投票权。这种权力不应被外包给资产管理行业的少数巨头。

问责只有在竞争的环境下才能奏效。竞争会降低价格、提高生产率，并确保企业无法长期保持高得离谱的利润。它还会激励企业预测消费者、员工和监管机构不断变化的偏好，以防对手抢占先机。

遗憾的是，自上世纪90年代以来，合并使得美国三分之二的产业都变得更为集中。与此同时，数字经济似乎也倾向于促成垄断。倘若利润处于历史正常水平，且私营企业的员工能够从中获益，那么工资会比实际水平高出6%。然而，扫一眼上个月180家联名美国企业的名单，就会发现其中许多都属于信用卡、有线电视、药品零售和航空等寡头垄断行业，这些行业收费过高，客户服务声名狼藉。不出所料，没有哪一家乐于降低准入门槛。

当然，健康、竞争性的经济离不开有效的政府来实施反垄断法规、消除时下的过度游说和任人唯亲，并应对气候变化。虽然这样运作良好的政体如

今并不存在，但让大企业的老板们代为行事的权宜之计并非解决之道。西方世界需要创新、广泛的所有权和多样化的企业来快速适应社会的需求。这才是真正开明的资本主义。 ■



China's economy

The other inversion

Officials are calm as growth slows. Are they complacent?

HALF A DECADE ago, if you had asked economists which number—five or seven—described China's GDP and which its currency, most would have answered this way: growth will remain strong at around 7% annually, and the currency will strengthen until it takes just five yuan and change to buy a dollar. One measure of the impact of Donald Trump's trade war on China is the inversion of these digits. As American tariffs bite, economic forecasters think that Chinese growth next year will slow to five-point-something percent. The yuan, for its part, has slumped to more than seven per dollar.

Mr Trump has crowed about the success of his tactics. "China has taken a very hard hit," he said on August 26th at a news conference after the G7 summit in France. "They want to make a deal very badly." But a more accurate reading of China's policy stance is one of surprising calm in the face of the economic slowdown and, by extension, of stiffer resolve in the trade dispute.

The toll of tariffs on China's economy is becoming more visible. Although exports to America account for just a small share of overall GDP, the uncertainty has bruised corporate confidence. Investment spending is on track to increase this year at its weakest pace in at least two decades. Factory prices have veered into deflation, a bad sign for industrial profits. Economists at Morgan Stanley, a bank, now forecast that Chinese growth will fall to 5.8% next year; previously they had expected 6.3%.

In the past, whenever growth looked set to slow sharply, Chinese companies

could count on a stimulus package to revive it. But this time officials have been much more restrained in their response, partly because of concern about adding to China's hefty debt burden. On August 26th the central bank had a chance to lower funding costs for banks, but it refrained, bucking the global trend towards lower rates. On August 27th the State Council, or cabinet, issued an underwhelming 20-point plan to promote consumption. Some analysts had been hoping for targeted tax cuts or subsidies; instead, it made small-bore promises, such as more 24-hour convenience stores.

The Chinese government's lack of panic about the economic outlook should give Mr Trump pause. "Its leadership now looks committed to a strategy of toughing out trade tensions," says Andrew Batson of Gavekal, a research firm. It helps that China has procured insurance in letting its exchange rate decline to 7.1 yuan per dollar, the weakest since 2008, offsetting some of the drag from tariffs.

But some think the calm is verging on complacency. Not only has China's government refrained from stimulus, but it has become more hawkish about the property sector, the engine of its economy. In line with President Xi Jinping's oft-repeated warning that investors should not speculate on housing, regulators have curtailed lending to developers and sworn off cutting mortgage rates. "We would view stabilising growth by choking credit to the property sector as analogous to performing cardiac surgery without blood pumps, oxygen and anaesthesia," says Lu Ting, an economist with Nomura, a bank. In other words, things could get ugly. ■



中国经济

另一种颠倒

经济增长放缓，官员处之泰然。是他们自负吗？

五年前，如果问经济学家“5”和“7”这两个数字哪个对应中国的GDP增速，哪个对应人民币汇率，大多数人都会这样回答：经济增长将保持强劲，年增速约为7%；人民币将走强，最终只要五元多人民币就能兑换一美元。要说特朗普挑起的贸易战对中国的影响，一大表现就是这两个数字的颠倒。随着美国开征新关税，经济预测机构认为明年中国经济增速将放缓至百分之五点几。而人民币兑美元汇率则已经破七。

特朗普志得意满地宣称自己的策略取得了成功。“中国受到了非常大的打击，”他在8月26日法国G7峰会后的新闻发布会上说，“他们非常急切地想与美国达成协议。”但是，对中国的政策姿态更准确的解读是官员们面对经济放缓出奇地冷静自若，并且在贸易争端中更加咬紧牙关。

关税对中国经济的打击日益显现。虽然对美出口仅占中国GDP总量的一小部分，但关税带来的不确定性已经损伤了企业信心。按照目前的趋势，今年投资支出的增速将跌至至少20年来的最低水平。工厂交货价格已转向下跌，对工业利润来说是个糟糕的信号。摩根士丹利的经济学家现在预测明年中国经济增速将降至5.8%，而此前他们预计为6.3%。

过去，每当增长看似即将急剧放缓时，中国企业都可以指望政府出台财政刺激计划重振经济。但这次官员们的反应较以往克制得多，部分原因是担心进一步加重中国本已沉重的债务负担。8月26日，央行原本可以调低银行的融资成本，但最终刹车，没有跟随全球下调利率的趋势。8月27日，国务院发布了令人兴味索然的20条措施以提振消费。之前一些分析人士一直希望政府推出有针对性的减税或补贴措施，而实际只迎来一些不疼不痒的承诺，比如开设更多24小时便利店。

中国政府面对经济下行的前景不慌不忙，应该能让特朗普停下来想一想。研究公司Gavekal的安德鲁·巴森（Andrew Batson）说：“现在看来，中国领导层的战略是要在贸易争端中硬挺过去。”有助于此的是，作为保全之策，中国让人民币汇率降至7.1元兑一美元，是自2008年以来的最低点，部分抵消了关税带来的影响。

但有人认为这种平静近乎安于现状。中国政府不仅没有采取刺激措施，还更加强硬地打压房地产这一经济引擎。习近平一再警告投资者不应投机炒房，遵照这一指示，监管机构已限制向开发商放贷，并承诺不再降低房贷利率。“我们认为，以扼杀房地产行业信贷来稳定增长，就跟不用血泵、氧气和麻醉来做心脏手术一样。”投资银行野村证券的经济学家陆挺表示。换句话说，情况可能会变得很糟。 ■



Free exchange

Cut-price economics

Prices for many consumer goods do not move the way economists reckon they should

TWO YEARS ago British chocoholics felt the pinch from the decision to leave the European Union. As sterling tumbled, global firms selling to the British market faced the same production costs as before, but got less money for each sweet sold. Rather than raise the price per chocolate, some chose to shrink the chocolate per price. The famous peaks on a bar of Toblerone grew conspicuously less numerous (though Mondelez, the bar's maker, said Brexit was not the cause). Other products suffered the same "shrinkflation": toilet rolls and toothpaste tubes became smaller. The threat of Brexit made the phenomenon more visible, but it is surprisingly common. Statisticians and policymakers need to take note.

Every first-year economics student quickly becomes familiar with charts of supply and demand, which place price on one axis and quantity on the other. Given a drop in demand, the charts show, firms can either sell fewer items at the prevailing price or cut prices to prop up sales. But online retailing, which makes it easier to collect fine-grained price data, reveals how poorly textbook models reflect real-world market dynamics. The prices of consumer goods, it turns out, behave oddly.

A forthcoming paper by Diego Aparicio and Roberto Rigobon of the Massachusetts Institute of Technology helps make the point. Firms that sell thousands of different items do not offer them at thousands of different prices, but rather slot them into a dozen or two price points. Visit the website for H&M, a fashion retailer, and you will find a staggering array of items for £9.99: hats, scarves, jewellery, belts, bags, herringbone braces, satin neckties, patterned shirts for dogs and much more. Another vast

collection of items cost £6.99, and another, £12.99. When sellers change an item's price, they tend not to nudge it a little, but rather to re-slot it into one of the pre-existing price categories. The authors dub this phenomenon "quantum pricing" (quantum mechanics grew from the observation that the properties of subatomic particles do not vary along a continuum, but rather fall into discrete states).

Just as surprising as the quantum way in which prices adjust is how rarely they move at all. Retailers, Messrs Aparicio and Rigobon suggest, seem to design products to fit their preferred price points. Given a big enough shift in market conditions, such as an increase in labour costs, firms often redesign a product to fit the price rather than tweak the price. They may make a production process less labour-intensive—or shave a bit off a chocolate bar.

Central banks are starting to see the consequences. Inflation does not respond to economic conditions as much as it used to. (To take one example, deflation during the Great Recession was surprisingly mild and short-lived, and after nearly three years of unemployment below 5%, American inflation still trundles along below the Federal Reserve's target rate of 2%.) In its recently published annual report the Bank for International Settlements, a club of central banks, mused that quantum pricing and related phenomena help account for such trends.

But firms' aversion to increasing prices may be as much a consequence of limp inflation as a contributor to it. When the price of everything rises a lot year after year, as in the 1970s and 1980s, firms can easily adjust the real, inflation-adjusted cost of their wares without putting off shoppers. A 5.5% jump in the cost of a pint after years of 5% increases does not send beer drinkers searching for other pubs in the way that a 0.5% hike after years of no change might. Thus falling inflation can make prices "stickier". To compensate, firms instead find other ways to impose costs on buyers—such

as making products smaller or lower-quality.

Labour markets are affected, too. Wages are notoriously sticky, especially downwards. In a world of low inflation, the ability to trim pay by raising wages less than inflation is lost to firms, with serious macroeconomic consequences. Economists blame sticky wages for causing unemployment during recessions. Facing reduced demand, firms that cannot cut pay to maintain margins while slashing prices instead reduce output—and sack workers.

But nimble firms have other options: the employment version of shaving a bit of chocolate from the bar. Some cut costs by boosting output per worker, often by driving workers harder. Tellingly, growth in output per worker now tends to fall in booms and rise during busts, precisely the opposite of the pattern 40 years ago, when inflation was high. Firms can respond to market pressures by reducing the benefits available to workers; Asda, a supermarket, recently announced plans to slash British workers' holiday allowances. Or they can offer workers more tortuous schedules. Research published in 2017 suggests that being able to vary workers' hours from week to week is worth at least 20% of their wages. On the flipside, during good times firms often opt to reward workers with office perks and one-off bonuses, rather than pay rises that cannot easily be clawed back during downturns.

If it happens on a sufficiently large scale, the practice of tweaking quality in lieu of price could play havoc with essential economic data. Statistical agencies do their best to account for changing product quality, but if adjustments are unexpectedly common or subtle then muted inflation figures could easily be concealing a more turbulent economic picture. Central banks watching for big swings in inflation or wage growth as a sign of trouble could be reacting to figures that bear far less relation to business conditions than they used to.

What's more, the substitution of quality for price as firms' main way of responding to changing market conditions weakens the case for keeping inflation low and stable. Inflation makes relative prices less informative, economists reckon, making it harder to decide what to buy and how to spend. Rather than clarity, low inflation has brought a different sort of confusion: one of shrinking chocolate bars and lost holidays. ■



自由交流

降价经济学

众多消费品的价格变动出乎经济学家所料

两年前英国脱欧的决定让巧克力控们感受到了冲击。随着英镑暴跌，向英国市场销售甜食的跨国公司面临的生产成本还和从前一样，单位产品的实际收入却减少了。一些公司没有选择提高巧克力的单价，而是让每单位价格的巧克力“瘦身”。每条三角巧克力棒（Toblerone）上著名的“山峰”的数量明显少了，尽管制造商亿滋（Mondelez）否认这是脱欧引发的。其他产品也出现了同样的“瘦身式涨价”，比如卷筒纸和牙膏管都变小了。虽然这种现象因为英国脱欧的威胁变得更加明显，但它实则惊人地普遍。统计学家和政策制定者都需要引起注意。

每个经济学专业的新生很快都会熟悉供求关系图，图上两条轴线分别用来标示价格和数量。图表显示，如果需求下降，企业要么维持现价、少卖商品，要么降价以提振销量。但是，更容易收集到详细价格数据的在线零售业却揭示，教科书上的模型远不能正确反映现实的市场动态。事实证明，消费品价格的变动很是古怪。

麻省理工学院的迭戈·阿帕里西奥（Diego Aparicio）和罗伯托·里哥本（Roberto Rigobon）即将发表的一篇论文有助于说明这一点。企业销售的商品成千上万，但不会一种商品一个价，而是会为它们设定十几二十个价格点。访问时装零售商H&M的网站，你会发现数量惊人的售价9.99英镑的商品，如帽子、围巾、首饰、腰带、包、交叉背带、缎子领带、给狗狗穿的花衬衫等等。还有大批售价为6.99英镑或12.99英镑的商品。当商家给商品调价时，往往不是微调，而是将它们归到其他业已存在的价格点之下。两位作者将这一现象称为“量子式定价”（量子力学所基于的观察是亚原子粒子是以离散而非连续体的形式变化）。

与量子式定价一样令人惊讶的是，价格根本就很少变动。阿帕里西奥和里

哥本认为，零售商似乎是根据自己喜欢的价格点来设计产品的。如果出现劳动力成本增加等较大的市场变化，企业常常会根据价格来重新设计产品，而不是微调价格。他们可能会减少生产过程中的用工量，或者把巧克力棒稍微刮掉一些。

各国央行已开始看到这样做的后果。经济状况对通货膨胀的影响不如过去那么大了。比如，大衰退时期的通货紧缩出奇地温和且短暂，而如今经历了近三年的失业率低于5%之后，美国的通胀率仍低于美联储2%的目标。“央行俱乐部”国际清算银行在最近发布的年度报告中推测，量子式定价和相关现象部分造成了这种趋势。

但是，企业不愿意涨价既可能是通胀疲软的一个原因，也可能是其结果。就像上世纪七八十年代所有商品年年大涨价之时，商家可以轻易调整商品经通胀调整后的实际成本，而不致引起消费者的反感。一品脱啤酒在连续多年涨价5%后再涨5.5%，并不会让客人跑到其他酒吧去，而如果价格多年不变后上涨0.5%却会有这种后果。因此，不断下降的通胀会使价格更具“粘性”。为弥补不涨价带来的损失，公司会寻找其他办法将成本转嫁到消费者头上，比如让产品瘦身或降低产品质量。

劳动力市场同样受到影响。工资的粘性之大众所周知，尤其是在向下调整时。在低通胀的情况下，公司没法用让工资涨幅低于通胀的方式来削减薪资，这给宏观经济带来了严重后果。经济学家将经济衰退期的失业归咎于粘性工资。面对需求减少，那些无法在大幅降价时削减薪资以维持利润的公司只能转而减产和裁员。

但灵活的公司还有其他选择，比如把刮掉一点巧克力这个办法挪到用工环节上。一些公司通过提高人均产量来削减成本——通常是加大员工的劳动强度。很能说明问题的是，现在的人均产量增长往往在经济繁荣时下降，在衰退时上升，与40年前通胀高企时的规律正好相反。公司可以通过减少工人的福利来应对市场压力。阿斯达超市（Asda）最近就宣布了削减英国工人假期津贴的计划。或者公司也可以给员工安排更含混不清的工作时间。2017年发表的一项研究表明，如果可以每周调整员工的工作时间，便

相当于至少节省了20%的工资支出。另一方面，在经济繁荣期，公司往往选择用办公室福利和一次性奖金来奖励员工，而不是给他们加薪，因为加薪的薪水没法在衰退期轻易再降下来。

如果这种情况发生的范围足够广，微调质量而非价格的做法可能会严重干扰基本经济数据。统计机构竭力解释产品质量为何出现变化，但如果调整出人意料地普遍或难以觉察，那么温和的通胀数据很容易掩盖更为动荡的经济形势。各国央行关注通胀或工资增长的大幅波动，将其视为问题的征兆，但它们为之做出反应的数据与商业状况的关系已经远没有以前那么密切。

此外，当公司以质量代替价格作为应对市场变化的主要手段时，维持稳定的低通胀这一做法变得理据不足。经济学家认为通胀降低了相对价格的指示性，使人们更难决定该买什么以及如何花钱。但低通胀并没有带来确定性，而是带来了另一种困惑：巧克力棒为何瘦身，假期为何消失。■



Bartleby

The curse of efficiency

Reflections of a business guru

CHARLES HANDY has been through a lot of challenges in a long career as a manager at Royal Dutch Shell, an oil giant, followed by a spell in academia and acclaim as a business writer championing more flexible, less hierarchical organisations. His latest battle is with his health. Earlier this year, the then 86-year-old Irishman suffered a stroke which meant that he had to learn to walk, talk and even swallow all over again. True to his reputation as a business guru, the experience taught him a valuable lesson, as he explained to Bartleby in a recent interview.

As far as Mr Handy was concerned, the point of his hospital stay was to allow him to recover as fully as possible. That meant he needed to be up and about. In the view of the nurses, that was a potential problem; he might fall and hurt himself. Their priority was to keep him safe. In practice, that required him to stay in bed and keep out of trouble.

The experience led him to reflect on the “curse of efficiency”. Organisations focus so much on efficiency that they fail to be effective. Instead of concentrating on their core goal, they pay attention to narrower measures like cutting costs, or reducing the inconvenience suffered by their staff. Examples of the problem can be found in many places. The purpose of education is to prepare children for later life, but all too often the focus is on getting the children to pass exams.

The drive for efficiency can also seem callous. Mr Handy argues that managers tend to like things more than they like people. If all the staff were replaced by robots, he says, running a business would be a lot easier.

As it is, there is a temptation to try to turn people into things by calling them “human resources”. Call someone a resource, and it is a small step to assuming that they can be treated like a thing, subject to being controlled and, ultimately, dispensed with when surplus to requirements.

Perhaps Mr Handy’s philosophy is best summed up as “what do they know of business who only business know?” Before his stroke he wrote a book, “21 Letters On Life And Its Challenges”, which takes the form of advice passed on to his grandchildren. The focus is more on gentle wisdom than on management theory. Indeed, Mr Handy argues that most organisations whose principal assets are skilled people, such as universities or law firms, tend not to use the term “manager”. Those in charge of them are called deans, directors or partners. Their real job is best described as leadership rather than management. And one of the primary functions of leadership is setting the right purpose for an organisation.

Leadership also involves letting subordinates learn for themselves. When he started work for Shell, he was running the firm’s oil business in Sarawak, Malaysia. He had studied Greek and Latin at university and knew nothing about business or energy. There was no telephone link to the regional office in Singapore, and letters took weeks to arrive. No senior manager felt inclined to visit.

Mr Handy says this gave him the opportunity to learn from his mistakes in private. He argues that “education is an experience understood in tranquillity. You look back and see where you went wrong.”

Because of this, he thinks that business schools need to change. What they tend to do at the moment is encapsulate the best practices of current businesses, codify them and pass them on. But the real challenge that business-school graduates will face is dealing with the unexpected. That cannot be taught in the classroom but needs to be experienced in the

outside world. So students should spend time at small businesses or community projects, and then write a report on how they coped.

Furthermore, if these students aspire to be leaders, they need the ability to tell stories and create a culture. That requires broader knowledge than studying only balance-sheets and sales projections.

Appropriately enough, Mr Handy has hopes of writing yet another book, based on the Bible, which he says is an excellent case study of storytelling. Clearly, he refuses to let illness hold him back. Looking back over his career, he believes that teaching and writing is all about creating the “Aha!” moment. That occurs when people realise that an idea the teacher or writer has advanced is both useful and something they already knew but had not articulated. Bartleby hopes that Mr Handy’s readers will be saying “Aha!” for some time to come. ■



巴托比

效率的诅咒

管理大师的反思

查尔斯·汉迪（Charles Handy）曾长期在石油巨头荷兰皇家壳牌担任管理职务，期间经历了许多挑战。随后他做了一段时间的学术研究，成了备受赞誉的经管作家，提倡更灵活、层级更少的组织架构。这位87岁的爱尔兰老人最新的战役是自己的健康问题。今年早些时候中风后，他必须重新学习走路、说话，甚至是吞咽。近期他接受本专栏记者采访时解释说，这次经历让他获得了一个宝贵的经验。经管大师真是名不虚传啊。

在汉迪看来，住院的意义是让他尽可能完全恢复健康，所以他该多下床活动。而在护士看来这有风险：他可能会摔倒受伤。他们的首要任务是保证他的安全，因此他实际上被要求多卧床，避免麻烦。

这段经历促使他反思“效率的诅咒”。组织对效率太过关注，反而牺牲了效力。它们没有把重点放在核心目标上，而是注重削减成本或减少员工的不便等更枝节性的措施。这种问题在很多地方都有体现。比如教育的目的是让孩子们为今后的人生做好准备，但应试却往往成了重点。

追求效率也会显得冷酷无情。汉迪认为，相对于人，管理者往往更喜欢物。他说，如果所有员工都被机器人取代，那么企业管理将会容易得多。事实上，把人称为“人力资源”就显现出把人物化的倾向。把某人叫做“资源”，就是开始假设他们可以被视为物，需要受到控制，并最终在过剩时舍弃。

也许对汉迪的哲学的最佳总结是“只懂企业的人，又懂什么企业？”在中风之前，他用给予自己的孙辈们忠告的形式写了《关于生活和挑战的21封信》（21 Letters On Life And Its Challenges）一书。书的重点不是管理理论，而是柔和的智慧。实际上，汉迪认为，大学或律师事务所等以高技能人才为主要资产的组织大多不会用“主管”这个词。它们的负责人一般叫院

长、董事或合伙人。最能恰当描述他们真正的工作内容的词是“领导”而非“管理”。而领导的一个主要职能是为组织设定正确的目标。

领导的职能还包括让下属自主学习。汉迪刚到壳牌工作时，负责公司在马来西亚沙捞越（Sarawak）的石油业务。他在大学学的是希腊语和拉丁语，对商业或能源一无所知。那时壳牌在新加坡的区域办事处还没有接通电话，信件来回耗时数周。没有高级主管愿意屈尊前来指导。

汉迪说这让他有机会私下从自己的错误中学习。他认为“教育是在平静中省视自己的经历。要不断回头看看自己哪里出错了。”

因此，他认为商学院需要改变。目前它们的做法是对当下的最佳商业实践做概括总结，然后编成教材传授给学生。但是，商学院毕业生未来面临的真正挑战是应对无法预料的状况。这在课堂上是学不到的，需要在外面的世界中实践。因此，学生应该花时间参与小型企业或社区的项目，然后写一份经验总结报告。

此外，如果这些学生立志成为领导者，他们要具备讲故事和创造企业文化的能力。要做到这一点，只会研究资产负债表和做销售预测是不够的，还需要更广泛的知识。

顺理成章地，汉迪希望自己再写一本书，它基于《圣经》，因为他说《圣经》是研究怎么讲故事的经典素材。显然，他拒绝向疾病屈服。回顾他的职业生涯，他认为教学和写作都是为了创造醍醐灌顶的一刻。当人们意识到老师或作家提出的观点很有用，而恰好又是他们已经知道但没能明确表达出来的想法时，就会出现这样的时刻。笔者希望，汉迪的读者在今后一段时间里也能体验醍醐灌顶的时刻。 ■



Schumpeter

Vodafone's search for the G-spot

Why telecoms firms view 5G with trepidation

THE GLOBAL telecoms boom that reached its zenith almost two decades ago was made for satire. It united two of the most intoxicating technologies of all time, the mobile phone and the internet. It generated the biggest wave of value-destroying takeovers the world had ever seen. Its apex, the £22.5bn (\$35bn) sale of third-generation (3G) wireless spectrum in Britain in 2000, was such a humdinger that the boffins who devised it described it, with a Pythonesque flourish, as the most successful auction since the Praetorian Guard sold the Roman Empire to Didius Julianus in 193AD.

Vodafone, a British mobile operator active across Europe, epitomised the madness of the time. Its £112bn hostile takeover launched in 1999 of Mannesmann, a German rival, was a gripping epic that went on for months—partly against the backdrop of the Savoy Grill, a posh London eatery where both sides mercilessly skewered each other. Vodafone bid almost £6bn over 150 rounds for its British 3G licence, more than any other firm. Then came the telecoms bust of 2001, almost as abrupt as the end of Didius Julianus, whose reign lasted all of nine weeks. It still haunts Vodafone today. The company's return on assets, in lofty double digits until 2000, has been negligible or negative every year since but one.

Vodafone's protracted dark ages stem from a problem common throughout Europe. Telecoms firms have built the networks over which social media, emails, cat videos and other marvels of communication flow, but the sums customers pay to use them has shrunk relentlessly. Understandably, that makes the companies wary of splashing out fortunes on the next mobile lottery, building fifth-generation (5G) wireless networks. Yet they face a

prisoner's dilemma. If none of them takes part, they could all avoid a huge bill. If only one does, it will clean up. If all of them do, they all suffer. Once again Vodafone is in the thick of the action. This time its strategy gives an inkling of how to avoid the worst of the pitfalls.

To put the promise and perils of 5G into perspective, go back a few generations—to 2G, which turned the world into an interconnected talking shop. That technology generated huge profits for mobile pioneers like Vodafone. It could not, however, support enough data to enable video calls, photo-sharing and other mobile internet use that customers wanted. That gave rise to 3G.

As Ferry Grijpink of McKinsey, a consultancy, puts it, the telecoms firms were on the right track with their bets on 3G. But they got two things wrong: the timing, and their ability to make money from it. It took Canada's BlackBerry, and Apple, maker of the iPhone, to bring mobile internet browsing to the masses. Instead of benefiting companies like Vodafone that built the networks, Apple reaped most of the rewards, as did search engines like Google and social networks such as Facebook. During the current decade, 4G (and LTE) have provided enhanced versions of 3G, with much faster data speeds and loading times. But in rich countries fierce competition between telecoms firms has caused them to offer bigger, often unlimited data plans at low cost, hammering profitability. This is especially true in Europe, where Mr Grijpink counts 26 big mobile operators, covering a similar-sized territory as America's four big providers (soon to become three). Average monthly revenue per customer has fallen from \$35 in 2006 to around \$20.

There are patterns in this potted history. In his book, "The 5G Myth", William Webb, a consultant, writes that a new generation of mobile connectivity has emerged every decade. As a rough guide, he says each one provides a tenfold increase in data speeds, say from two hundred kilobits a second with 2G, to

two megabits a second with 3G to 20 megabits a second with early 4G. And telecoms folklore has it that the even numbers (2G and 4G) do better than odd ones.

The hype is that the arrival of 5G will break the pattern. It is coming less than a decade after 4G was widely adopted. It promises to bring a 50-fold improvement in data speeds (say, one gigabit a second). And the hope is that it will be revolutionary, bringing benefits such as immersive gaming, augmented-reality glasses, factories of the future and even remote surgery. Already, the global industry is spending nearly \$160bn a year upgrading towards 5G, and 22 5G networks are up and running.

Still, scepticism is in order. People are not clamouring for faster data, because 4G gives them enough already. After studying the internet usage of reporters at the *Wall Street Journal*, academics found that they use only a fraction of their available bandwidth, even while watching several videos at once. Much of the industrial logic of faster connectivity, such as greater use of sensors in factories, can be supplied by 4G networks. No device exists that makes a compelling business case for 5G. Mr Webb invokes the aerospace industry to warn of the perils of betting on ever-faster speeds. “5G could end up being like Concorde—a superb feat of engineering but of limited value to all but a small minority.”

5G has already come at a cost to Vodafone. This year it slashed its dividend, partly to pay for a pricey spectrum auction in Germany. But like many of its peers, it sees 5G as a way to revitalise revenue growth. It says the new technology will support many more devices at home and at work than 4G does, will lower the cost to Vodafone of handling a lot of data, and improve the reliability of communications in everything from cars to hospitals. Its newish boss, Nick Read, is hoping to form a closer relationship with customers, who increasingly see wireless connectivity as a commodity, by offering tailor-made 5G services. He is also lobbying governments to spur

investment (rather than competition) to avoid a 3G-style fiasco. He is cutting his own infrastructure costs by striking network-sharing deals with mobile operators in Britain, Spain and Italy.

Those are good ideas that may ease the 5G strain. But until the equivalent of a “killer app” comes along to bring the benefits of 5G to billions, it is not clear who will make much money from it. It is up to the telecoms firms to show that they can defy history. ■



熊彼特

沃达丰寻觅G点

电信公司为何对5G心怀忧惧

全球电信业狂飙突进，在约20年前达到顶峰，这一历程不无讽刺。它融合了史上最令人兴奋的两种技术——手机和互联网，催生了全球有史以来最大规模的一轮损毁价值的收购浪潮。它的最高峰是2000年英国拍卖第三代（3G）无线频谱牌照，拍卖额达到令人瞠目的225亿英镑（350亿美元）。开发该技术的科研人员曾夸张地戏称，那是自公元193年禁卫军将罗马帝位卖给狄图斯·尤利安努斯（Didius Julianus）以来最成功的拍卖。

活跃在欧洲的英国移动运营商沃达丰（Vodafone）凸显了当时的狂热。

1999年，沃达丰出价1120亿英镑恶意收购德国对手曼内斯曼

（Mannesmann），这一耗时数月的争夺扣人心弦。一些会谈在伦敦一家高级餐厅萨沃伊烧烤（Savoy Grill）上演，双方针锋相对，毫不留情。沃达丰在超过150轮的出价中以近60亿英镑拍得英国3G牌照，超越其他任何公司。之后2001年电信泡沫破裂，几乎与尤利安努斯在短短九周后就被迫退位一样突然。沃达丰直到今日仍备受困扰。它的资产回报率在2000年前高达两位数，而之后几乎每年都低至忽略不计或为负数，只有一年例外。

沃达丰陷入了漫长的黑暗岁月，根源是普遍存在于欧洲各地的一个问题。电信公司搭建了通信网络，供社交媒体、电子邮件、萌宠视频及其他新奇的通信应用使用，但客户支付的网络使用费却大幅缩减。自然地，这使得它们在砸钱押注下一场移动业务“博彩”（开发5G无线网络）时变得更加谨慎。但它们面对的是一个囚徒困境。如果谁也不开发5G，那大家都可以省下巨额投资。如果只有一家公司开发，那它会大赚特赚。如果大家都开发，那家家日子都不好过。一如之前，沃达丰又积极行动。而这次它的策略似乎是躲避最险恶的陷阱。

为了解5G的潜在利弊，可以回溯几代，看看把世界变成了互联聊天室的2G技术。这项技术为沃达丰这类移动通信的先行者带来了巨大的利润。但2G网络无法支持足够的数据来提供客户想要的视频通话、照片分享和其他移动互联网应用。于是3G应运而生。

正如咨询公司麦肯锡的费里·格雷杰平克（Ferry Grijpink）所说，电信公司当初押注3G时在大方向上是对的，但在两方面出了岔子：时机，以及它们利用3G盈利的能力。加拿大的黑莓和制造iPhone的苹果为大众带来了移动互联网浏览设备。从中获取大部分回报的是苹果、谷歌等搜索引擎以及Facebook等社交网络，而不是沃达丰这种打造了3G网络的公司。在当前的十年，4G（以及LTE）提供了比3G更强的网络，数据传输和加载都大幅提速。但在富裕国家，电信公司之间的激烈竞争迫使它们以低价提供更大（通常是无限）流量的套餐，严重损害了盈利能力。在欧洲尤其如此。据格雷杰平克统计，欧洲共有26家大型移动运营商，而美国虽与之地域大小相仿，却只有四家大运营商（很快将变为三家）。在欧洲，电信公司的客均月收入已从2006年的35美元降至约20美元。

从这段简史中可觅得一些模式。咨询顾问威廉·韦伯（William Webb）在其著作《5G神话》（The 5G Myth）中写道，移动网络每十年就会更新换代。据粗略估计，每一代技术的数据传输速度均为之前的十倍，比如从2G的200Kbps到3G的2Mbps，再到早期4G的20Mbps。民间流传的说法认为，双数代技术（2G和4G）好于单数代技术。

市场造势说5G的到来将打破旧有模式。在4G普及还不到十年时，5G便已来到。它号称数据传输速度可提升至原来的50倍（每秒1Gb），还有望带来革命性的应用，如沉浸式游戏、增强现实眼镜、未来工厂，甚至远程手术。全球电信业已每年支出近1600亿美元向5G升级，目前已有22个5G网络建成投用。

然而，仍有值得存疑之处。人们并没有强烈要求更快的数据传输速度，毕竟4G已经够快了。有学者研究了《华尔街日报》的记者使用互联网的情况，发现他们只使用了一小部分可用带宽，即便在同时观看多个视频时也

如此。至于工业上对更快连接性能的需求（例如工厂可更广泛使用传感器），4G网络大多也能满足。现在还没有什么设备能让5G技术有很充分的商业价值。韦伯以航空航天业为例，警告一味押注提速的风险：“5G可能最终会变得像协和式客机一样，虽然它本身是一项惊人的工程创造，但只能惠及极少数人，对大众价值有限。”

沃达丰已为5G付出了代价。今年它大幅削减股息，部分是因为需要资金在德国竞拍价格高昂的5G频谱牌照。但与许多同行一样，沃达丰将5G视为激活收入增长的一个途径。它表示，相比4G，新技术将能支持更多的家用和办公设备，降低沃达丰处理大量数据的成本，并提高从汽车到医院等各种场景内的通信可靠性。其新老板尼克·里德（Nick Read）认为客户越来越把无线联网服务看作一种大宗商品，他希望通过提供量身定制的5G服务与客户建立更紧密的关系。同时，他正在游说政府促进这方面的投资（而非竞争），避免3G那样的惨淡局面。沃达丰正与英国、西班牙和意大利的移动运营商达成网络共享协议，以此来降低自己的基础设施成本。

这些都是可以缓解5G风险的好点子。但是，不到“杀手级应用”出现来把5G的好处带给数十亿人的那天，还说不准谁能从5G中获取厚利。电信公司能否改写历史，要看它们的本事了。■



Blue-collar workers

Reflecting back

An American documentary about labour rights strikes a chord in China

THE COMMENTS came in thick and fast on Douban, a social network popular with film buffs and bookworms. More appeared on Weibo, a microblogging website, where the hashtag #AmericanFactory has gained more than 16m views. The documentary of that name, by a film-making couple from Ohio, was released on August 21st on Netflix. The American firm's streaming service is not available in China, but pirated copies of the film have proliferated. Strikingly, it has drawn praise—even as the Sino-American trade war stokes nationalist feelings within China.

That reception is partly a testament to the faultlessly balanced take of “American Factory”, shaped by 1,200 hours of rare footage. Much was shot inside a plant in Dayton, Ohio, which was taken over in 2014 by Fuyao, a Chinese glass-making giant that supplies the global car industry. In 2008 General Motors had closed its complex there, so for jobless local people Fuyao’s arrival was a miracle. Before long, however, Stakhanovite bosses clashed with a restive and outspoken factory floor. The film is a parable of modern manufacturing, showing the strengths and weaknesses of each country. For Chinese viewers, the failings of theirs hit home.

“It was hard to watch,” wrote a user on Douban. “Who does not know that Chinese efficiency is driven by depriving workers living at the bottom of society of their health, safety and dignity?” Another comment came from the city of Fuqing, Fuyao’s base, to which American managers are taken to be trained in Chinese factory-floor culture (they are alarmed to see workers crouched on mountains of shards, sorting them for recycling, and bewildered by the militaristic morning roll-calls and 12-hour shifts). “The

scariest thing is that we have grown used to this,” wrote the native of Fuqing, pondering whether to feel pride or sorrow at management methods like Fuyao’s.

Young Chinese have begun to resist them. Earlier this year engineers in the cut-throat technology industry led a rare online labour movement to protest against the “996” regime (a de facto work schedule of 9am to 9pm, six days a week, often without extra pay for those extra hours). Last year students and activists joined protests by factory workers at Jasic, a maker of welding machinery in Shenzhen.

Their gripes were poor working conditions and firings after some had tried to unionise—something that in America Fuyao fought tooth and nail, and successfully, to block. “American Factory” depicts a collision between two working cultures. But worries about the plight of blue-collar workers unite them. ■



蓝领工人

回响

一部关于劳工权利的美国纪录片在中国引起了共鸣

在电影爱好者和书虫聚集的社交网站豆瓣上，评论铺天盖地。微博上的就更多了——带“#美国工厂”（#AmericanFactory）标签的话题浏览量已过1600万。由俄亥俄州一对夫妇拍摄的纪录片《美国工厂》于8月21日在Netflix上播出。这家美国公司的流媒体服务尚未进入中国大陆，但这部电影的盗版在中国已经遍地开花。出人意料的是它颇受褒扬，尽管眼下中美贸易战正在中国国内激起民族主义情绪。

这样的反响一定程度上证明《美国工厂》实现了极为平衡的展示。这部电影是由1200个小时的珍贵的镜头剪辑而成，大部分是在俄亥俄州代顿（Dayton）的一家工厂内拍摄的。这家工厂于2014年被福耀收购，这家中国玻璃制造巨头为全球汽车业供货。2008年，通用汽车关闭了当地的工厂，因此对失业的当地人来说，福耀的到来是一件天大的幸事。然而没过多久，斯达汉诺夫式的老板们就和一群难以驾驭、直言不讳的普通工人发生了冲突。这部电影是现代制造业的寓言，展示了每个国家的强弱项。对于中国观众来说，影片对他们的缺点的展示直击要害。

“看着很难受。”一位豆瓣用户写道。“谁不知道所谓的中国速度是牺牲了社会底层工人的健康、安全和尊严换来的？”另一句评论来自福耀的总部所在地福清，美国的管理人员被带到那里，在中国的工厂文化中接受培训（他们惊恐地看到工人们蹲在堆积如山的碎玻璃上，把它们分类回收，并且被军事化的晨间点名和12小时轮班制搞得晕头转向）。“最可怕的是我们已经渐渐习惯了。”这位福清人写道，思忖着不知道该对福耀这样的管理模式感到自豪还是悲哀。

中国的年轻人已经开始抵制这些做法。今年早些时候，竞争激烈的科技行业里的工程师们发起了一场罕见的在线劳工运动，抗议“996”工作制（实

际工作时间从早上9点到晚上9点，每周工作六天，而这些加班时间通常没有加班费）。去年一些学生和活动人士加入了深圳焊接机械制造商佳士公司的工人抗议活动。

他们抗议的是糟糕的工作条件，以及公司解雇一些试图成立工会的工人。而在美国，福耀竭尽全力，成功阻止了工会的成立。《美国工厂》描述了两种工作文化的碰撞。但对蓝领工人困境的担忧让这两种文化团结起来。





Free exchange

Meeting of minds

President Donald Trump has helped bring the world's central bankers together

AS THE ANNUAL meeting of central bankers and economists at Jackson Hole, a mountain resort in Wyoming, began on August 23rd, two participants made a bet. Would President Donald Trump tweet about the opening remarks of Jerome Powell, the chairman of the Federal Reserve, within 45 minutes? In the event, it took the president 57 minutes. That night the victor enjoyed his winnings—a glass of whiskey—in the bar.

Mr Trump's words made the conference theme, "challenges for monetary policy", uncomfortably timely. He called Mr Powell an "enemy" and promised to ramp up trade tensions with China. Then he announced increases in tariff rates on over \$500bn of Chinese imports. But even as stockmarkets reeled, the conference continued serenely. Indeed, Mr Trump even brought the assembled economists and monetary policymakers closer together.

Most obviously, they were united in grumbling about the impact of his trade policy on the global economy. Philip Lowe, the governor of the Reserve Bank of Australia, said that business uncertainty was turning political shocks into economic ones. Mark Carney, the governor of the Bank of England, said that trade tensions had raised risk premiums, thus tightening financial conditions. The president's twitter tirade could lead to greater policy convergence, too. Mr Powell said that the Fed's doveish shift had helped secure a positive outlook for inflation and employment. As recently as December it was raising rates away from those set by other central banks; now it is moving downwards with them.

Participants also seemed united in scepticism that monetary policy could entirely offset the trade war's ill effects. It could help with confidence, said Mr Powell, but could not create a "settled rulebook for international trade". Mr Lowe questioned how much modest interest-rate cuts would stimulate investment, and noted that countries could not all pep up their economies with currency depreciation, as "we trade with one another, not with Mars".

The academic presentations revealed another point of sympathy. Mr Trump is a powerful force outside the Fed's control—one it cannot fully offset. In claiming to put America first, he complicates the Fed's task of keeping America's economy on an even keel. That difficulty is paralleled by how the Fed, in turn, complicates monetary policy in the rest of the world.

Mr Trump's power is expressed via social media. The Fed's is exerted via the dollar, which has become more important globally in the decade since the financial crisis. America accounts for just 15% of global GDP and 10% of global trade, yet the greenback is used for half of global trade invoicing, two-thirds of emerging-market external debt and two-thirds of official foreign-exchange reserves.

Fed policy thus has far-reaching effects. Participants at Jackson Hole referred to the work of Gita Gopinath of the IMF, which showed that the dollar's dominance in trade invoicing may stop economies from adjusting to external shocks by as much as traditional models suggest. They also heard about the findings of Arvind Krishnamurthy and Hanno Lustig of Stanford University, showing that when the Fed raises interest rates, the premium for buying the world's safest asset—dollar-denominated American government debt—rises too. That, they think, is because the Fed is, in effect, signalling that a reduction in supply is imminent. Wenxin Du of the University of Chicago suggested that the premium could also reflect limits on global banks' ability to lend in dollars, and that tighter Fed policy could exacerbate those constraints.

That discussion built on earlier work by another participant, Hélène Rey of London Business School, who has argued that when the Fed raises interest rates financial conditions tighten in the rest of the world. Sebnem Kalemli-Ozcan of the University of Maryland explained how emerging markets could be hit as, when the Fed raises rates, some money moves from emerging markets towards America. Investors then worry that emerging markets might run into problems, which makes them look riskier and worsens capital flight. Central banks, she added, would be unable to shield their economies fully from the consequences. In theory they could lean against the wind, raising rates to encourage investors to stay. But the tightening required tends to be so extreme that it would throttle the domestic economy. Though allowing the exchange rate to adjust instead also brings pain, it is the less bad option.

The assembled central bankers uttered a chorus of complaints about the forces making their lives harder. Amir Yaron, the governor of the Bank of Israel, spoke of keeping interest rates very low for the past three years, but still seeing foreign capital slosh in as the Fed tightened, because investors regarded Israel as an emerging-market haven. The Fed's moves were offset only partially by Israel's monetary policy, he said. Participants from advanced economies also grumbled: Mr Carney called the dollar "domineering".

In some ways, then, the Fed's struggles to cope with the consequences of Mr Trump's words and deeds echo the experiences of its counterparts in other countries, for which it is the Fed itself that is the unruly, unbidable external force. But in other ways the comparison is unfair. The Fed is, after all, seeking to create the conditions for America's economy to thrive. The more it succeeds, the better for everyone else. And sometimes it considers the spillover effects of its actions. Its decision in July to cut interest rates was motivated in part by concerns over "weak global growth".

On August 27th Bill Dudley, a former president of the New York Fed, suggested in an opinion piece for Bloomberg that the Fed should not ease monetary policy in response to the trade war in case it emboldened Mr Trump's protectionism and boosted his chances of re-election. It responded with a statement slapping down any idea that it had such political motives. America's monetary policymakers certainly create problems for their counterparts elsewhere. But, unlike Mr Trump, they are not trying to. ■



自由交流

所见略同

特朗普拉近了各国央行行长之间的距离

各国央行行长和经济学家的年会于8月23日在怀俄明州的山区度假胜地杰克逊霍尔（Jackson Hole）召开。会议开始之际，两名与会者打了个赌：特朗普是否会在45分钟内就美联储主席杰罗姆·鲍威尔（Jerome Powell）的开场致辞发推文？结果，特朗普在57分钟后发了推文。当天晚上，赌赢的那位在酒吧里享受了他的胜利果实——一杯威士忌。

特朗普的推文让这场会议的主题“货币政策面临的挑战”显得格外适时，令人不安。他称鲍威尔为“敌人”，并承诺升级与中国的贸易争端。随后他宣布将对超过5000亿美元的中国进口商品加征关税。但即使股票市场动荡不安，会议仍平静有序地进行着。实际上，特朗普甚至还拉近了与会的经济学家和货币政策制定者之间的距离。

最明显的就是他们同声抱怨了特朗普的贸易政策对全球经济的影响。澳大利亚储备银行行长菲利普·洛伊（Philip Lowe）表示，商业不确定性正在把政治冲击转变为经济冲击。英格兰银行行长马克·卡尼（Mark Carney）表示，贸易紧张局势已经提高了风险溢价，从而收紧了金融环境。特朗普接连不断的推文也可能导致更大的政策趋同。鲍威尔表示，美联储向鸽派立场的转变有助于保证通胀和就业前景乐观。就在去年12月美联储还在加息，与其他央行背离，现在它正和它们一起降息。

与会者似乎也一致怀疑货币政策是否可以完全抵消贸易战的不良影响。鲍威尔表示，货币政策可能有助于增强信心，但无法提供“国际贸易的确定规章”。洛伊质疑小幅降息对刺激投资能有多大作用，并指出各国不可能都靠货币贬值来提振经济，因为“我们是与彼此做贸易，而不是与火星做贸易”。

会上发布的学术报告还揭示出另一个共识。特朗普是美联储控制范围之外

的一个强大的力量，美联储无法完全抵消其影响。特朗普声称将美国放在第一位，这使得美联储维持美国经济平稳的任务变得更加复杂。美联储面对的这种困难继而又令世界其他地区的货币政策也变得更复杂。

特朗普通过社交媒体施展影响力。美联储通过美元发挥作用。金融危机之后的十年里，美元在全球变得更加重要。美国仅占全球GDP的15%和全球贸易的10%，但一半的全球贸易结算、新兴市场三分之二的外债的和三分之二的官方外汇储备用的都是美元。

美联储的政策因而影响深远。杰克逊霍尔会议的与会者提到了国际货币基金组织（IMF）的吉塔·戈皮纳特（Gita Gopinath）的研究。该研究显示，美元在贸易结算中的主导地位可能会让各个经济体无法像传统模型所显示的那样适应外部冲击。他们还听到了斯坦福大学的阿文德·克里斯纳姆塞（Arvind Krishnamurthy）和汉诺·卢斯蒂格（Hanno Lustig）的研究结果。这两位学者发现，美联储提高利率时，美元计价的美国国债这一世界上最安全的资产的购买溢价也会上升。他们认为，这是因为美联储提高利率之举实际上是在暗示供应量即将减少。芝加哥大学的杜文新（Wenxin Du，音译）认为，溢价也可能反映出各国银行以美元贷款的能力受限，美联储的紧缩政策可能会加剧这些限制。

这些讨论是建立在另一位与会者、伦敦商学院的埃莱娜·雷伊（Hélène Rey）早前的研究基础上。她认为美联储提高利率时，世界其他地区的金融环境会收紧。马里兰大学的谢布内姆·卡勒姆利-厄兹甘（Sebnem Kalemli-Ozcan）解释说，美联储加息时，部分资金会从新兴市场流向美国，从而对新兴市场造成冲击。投资者因而担心新兴市场可能会遇到问题，这让它们看起来投资风险更高，加剧了资本外逃。她补充说，各国央行无法完全保护其经济免受上述后果的影响。从理论上讲，它们可以逆风而行，提高利率以鼓励投资者留下来。但这所需的紧缩政策往往太过极端，会遏制国内经济的发展。尽管允许汇率调整也会带来痛苦，但这是损害较小的做法。

与会的央行官员一致抱怨有些因素让他们的日子更加难过。以色列央行行

长阿米尔·亚龙（Amir Yaron）谈到，过去三年里，以色列一直保持着非常低的利率水平，但随着美联储收紧货币政策，外资仍纷纷涌入，因为投资者认为以色列是新兴市场的避风港。他说，以色列的货币政策仅抵消了美联储举措的一部分影响。发达经济体的与会者也在抱怨；卡尼称美元“专横跋扈”。

所以，在一定程度上，其他央行应对美联储带来的影响与美联储努力应对特朗普言行的后果是一样的——对它们而言美联储就是那个不守规矩、无法控制的外部力量。但在其他方面，这种比较就不公平了。毕竟，美联储是在为美国经济的蓬勃发展创造条件，它越成功，对其他国家就越好。而且有时美联储也会考虑其决策的溢出效应。7月它决定降息的部分原因就是担忧“全球经济增长疲软”。

上月27日，纽约联储前主席比尔·达德利（Bill Dudley）在彭博社的一篇评论文章中表示，美联储不应该为了应对贸易战而放松货币政策，这样做可能会让特朗普的保护主义政策变本加厉，并增加其连任的机会。美联储发表声明严正驳斥了任何认为其决策具有政治动机的揣测。美国的货币政策制定者确实为其他国家的同行制造了问题，但与特朗普不同的是，他们不是有意为之。 ■



China's financial system

Expelling the poison

After three banks are rescued, how many more are at risk?

WORKING AT Hengfeng Bank, an embattled Chinese lender, requires a thick skin these days. On August 30th the bank's Communist Party committee summoned its members, including top executives, for a self-criticism session, of the sort common in the Maoist era. "No one talked about their achievements. They talked only of their shortcomings and problems. They pointed the knife blade at themselves," the bank reported afterwards. "Blushing and sweating, they expelled their poison."

The revival of self-criticism under Xi Jinping, China's president, has raised alarm about the direction in which he is steering the country. Other banks have also conducted similar sessions, a testament to Mr Xi's assertion of party control over the economy. But in the case of Hengfeng, ravaged by corruption scandals and bailed out last month by the government, the sight of its employees examining their misdeeds was, in a way, reassuring. It suggests that officials are getting a handle on one of the worst actors in the banking system, even if their techniques sometimes owe more to Lenin than to Dodd or Frank.

The question now is how many more Hengfengs there are. It was the third bank to be rescued in the space of three months. In May regulators took over Baoshang Bank in Inner Mongolia. In July Industrial and Commercial Bank of China (ICBC), a state-owned giant, propped up the Bank of Jinzhou in the north-east. Then in August Hengfeng, based in Shandong province, received a cash infusion from China's sovereign-wealth fund.

Officials have portrayed these troubled banks as peripheral to the economy.

The assets of Hengfeng, the biggest, peaked in 2017 at 1.4trn yuan (\$210bn at the time), just 0.5% of the total for Chinese banks. Regulators have also been prompt in fixing holes. When the Baoshang rescue spooked investors as the first instance of losses on interbank loans, the central bank quickly calmed them by injecting cash into the banking system.

Nevertheless, many financiers suspect that the rot is deeper. Their nerviness is visible in two ways. The first is small banks' elevated funding costs. For years they paid roughly the same interest rates as big banks to borrow from each other. Since Baoshang's rescue, their costs have been half a percentage point higher (see chart).

The second is the 10% fall in ICBC's shares since its Jinzhou investment, a performance that has fallen short of other banks. An auditor who worked with ICBC says the bank was surprised by the blowback. It had used a subsidiary to support Jinzhou, hoping to quarantine the rest of its balance-sheet. But investors did not see it that way. As analysts with China Merchants Bank said, it looked as if ICBC was performing "national service". The fear is that big banks will be conscripted into service again and again.

Many more banks do indeed need help. By the central bank's count, 420 of China's 4,327 lenders are at high risk of distress. However, all but nine are puny rural lenders, so it should be possible to mop up their messes. To get a sense of the scale, Jason Bedford of UBS assessed capital levels, bad loans and loss provisions at a large sample of banks. He estimated that banks with total assets of 9.2trn yuan (\$1.3trn) are in danger, amounting to about 4% of the commercial banking system, or nearly a tenth of GDP. That is a big problem, but not an insuperable one.

The banks rescued in recent months were atypical in various ways. Baoshang was the piggy bank of a disgraced tycoon; Bank of Jinzhou's

auditors resigned amid signs of loan fraud; multiple executives at Hengfeng were felled by corruption charges. “There doesn’t appear to be other banks left with the same scale and toxicity as these three,” says Mr Bedford.

Yet much about them was also normal. China’s smaller banks have been especially aggressive, increasing their assets by 144% over the past five years, compared with 53% for large banks. They have also relied more on interbank borrowing. The implication is that as the economy slows, and as big banks grow wary of counterparty risk, more small banks will be exposed.

Charlene Chu of Autonomous Research has long estimated that bad loans in China are much higher than reported: more like 20% of bank assets rather than the official 2%. She thinks this year’s turbulence is a preview of what lies ahead. But she also says that China has ways to delay the reckoning, potentially for a long time. When defaults spread to brokerages in June, regulators brought them and their creditors, mostly banks, together in emergency meetings. “It is a rare tool that Chinese authorities have,” says Ms Chu. “They called in all parties, and said no one is defaulting any more.”

Even if China can prevent widespread defaults, its banks’ newfound risk aversion poses dangers itself. Small banks had been big lenders to small companies, which in turn are big drivers of growth. Now, the outlook for all is more subdued.

At Hengfeng it is no coincidence that, when not engaged in self-criticism, bankers are talking up their role in helping small firms. In a recent news broadcast, Hengfeng’s chairwoman was shown visiting a local food company. She gazed over a rice field, trimmed to look like Tiananmen, complete with a portrait of Mao. A slogan was cut into the field: “I love my motherland”. In banking as in farming, it is good to know which way the wind is blowing. ■



中国的金融体系

排毒治病

三家银行获救后，还有多少家面临危机？

这些天，在深陷困境的恒丰银行工作得脸皮够厚。8月30日，该银行党委召集包括高管在内的党员举行毛时代常见的自我批评会议。“大家在发言中不谈成绩经验，只查问题短板，自我批评刀刃向内、触动灵魂，”该银行在会后报告中写道，“收到了红脸出汗、排毒治病的效果。”

在国家主席习近平的领导下，自我批评之风重新刮起，令人对他的治国走向心生警惕。其他银行也举行了类似的会议，体现出习近平加强党管控经济的主张。但在恒丰这个案例中——这家银行深陷腐败丑闻并于上月被政府接管——其员工检讨自身的不当行为多少令人宽慰。这表明官员们正对银行系统中的最恶劣分子之一动手，即便有时他们使用的方法更多是列宁式的而非《多德弗兰克法案》那样的法治。

现在的问题是还有多少家“恒丰银行”。这是三个月内国家出手纾困的第三家银行。5月，监管机构接管了内蒙古的包商银行。7月，国有银行巨头中国工商银行入股挽救了东北地区的锦州银行。接着到了8月，山东的恒丰银行又获中国主权财富基金注资纾困。

按官员们的说法，这些陷入困境的银行只是中国经济中的小角色。其中规模最大的恒丰银行在2017年巅峰时期的资产为1.4万亿元（按当时汇率为2100亿美元），仅占国内银行总资产的0.5%。监管机构填补漏洞的动作也很迅速。作为同业贷款亏损的首个案例，包商银行被接管震动了投资者。中央银行向银行系统注入资金，迅速平息了他们的忧虑。

然而，许多金融业人士怀疑问题实际上更严重。他们的忧虑从两方面反映出来。一是小银行的融资成本上升。多年来，小银行同业贷款的利率与大银行大致相同。自包商银行被接管以来，小银行的融资成本高出了0.5个百分点（见图表）。

第二是工行自入股锦州银行以来股价下跌了10%，表现逊于其他银行。与之合作的审计机构表示，工行对出现这种负作用感到惊讶。工行通过子公司入股锦州银行，希望将它与自己资产负债表内的其他部分隔离开来。但投资者不这么看。正如招商银行的分析师所说，工行像是在承担“国民服务”。人们担心大银行会一再被征召完成这类任务。

确实还有许多银行需要帮助。据中国人民银行统计，中国4327家银行中有420家有陷入困局的高风险。然而其中除九家银行外，其余都是规模很小的农村银行，所以政府应该还是能够帮它们收拾残局的。为了解问题的严重程度，瑞银的杰森·贝德福德（Jason Bedford）对大批银行的资本水平、不良贷款和贷款损失准备金做了评估。他估计，处于危险中的银行的总资产为9.2万亿元人民币，约占商业银行系统的4%，接近GDP的十分之一。这是个大问题，但并非不可克服。

近几个月里被救助的银行各有各的非典型性。包商银行是一位名声不佳的大亨的小金库；锦州银行的审计机构因发现存在贷款欺诈而辞任；恒丰银行则是有多名高管因贪腐指控被免职。“论规模和危害，其他银行似乎都比不上这三家。”贝德福德说。

但它们的许多特点都很常见。中国的小银行发展尤为激进，过去五年资产增加了144%，而大银行仅增加了53%。小银行也更依赖同业拆借。这意味着随着经济放缓，以及大型银行愈加警惕交易对手风险，更多小银行会爆雷。

“自主研究”（Autonomous Research）的朱夏莲一直认为中国的不良贷款比率远高于官方数字：更有可能是占银行资产的20%，而非官方所说的2%。她认为今年的动荡是未来情势的预演。但她也表示，中国有可能在很长一段时间内阻止问题爆发。6月，债务违约问题蔓延至券商，监管机构马上把这些券商及其债权人（主要是银行）叫来召开紧急会议。“这是中国政府拥有的稀有工具，”她说，“监管机构召集各方开会，并宣称没人会再违约了。”

即使中国能阻止大规模违约，国内银行规避风险的新趋势本身也会带来危险。小银行一直是小企业的主要贷款方，而小企业是经济增长的重要动力。如今，整体前景都变得更黯淡了。

在恒丰银行，当没在参加自我批评会时，高管们大谈自己对小企业的扶持作用，这并非巧合。最近有一则电视新闻报道恒丰的董事长参观一家本地食品公司。画面中她凝视着一片稻田。这片稻田整个修剪得像天安门，配有毛泽东肖像，其中还修剪出了一句口号：“我爱我的祖国。”银行业跟农业一样，把握好风向总是好事。 ■



Wine investing

A cellar's market

Want a top-performing liquid asset? Try Pinot Noir

WINE COLLECTORS like to proclaim that “all roads lead to Burgundy.” They often wince at the plonk they drank when starting their hobby. In America and Australia, a common entry point is local “fruit bombs”: heavy, alcoholic wines that taste of plum or blackberry; bear the vanilla or mocha imprint of oak barrels; and should be drunk within a few years of bottling.

As oenophiles gain experience, they start seeking reds to have with, say, chicken as well as steak. That leads to lower-octane French options: Cabernet Sauvignon from Bordeaux rather than Napa; Rhône Syrah instead of Barossa Shiraz. But once you value complexity and finesse over power, your vinous destination is pre-ordained.

Encyclopaedic wine knowledge is most precious in Burgundy. The French region is split into hundreds of named vineyards. In turn, myriad producers own specific rows within each vineyard, from which they all make unique wines. This yields thousands of distinct pairings, each consisting of a few thousand bottles at most.

Moreover, red Burgundy is made from Pinot Noir, a grape with a maddening ageing pattern. After a few years of storage, it tends to “shut down” and lose flavour. The best wines blossom after a few decades, but many never “wake up” from their slumber.

In the past, Burgundy’s complexity and small output relegated it to a market niche. A decade ago, Bordeaux—which makes fewer distinct wines in larger batches—became popular in Asia, and prices soared. But the bubble burst in 2012, when China’s government began to frown on lavish gifts.

As tastes moved on from commoditised Bordeaux, mastery of Burgundy became seen as the test of connoisseurship, both in Asia and the West. But the region's vast array of wines—including trophies as scarce as 300 bottles a year—makes reliable pricing data hard to find. Among the hundreds of fine red Burgundies, Liv-ex, a marketplace, includes just 11 in its regional index.

To create a sturdier measure, WineBid, the biggest online wine auctioneer, kindly gave us a full sales record for every wine sold at least ten times on its site since 2003. The data contain 1.6m lots, covering 33,000 wines. We built portfolios of 50-500 of the most expensive unique labels (one vintage of one wine) from each region. We then estimated the returns for each portfolio, before storage and transaction costs.

Collectors who have drunk most of their Pinot already may need another glass after seeing the results. By the end of 2018, red Burgundy had returned 497%, versus 279% for the S&P 500. (Our index does not extend to 2019, since many of the wines it contains have not been traded this year.) The index has also been less volatile than stocks are, though this may be an artefact of how it is calculated: no one knows what each wine would have sold for in the crash of 2008-09. Bordeaux and Champagne rose by 214% in 2003-18; everywhere else did worse.

It is hard to fathom how Burgundy can maintain such appreciation. Many people can buy a \$300 bottle. But at \$3,000, the market depends on the whims of the rich.

Even if prices keep rising, the best-performing stocks tend to beat their vinous peers. For example, Kering and LVMH—luxury conglomerates whose owners have bought Burgundy vineyards—returned 958% in 2003-18. And with dividend yields over 2% in recent years, they have paid enough income for a *grand cru* bottle, too. The best way to make money in Burgundy is probably making wine, not buying it. ■



葡萄酒投资

酒窖市场

想要回报最佳的液体资产？试试黑皮诺吧

葡萄酒收藏者总爱说，“条条大路通勃艮第。”刚开始培养品酒的爱好时，入喉的廉价酒常让他们蹙起眉头。在美国和澳大利亚，常见的入门酒是当地产的“水果炸弹”：口感浓郁、酒精度高的葡萄酒，喝起来有李子或黑莓的味道，而且带有橡木桶赋予的香草或摩卡风味，在装瓶后的几年内饮用为佳。

随着葡萄酒行家们经验的增多，他们开始寻觅和鸡肉、牛排等多种食物都能搭配的红葡萄酒。这就把他们引向了辛烷值更低的法国葡萄酒：选择波尔多产区的赤霞珠，而不是纳帕谷的赤霞珠；选罗讷河谷的西拉，而不是巴罗萨谷的设拉子。但是，一旦你重视酒的复杂和细致度更甚于劲道，那么你的品酒之旅终将走到一个早已注定的地方。

百科全书般广博的葡萄酒知识在勃艮第最能派上用场。这个位于法国的产区被分割成数百个不同名字的葡萄园。园中不同的地块又分属数不胜数的葡萄酒生产商，它们用自家栽种的葡萄制作出独一无二的葡萄酒。由此又产生了成千上万独特的混调酒款，每种最多生产几千瓶。

此外，勃艮第红酒是用黑皮诺酿制而成，这种葡萄的陈酿过程令人抓狂。经过几年储存后，它往往“封闭”，失去风味。最优质的黑皮诺葡萄酒会在陈酿几十年后臻于佳境，但大多数永远不会从沉睡中“苏醒”。

在过去，勃艮第葡萄酒因其复杂度和小产量而成为一种市场利基。十年前，波尔多葡萄酒（独树一帜的酒款较少，但产量较高）在亚洲流行开来，价格飙升。但2012年中国政府开始禁止收受高档礼品后，泡沫破裂。

随着酒客的品味超越了商业化的波尔多葡萄酒，对勃艮第葡萄酒了若指掌被视为鉴赏力的试金石，在亚洲和西方都是如此。但该产区出产的葡萄酒

种类繁多（包括年产量仅为区区300瓶的特级酒），以致难以找到可靠的定价数据。勃艮第精品红葡萄酒有成百上千种，而葡萄酒市场Liv-ex的产区指数仅包含其中的11种。

为创造一个更可靠的衡量标准，我们有幸获得了最大的在线葡萄酒拍卖商WineBid提供的数据——自2003年以来在其网站上至少售出10笔的葡萄酒的完整销售记录。这些数据包含160万个产品批次，涵盖33,000种葡萄酒。我们将来自每个产区的50到500个最昂贵的、独一无二的品牌（一款酒选择一个年份）组成投资组合，然后再估算未计入存储和交易成本前每个组合的回报。

看到结果后，那些已经把自藏的黑皮诺喝得所剩无几的收藏者可能还得再来一杯冷静冷静。截至2018年底，勃艮第红葡萄酒的回报率已达497%，而标普500指数的回报率为279%。（我们的指数不包含2019年，因为这一年生产的葡萄酒有许多尚未交易。）这一指数的波动性也比股票小，虽然这可能和计算方法有关：没有人知道每种葡萄酒在2008到2009年经济衰退期间是什么行情。2003至2018年波尔多和香槟产区的葡萄酒的回报率为214%。其他产区的情况都没这么好。

很难理解勃艮第葡萄酒如何能保持这样的增值势头。很多人都买得起300美元一瓶的酒，但当一瓶酒要卖到3000美元时，市场就得指望富人的心血来潮了。

即使价格持续上涨，表现最好的股票往往也会击败葡萄酒。例如，2003到2018年间，奢侈品企业集团开云（Kering）和路威酩轩（LVMH）的回报率达到958%。它们的所有者都在勃艮第收购了葡萄园。而且近年来随着股息收益率超过2%，它们将足够多的收入贡献给了产自特级葡萄酒园的佳酿。在勃艮第赚钱的最佳途径可能是制作葡萄酒，而不是买葡萄酒。■



Confessions of a tycoon

Mea culpa

A fallen corporate star reflects on failure in German business

“GUILTY” IS THE title of a book presented on August 20th by Thomas Middelhoff, the former boss of Bertelsmann, a media conglomerate, once feted from Berlin to Hollywood. It is not an admission of legal guilt, for Mr Middelhoff still feels his three-year prison sentence for tax evasion and breach of trust was overly harsh. But he committed the seven deadly sins in a biblical sense, he says, which is why he feels he deserved time behind bars and the loss of his fortune, reputation, health and marriage. He wants the account of his failures to serve as a cautionary tale for businesspeople in Germany and beyond.

Mr Middelhoff’s stellar rise was unusual in staid Teutonic business culture. He climbed to the top of Bertelsmann through a combination of hard work, unwavering belief in his instincts, showmanship and an Anglo-Saxon appetite for risk. Perhaps his biggest coup was a partnership with Steve Case, who at the time was the virtually unknown boss of a struggling startup called America Online. Then known as “Big T”, Mr Middelhoff made a fortune for Bertelsmann when he sold its stake in AOL for close to €7bn (\$6.7bn) in 2000, just before the dotcom bubble burst.

His reward—a bonus of €45m—was the start of the undoing of his personal finances. Greed, he says, led him to invest in dodgy real-estate funds and tax-avoidance schemes. In 2002 he was forced out of Bertelsmann after clashing with the Mohn family, who own the company, over his plans to take the firm public. Eager for a second act as a German business tycoon, in 2005 he took the helm of KarstadtQuelle, which later became Arcandor, then Germany’s biggest retailer. His efforts to turn around that ailing company

led to his humiliating decline. He sold Arcandor's property portfolio for €4.5bn but saddled its department stores with high rents. In February 2009 it was the Arcandor board's turn to force him out. By June the retailer had collapsed.

That is when prosecutors began investigating Mr Middelhoff's conduct at the company. They uncovered his use of Arcandor aircraft for private purposes and company cash to part-finance a book honouring his mentor at Bertelsmann. In 2014 a court in Essen found him guilty. He was arrested in the courtroom in front of his family. A year later he declared personal bankruptcy.

Mr Middelhoff's tale of hubris resonated beyond the corporate world. He served as the model of the title character in "Johann Holtrop", a novel by Rainald Goetz. At the end of the novel Holtrop commits suicide. "For Germans there is no rise after the fall," says Mr Middelhoff.

The repentant mogul has already published one book in 2017 about his time in the nick and his autoimmune disease. Jarringly, he prefaced several chapters with quotes from Dietrich Bonhoeffer, a pastor imprisoned and executed by the Nazis, seemingly equating their respective fates. He is now working on his third book, a novel about the rise and fall of a business tycoon. Mr Middelhoff may be humbled. But his favourite topic is still Mr Middelhoff. ■



大亨的忏悔

我之过失

一位陨落的企业明星反省自己在德国商业中的失败经历

传媒集团贝塔斯曼的前老板、曾经在柏林乃至好莱坞都广受赞誉的托马斯·米德尔霍夫（Thomas Middelhoff）于8月20日发布了新书《有罪》（Guilty）。这并不是法律意义上的认罪——他仍然认为自己因逃税和违反信托获刑三年的判罚过重了。但他承认自己犯了《圣经》所说的七宗罪，因而理应被关进监狱，失去财产、名誉、健康和婚姻。他希望自己的失败经历能给德国及其他国家的商界人士敲响警钟。

米德尔霍夫明星般的崛起在保守的日耳曼商业文化中非同寻常。他登上贝塔斯曼的最高位靠的是努力工作、对直觉的坚定信念、表现力，以及盎格鲁-撒克逊人的冒险精神。或许他最妙的一招是与史蒂夫·凯斯（Steve Case）合作。凯斯当时可以说籍籍无名，是苦苦挣扎的创业公司美国在线（America Online）的老板。当时被称为“大T”的米德尔霍夫在2000年互联网泡沫破裂前夕以近70亿欧元（67亿美元）的价格出售了贝塔斯曼持有的美国在线股份，为贝塔斯曼赚进一大笔。

他由此获得了4500万欧元的分红，而这成了他个人财务状况恶化的开端。他说是贪婪让他投资于冒险的房地产基金和避税计划。2002年，他和拥有贝塔斯曼的莫恩家族（Mohn）因为他的公司上市计划产生冲突，被迫离开公司。2005年，渴望再次成为德国商业大亨的他接管了卡尔施泰特（KarstadtQuelle），该公司之后成为当时德国最大的零售商阿坎多（Arcandor）。他努力让这家境况不佳的公司扭亏为盈，结果导致自己一败涂地，颜面无存。他以45亿欧元出售了阿坎多的房地产投资组合，但任其百货公司负担着高昂租金。2009年2月，轮到阿坎多董事会赶他出门了。当年6月，该公司破产倒闭。

就在那时，检察官开始调查米德尔霍夫在阿坎多的行为。他们发现他私自

使用公司的飞机，并且用公司现金为一本纪念他在贝塔斯曼的导师的书提供了部分资金。2014年埃森市的一家法院判定他有罪。他在法庭上当着家人的面被捕。一年后，他宣布自己破产。

米德尔霍夫狂妄自大的故事流传到了企业界之外。他是雷纳德·戈茨（Rainald Goetz）的小说《约翰·霍尔特罗普》（Johann Holtrop）中主人公的原型。在小说的结尾，霍尔特罗普自杀了。“对德国人来说，东山再起是不存在的。”米德尔霍夫说。

这位悔过自新的大亨已于2017年出版了他的第一本书，讲述了自己的经历和他的自体免疫性疾病。颇有些刺眼的是，他在几个章节的开头引用了被纳粹囚禁和处决的牧师迪特里希·邦霍费尔（Dietrich Bonhoeffer）的话，似乎在把自己的命运和这位牧师相提并论。现在他正在写第三本书，一本讲述一位商业大亨兴衰的小说。米德尔霍夫现在或许敛眉低首，但他最喜欢的话题仍然是米德尔霍夫。 ■



The Economist film

How will quantum computing change the world?

quantum computing is not just better computing, faster computing, it's a different kind of computing.



经济学人视频

量子计算如何改变世界？

量子计算不只是更好、更快的计算——它是一种前所未有的计算方式。



Huawei

Piece offering

Ren Zhengfei appears prepared to sell all Huawei's 5G technology to a Western buyer

IN AN ATRIUM designed to evoke ancient Greece—ringed by stone columns and six towering approximations of the Caryatids—it was fitting that Ren Zhengfei, chief executive of Huawei, should extend an olive branch to the West: a piece of his company. The palatial edifice on Huawei's sprawling campus in Shenzhen houses an exhibition hall proudly displaying the Chinese telecommunications giant's “fifth-generation” (5G) technology. The ultra-swift, and ultra-coveted, mobile-phone networks will soon connect everything from cars to industrial robots.

It is this 5G technology—central to Huawei's future revenue growth—that Mr Ren said he was ready to share, in a two-hour interview with *The Economist* on September 10th. For a one-time fee, a transaction would give the buyer perpetual access to Huawei's existing 5G patents, licences, code, technical blueprints and production know-how. The acquirer could modify the source code, meaning that neither Huawei nor the Chinese government would have even hypothetical control of any telecoms infrastructure built using equipment produced by the new company. Huawei would likewise be free to develop its technology in whatever direction it pleases.

Huawei has been on a charm offensive this year. It has wheeled Mr Ren out once a month since January for interview bonanzas with international media outlets. But the idea of transferring its 5G“stack” to a competitor is by far the boldest offering to have surfaced. “It's hard to come up with similar precedents in the history of technology,” says Dan Wang of Gavekal Dragonomics, a research firm.

Mr Ren's stated aim is to create a rival that could compete in 5G with Huawei (which would keep its existing contracts and continue to sell its own 5G kit). To his mind, this would help level the playing field at a time when many in the West have grown alarmed at the prospect of a Chinese company supplying the gear for most of the world's new mobile-phone networks. "A balanced distribution of interests is conducive to Huawei's survival," Mr Ren says.

No kidding. A months-long assault by America has pummelled the firm, whose global networks it suspects of allowing China to spy on others. America has also attempted to press allies not to use Huawei's equipment as they begin to build their own 5G networks. In May American companies were barred from selling components and software to Huawei on the ground that it posed a national-security risk. Last month America restricted government agencies from doing business with it (the firm is challenging this ban in court).

At first glance, Mr Ren's gesture has much going for it. If the sale eventually gave rise to a thriving competitor, countries such as Australia (which has banned Huawei's gear) would no longer have to choose between, on the one hand, technology in their networks that is both cutting-edge and cheap, as Huawei's is, and, on the other, fears of Chinese eavesdropping. They could have the best technology from an ally instead. Decisions on the purchase of telecoms equipment could then return from politicians to pragmatic boardrooms.

The gesture may also convince those suspicious of Huawei's tech that the firm's business intentions are hard-nosed. Mr Ren says money from the deal would allow Huawei to "make greater strides forward". The value of the firm's entire 5G technology portfolio, if it were sold, could run to tens of billions of dollars. In the past decade the company has spent at least \$2bn on research and development for the new generation of mobile connectivity.

In saying he wants to create a fairer technological race, Mr Ren is also attempting to dissociate American security fears from those of Huawei's market dominance. His offer is "essentially calling their bluff", says Samm Sacks of New America, a think-tank in Washington. As she points out, America's government is working out how to create a rival to Huawei, whether by fostering American firms or helping bolster its two main global competitors, Ericsson, a Swedish firm, and Nokia, a Finnish one. Moves are also afoot to make certain components of mobile networks interchangeable with each other, to let carriers mix and match suppliers more easily. OpenRAN, a standards body, wants infrastructure manufacturers like Huawei to agree on standards for the technology in their networks that shuttles data around to make joint operation easier. Huawei has so far declined to join.

Yet questions over the feasibility of the deal abound. Would China accept hiving off a core part of one of its few globally powerful corporations? For better or worse, 5G has become a proxy for superpowerdom. As Mr Ren told *The Economist*, "5G represents speed" and "countries that have speed will move forward rapidly. On the contrary, countries that give up speed and excellent connectivity technology may see economic slowdown."

Even if the Chinese state gave its blessing, who might be the buyer? Mr Ren says he has "no idea". Analysts suspect that giants such as Ericsson and Nokia would balk at an offer out of pride, and would question the value of Huawei's tech. (Having posted losses last year, they are also short of cash.) The technology may not help a smaller firm compete on an equal footing with Huawei. The Chinese company is so well entrenched with big operators, say consultants, that it would not make financial sense for most of them to take on a new supplier. Samsung, a South Korean electronics giant, has deep pockets and a smallish but growing networking-gear business—and without rival bidders, it could drive a hard bargain. A consortium of buyers is possible; who would make one up is unclear,

however.

Suitors may be put off by other considerations. If Huawei really is ready to transfer all its technology to another company, then, as Mr Wang points out, “it has to accept the risk of a major competitor in the future”. But Huawei’s dominance owes as much to technology as to its low prices and the speed at which it can roll products out, says Ms Sacks. Its willingness to serve places Western firms steer clear of is also a factor: who else besides Huawei would wade through malarial swamps in Africa and haul base stations up the flanks of Colombian mountains? Mr Ren knows this. Asked whether he thought that an American firm, with Huawei’s precious know-how in hand, would be able to pull it off, he said, with swagger, “I don’t think so.” But potential buyers know it, too.

Lastly, few believe that a sale would placate America’s national-security apparatus, at least in the short run. A new competitor would almost certainly still need to make equipment in China, which produces half of America’s telecoms kit. Concerns about Chinese meddling would not go away. And Huawei’s latest offensive is not all charm. A week ago it accused American officials of committing infractions while posing as Huawei workers, in order to “bring unsubstantiated accusations against the company”. It also accused America’s government of targeting it with cyber-attacks. That may sour relations.

Could Mr Ren’s proposal, then, be a sign of desperation? Not a bit of it, he says. He claims that Huawei has found alternative suppliers for its network-infrastructure business that are unaffected by its blacklisting by America. He denies that the company will make a loss in the coming year.

Nonetheless, the consumer business is under pressure. Half of the company’s \$105bn in sales last year came from the 208m smartphones it

sold around the world. So did an outsize share of profits. This business is in deep trouble. Phones that Huawei sells outside China are desirable communication devices largely thanks to proprietary software available exclusively from Google. Android, Google's mobile operating system, which Huawei uses, is open-source and freely available. But the American tech giant's own apps are not. Because Google is American and its apps are compiled in America, the Commerce Department's ban on sales of American technology to Huawei applies to them.

Mr Ren says that Google has been lobbying the Trump administration to allow it to resume supplying Huawei with proprietary Android software, but so far to no avail. Unless American policy changes, Huawei will remain stuck with the open-source version of Android, without any of the apps that consumers have come to expect. The Chinese firm is in the process of developing its own operating system, Harmony OS, but it will be no rival to the mature Android ecosystem for years to come.

This means that all new Huawei phones will ship without Gmail, Google Maps, YouTube or, crucially, Google Play Store. The Play Store is what allows Android users to download apps like WhatsApp, Instagram and Facebook easily. WhatsApp in particular has become a standard mode of communication in much of the world outside America. Unless its government lets up, Huawei's new smartphones will be little more than decent cameras that make phone calls. The firm will launch the Mate 30, the first top-end phone since its blacklisting, on September 19th in Munich. Huawei claims its hardware features will buoy sales. But a phone which lacks basic functions is unlikely to be a hit. A weakened consumer business would dent profits.

Huawei's share of the Chinese smartphone market, where it has never relied on Google's apps, is growing fast. But two-fifths of its annual phone sales,

or roughly \$20bn, come from outside the country. Though the firm's executives repeatedly declined to share any projections, firm-wide revenue growth in the eight months to August slowed to 20%, year on year, from 23% in the first half of 2019. If the Mate 30 and its successors flop, Huawei stands to lose billions of dollars in annual revenue.

Similar supply-chain challenges affect other parts of its business. Its coders are busily writing software tools known as compilers and libraries, themselves used to create the software that powers all manner of electronic devices, not just smartphones but also networking gear. As with Android, Huawei would have to create its own version of these, and a technological ecosystem around them. Such ecosystems take years to evolve, and there is only so much one company can do to stimulate this evolution, which relies on third-party developers, with their own goals and incentives. Huawei's expertise in high, hard technology is of little use here.

And, Mr Ren's assurances notwithstanding, Huawei's finances are being squeezed. Even he concedes that its relations with large Western banks such as HSBC and Standard Chartered have been disrupted. Still, the firm has plenty of cash and he says that smaller banks remain willing to lend to it. The Chinese Development Bank, which has reportedly extended credit lines to Huawei and ZTE, a Chinese competitor, in the past, may stump up if needed. Mr Ren and his underlings repeatedly claim that cashflow is "healthy", pointing to the firm's furious building work. It has just finished a 120-hectare, \$1.4bn research campus.

Huawei is being forced to transform itself from a company that makes and sells hardware into one that also makes many components that it used to buy from others. This kind of shift strains a firm. Its cash cow is under threat even as it has to invest heavily to replace the suppliers and software it can no longer get from America. Mr Ren may hope that his mooted sale of Huawei's 5G technology will give him sufficient fuel for the company to

fly ever higher. But peer behind the showy frescoes in Shenzhen, and his showier gesture, and Huawei's future looks decidedly hazy. ■



华为

出售一角

任正非似乎已准备将华为的全部5G技术出售给一个西方买家

设计成古希腊风格的中庭里环绕着石柱和六根高耸的仿女像柱，华为的首席执行官任正非在这里向西方伸出橄榄枝再合适不过了。这根橄榄枝是他的公司的一角。在华为位于深圳的庞大园区里，这座富丽堂皇的大厦里设有一个展厅，自豪地展示了这家中国电信巨头的“第五代”（5G）技术。这种速度超快、令众人垂涎的移动电话网络很快将连接从汽车到工业机器人的各种设备。

任正非于9月10日接受了本刊的专访。在两小时的交谈中，他表示自己准备好分享的正是这种5G技术——华为未来收入增长的核心。只要收取一次性费用，交易的买方便能永久使用华为现有的5G专利、许可证、代码、技术蓝图和生产技术知识。买方可以修改源代码，这意味着华为和中国政府哪怕在假想中都无法控制使用这家新公司生产的设备建造的任何电信基础设施。同样，华为也可以随心所欲地开发自己的技术。

华为今年一直在展开魅力攻势。自1月份以来，华为每个月都让任正非出场一次，大举会见国际媒体。但将其5G“技术栈”转让给竞争对手的想法绝对是目前为止拿出的最大胆作品。“在技术史上很难找到类似的先例。”研究公司龙洲经讯的王丹（音译）说。

任正非声称其目标是创造一个可与华为在5G领域竞争的对手（而华为将保留现有合同并继续销售自己的5G套件）。在他看来，这将有助于平衡竞争环境，因为许多西方人开始对世界上大多数新的移动电话网络都由一家中国公司提供设备的未来感到恐慌。“平衡利益分配有利于华为的生存。”任正非说。

这不是开玩笑。美国怀疑华为的全球网络帮助中国政府监视其他国家，已对它发动长达数月的攻击，令其接连受挫。美国还试图给盟友施加压力，

让它们在启动搭建自己的5G网络时不要使用华为的设备。5月，美国公司被禁止向华为销售元器件和软件，理由是华为构成了国家安全风险。上个月，美国限制政府机构与华为做生意（华为正在法庭上对此禁令提出质疑）。

乍一看，任正非的这一步有很多好处。如果这项销售最终促成了一个蓬勃发展的竞争对手出现，那么澳大利亚（已禁用华为的设备）等国家就不用再二选一了：一方面是为其网络选择既先进又便宜的技术，比如华为的；另一方面是对中国窃听的恐惧。它们可以从盟友那里得到最好的技术。然后，购买电信设备的决策可以从政客回到务实的董事会手中。

这么做也可能让那些对华为的技术有所怀疑的人相信这家公司的商业意图是坚定的。任正非表示，交易带来的资金将推动华为“更加大步向前”。该公司整个5G技术组合的价值如若出售可能达到数百亿美元。在过去十年中，该公司至少花费了20亿美元用于第五代移动连接技术的研发。

在谈到希望创造一项更公平的技术竞赛时，任正非还试图将美国的安全担忧与对华为取得市场支配地位的担忧分开来。华盛顿智库“新美国”（New America）的莎姆·萨克斯（Samm Sacks）说，他的做法“实质上是要揭穿美国”。她指出，美国政府正在研究如何创造一个与华为竞争的对手，无论是培养美国公司，还是帮助支持华为在全球的两大主要竞争对手——瑞典的爱立信和芬兰的诺基亚。还有一些酝酿中的行动让移动网络的某些组件可以互换，好让运营商更容易自行搭配供应商。标准组织OpenRAN希望像华为这样的基础设施制造商能够就网络中的技术标准达成一致，可以相互传输数据，使联合运行更为容易。华为迄今拒绝加入。

不过，有关这一交易是否可行的问题还有很多。中国是否会接受把自己为数不多的有全球实力的企业之一的核心部分卖掉？不管是好是坏，5G已成为超级大国的代名词。正如任正非告诉本刊的，“5G代表着速度”，“拥有速度的国家会迅速向前发展。相反，在那些放弃了速度以及杰出连接技术的国家，经济可能放缓。”

即使中国政府同意了，买家又会是谁呢？任正非说他“不知道”。分析人士疑心爱立信和诺基亚等巨头会因为自尊心而犹豫不前，并且会质疑华为技术的价值。（两家公司去年均报亏损，现金也紧张。）这项技术可能无助于小公司与华为平等竞争。咨询公司指出，这家中国公司在大型运营商中根深蒂固，这使得对大多数运营商来说，改用新供应商在财务上并不明智。韩国电子产品巨头三星财力雄厚，网络设备业务的规模虽小却也在增长——而且没有人竞争出价的话，它可以好好还价一番。出现买家联盟也有可能，然而谁会牵头就不知道了。

心仪者也可能会因为其他因素而却步。如果华为确实准备好将所有技术转让给另一家公司，那么正如王丹所说，“它必须接受未来有一个主要竞争对手的风险。”但萨克斯表示，华为占据主导地位除了技术因素外，更是因为其低廉的产品价格以及产品铺开的速度。它愿意去那些西方公司避之不及的地方也是一个因素：除了华为以外，还有谁会趟过非洲充满疟疾的沼泽地，并把基站拖上哥伦比亚的山腰？任正非知道这一点。当被问及拥有华为宝贵专有技术的美国公司能否实现这一目标时，他很牛气地说，“我觉得不行。”但潜在买家也知道这一点。

最后，很少有人相信这项销售能让美国的国家安全机构安心，至少在短期内是如此。一个新的竞争对手几乎肯定还是得在中国制造设备，而美国的电信组件有一半都在中国生产。对中国干涉的担忧不会消失。而华为的最新攻势也不限于魅力。一周前，它指责美国官员冒充华为员工犯下违规行为，以“对该公司提出莫须有的指控”。它还指责美国政府通过网络攻击它。这可能会使关系恶化。

那么，他的计划会不会是绝望的表现？任正非说，完全不是。他声称华为已经为其网络基础设施业务找到了不受美国黑名单影响的替代供应商。他否认公司将在来年亏损。

尽管如此，它的消费者业务仍面临压力。华为去年的销售额为1050亿美元，其中有一半来自它在全球销售的2.08亿部智能手机。智能手机也贡献

了超大比例的利润。这项业务深陷困境。华为在中国境外销售的手机备受追捧，这很大程度上要归功于谷歌独家提供的专有软件。华为使用的谷歌移动操作系统安卓是开源和免费获得的。但这家美国科技巨头自有的应用却不是。由于谷歌是美国公司，其应用是在美国编制的，因此美国商务部禁止向华为销售美国技术的做法适用于这些应用。

任正非表示，谷歌一直在游说特朗普政府允许它继续向华为提供专有的安卓软件，但到目前为止无济于事。除非美国政策发生变化，否则华为将只能继续使用安卓的开源版本却无法提供任何消费者期待的应用。这家中国公司正在开发自己的鸿蒙操作系统，但在未来多年里还无法与成熟的安卓生态系统竞争。

这意味着所有华为新手机都将在没有Gmail、谷歌地图和YouTube的情况下发售。甚至要命的是，连Google Play商店都没有。Play商店能让安卓用户轻松下载WhatsApp、Instagram和Facebook等应用。特别是WhatsApp，它已成为美国以外世界大部分地区的标准交流方式。除非美国政府松口，否则华为的新款智能手机只不过是一台能打电话的不错的相机。该公司将于9月19日在慕尼黑发布Mate 30，这是它被列入黑名单以来发布的第一款高端手机。华为称其硬件特性将推动销售。但是缺乏基本功能的手机不太可能大卖。疲弱的消费者业务将损害利润。

华为在中国智能手机市场的份额正在快速增长。在这个市场中，它从未依赖过谷歌的应用。但其年度手机销售额的五分之二（约合200亿美元）来自国外。虽然该公司的高管一再拒绝分享任何预测，但在截至8月份的前八个月内，全公司的收入增长率从2019年上半年的同比23%放缓至同比20%。如果Mate 30及后续产品失败，华为势必会失去数十亿美元的年收入。

类似的供应链方面的挑战也影响了业务的其他部分。华为的程序员正忙于编写编译器和库等软件工具，它们本身用于创作支持各种电子设备的软件，不仅包括智能手机，也包括网络设备。与安卓一样，华为也必须为此

编写自己的版本，并围绕它们建立技术生态系统。这样的生态系统需要耗时多年才能发展起来，而这种发展依赖有自己的目标和动力的第三方开发商，华为要刺激这种发展所能做的有限。它在高端硬技术方面的专业知识在这里派不上什么用场。

并且，尽管任正非信誓旦旦，华为的财务状况正在受挤压。连他自己也承认，华为和汇丰、渣打等西方大银行的关系被扰乱了。尽管如此，该公司仍有充足的现金，并且他说小型银行仍然愿意放贷。中国开发银行可能会在它有需要时慷慨解囊。据报道这家银行过去曾向华为和它在国内的竞争对手中兴通讯提供信贷额度。任正非和他的下属一再声称现金流是“健康的”，说公司的建设如火如荼。它刚刚建成了一个占地120公顷、价值14亿美元的研究园区。

华为被迫从一家制造和销售硬件的公司转变为一家同时还生产许多它惯于采购的其他零部件的公司。这种转变会给一家公司带来巨大的负担。它的摇钱树正面临威胁，而与此同时它又必须投入巨资来取代再也无法从美国获得的供应商和软件。任正非可能希望他有意出售的华为5G技术能提供足够的燃料，让公司飞得更高。但在深圳华丽的壁画和他更为耀眼的姿态背后，华为的未来却无疑愈发朦胧。■



Horticulture

Growing brighter

New ways to make vertical farming stack up

FROM THE outside it looks like a tall, metal-clad barn. But step in, through a large airlock designed to keep out the bugs, and a kaleidoscopic scene emerges. A central aisle is flanked by two pairs of towers. Each tower is stacked with a dozen or so trays on which are growing strawberries, kale, red lettuce and coriander. And each tray is bathed in vibrant light of different colours, mostly hues of blue and magenta. Douglas Elder, who is in charge of this artificial Eden, taps some instructions into an app on his mobile phone and, with a short whirr of machinery, a tray of lush, green basil slides out for his inspection.

Mr Elder is product manager for Intelligent Growth Solutions (IGS), a “vertical farming” company based at Invergowrie, near Dundee, in Scotland. Each of the nine-metre-high towers in the demonstration unit that he runs occupies barely 40 square metres. But by stacking the trays one on top of another an individual tower provides up to 350 square metres of growing area. Using his phone again, Mr Elder changes the colours and brightness of the 1,000 light-emitting diodes (LEDs) strung out above each tray. The app can also control the temperature, humidity and ventilation, and the hydroponic system that supplies the plants, growing on various non-soil substrates, with water and nutrients. Armed with his trusty phone, Mr Elder says he can run the farm almost single-handedly.

Vertical farming of this sort is not, of itself, a new idea. The term goes back to 1915, though it took a century for the first commercial vertical farms to be built. But the business is now taking off. SoftBank, a Japanese firm, Google’s former boss Eric Schmidt and Amazon’s founder Jeff Bezos have between

them ploughed more than \$200m into Plenty, a vertical-farming company based in San Francisco. And in June Ocado, a British online grocery, splashed out £17m (\$21.3m) on vertical-farming businesses to grow fresh produce within its automated distribution depots.

The interest of investors is growing just as technology promises to turn vertical-farming operations into efficient “plant factories”. The high-tech LEDs in IGS’s demonstration unit are optimised so that nary a photon is wasted. The hydroponics, and the recycling that supports them, mean the only water lost from the system is that which ends up as part of one of the plants themselves. And towers mean the system is modular, and so can be scaled up. Most of the systems which IGS hopes to start delivering to customers early next year will consist of ten or more towers.

Some people, however, remain sceptical about how much vertical farms have to offer that good-old-fashioned greenhouses do not. Vertical farms are certainly more compact—a bonus in places like cities where land is expensive. Since sales of fresh produce to the urban masses are often touted as one of vertical farming’s biggest opportunities, that is important. But a greenhouse gets its light, and much of its heat, free, courtesy of the sun. And modern greenhouses can also use solar-powered supplementary LED lighting to extend their growing seasons and hydroponic systems to save water, says Viraji Puri, co-founder of Gotham Greens, an urban-farming company that operates greenhouses on the roofs of buildings in New York and Chicago. As for food miles, they could not get any shorter for Gotham Greens’s rooftop greenhouse in Brooklyn, which supplies the Whole Foods Market located downstairs.

The biggest drawback of vertical farming is the high cost of the electricity required to run the large number of LEDs. This has meant that production has been commercially viable for high-value, perishable produce only, such as salad leaves and herbs. That, nevertheless, is a market not to be sniffed

at. But for a broader range of produce, it can prove too expensive. In 2014 Louis Albright, an emeritus professor of biological and environmental engineering at Cornell University in America, calculated that a loaf of bread made from wheat grown in a vertical farm would be priced at about \$23.

One way of saving electricity is to use LEDs that generate only the colours that plants require, instead of the full spectrum of plain white light. Plants are green because their leaves contain chlorophyll, a pigment that reflects the green light in the middle of the spectrum while absorbing and using for photosynthesis the blue and red wavelengths at either end of it.

The vertical farm at Invergowrie takes this idea further. It uses LEDs that are highly tuneable. Although the lights produce mostly blue and red wavelengths, researchers now know that other colours play an important role at various stages of a plant's development, says David Farquhar, IGS's chief executive. A dose of green at an appropriate moment produces a higher yield. A timely spot of infrared can improve the quality of foliage. The lights can also produce various blue/red mixes.

To operate these LEDs efficiently, the company has developed a low-voltage power-distribution system. This, says Mr Farquhar, can cut energy costs to about half of those incurred by existing vertical farms. As a result, all four towers can produce 15-25 tonnes a year of herbs, salad leaves, fruit and vegetables. This, the company claims, is between two and three times more than a conventional greenhouse with an equivalent but horizontal growing area, and equipped with supplementary lighting and heating, could manage. And the system can grow all this produce at a similar cost-per-kilogram.

One of the jobs of the Invergowrie unit is to develop lighting regimes tailored to individual crops. Another is to develop algorithms to control, in an equally bespoke way, the climatic conditions preferred by different

crops. The idea is to design crop-specific weather “recipes” in order to boost the yield and quality of whatever varieties are grown in the vertical farm. All the processes involved are engineered to be efficient. Irrigation, for instance, relies on captured rainwater. This is cleaned and recycled, but only 5% gets used up by each harvest—and most of that as the water-content in the plants themselves. Ventilation is also a closed loop, harvesting surplus heat from the LEDs while managing humidity and oxygen levels.

By reducing running costs, the system should make it profitable to grow a wider variety of produce vertically. The firm has already succeeded with some root vegetables, such as radishes and baby turnips. Bulk field crops, such as wheat and rice, may never make sense for a vertical farm, and larger, heavier vegetables would be tricky to raise. This means full-grown potatoes are probably off the menu, at least with existing technology.

Seed potatoes, though, are a good candidate, says Colin Campbell, head of the James Hutton Institute, a plant-science research centre backed by the Scottish government. It is based next door to IGS and works with the company. Many fields around the world, Dr Campbell observes, are suffering a growing burden of pests and disease, such as potato-cyst nematode. In the controlled environment of a vertical farm, from which both pests and diseases can be excluded, seed potatoes could be propagated more efficiently than in the big, bad outdoor world. This would give them a head start when they were planted out in fields.

The institute’s researchers are also looking at plant varieties that might do particularly well indoors, including old varieties passed over in the search for crops which can withstand the rigours of intensive farming systems. By dipping into the institute’s gene banks, Dr Campbell thinks it may find some long-forgotten fruits and vegetables that would thrive in the security of a vertical farm.

All this could go down well with foodies, and unlock new and forgotten flavours. Shoppers might even find some exotic varieties growing in supermarket aisles. In Berlin a company called Infarm provides remotely controlled shelved growing cabinets for shops, warehouses and restaurants. Herbs and salad leaves, including exotics such as Genovese basil and Peruvian mint, are resupplied with seedlings from the company's nursery as the mature plants are picked.

Vertical farming then will not feed the world, but it will help provide more fresh produce to more people. It may even be that, as vertical-farming systems improve further, miniature versions will be designed for people to put in their kitchens—thus proving that there is nothing new under either the sun or the LED. Such things used once to be called window boxes. ■



园艺

闪亮生长

新方法让垂直农业获得竞争力

从外面看，它就像一个金属外壳的高大谷仓。但是，穿过一道高大的防虫气闸进入其中，一个万花筒般的世界呈现在眼前。一个中央通道的两侧是两对高架子。每座架子上都叠放着十几个种着草莓、甘蓝、红生菜和香菜的托盘。所有托盘都沐浴在各色鲜亮的光线中（主要是蓝色和紫红色系）。这座人造伊甸园的园长道格拉斯·埃尔德（Douglas Elder）在手机应用中输入一些指令，随着一阵短暂的机械嗡嗡声，一托盘郁葱葱的绿色罗勒便滑了出来，供他检查。

埃尔德是“智能生长方案公司”（Intelligent Growth Solutions，以下简称IGS）的产品经理。这家“垂直农业”公司的总部位于苏格兰邓迪

（Dundee）附近的因弗高利（Invergowrie）。在他管理的示范区中，每座高九米的架子占地仅40平方米，但是通过将托盘层层叠放，每个架子的种植面积最多能达到350平方米。埃尔德再次拿起手机，改变了每个托盘上方安装的1000个LED管的颜色和亮度。这款手机应用还可以控制温度、湿度和通风，以及为生长在各种非土壤基质上的植物提供水分和养分的水培系统。埃尔德说，有了这部可靠的手机，他几乎一个人就可以运营整个农场。

这种垂直农业本身并非什么新鲜的创意。这个词可以追溯到1915年，尽管首批商业化的垂直农场要在一个世纪后才建成。但这门生意现在开始红火起来。日本的软银、谷歌前老板埃里克·施密特和亚马逊创始人杰夫·贝佐斯向总部位于旧金山的垂直农业公司Plenty总共投资了2亿多美元。今年6月，英国网上超市Ocado在垂直农业上投入1700万英镑（2130万美元），在其自动化的配送仓库中种植新鲜的农产品。

科技有望将垂直农业生产转化为高效节能的“植物工厂”，投资者的兴趣因

而与日俱增。IGS示范区中的高科技LED经过优化，一个光子也不会浪费。水培以及支持水培的循环利用使得从系统中流失的唯一那点水最终也被植物吸收。而高架结构则意味着整个系统可以进行模块式组合，因此可以扩大规模。IGS希望从明年初开始向客户交付这些系统，其中大部分将包含10个或更多架子。

然而，仍有些人怀疑垂直农场所能够提供多少老式温室无法提供的东西。垂直农场无疑占地更小，这在城市等地价昂贵的地方可算利好。这一点很重要，因为向城市居民出售新鲜农产品常被标榜为垂直农业的最大机遇之一。但是，温室的光和大部分热量都是太阳赐予的，不用花钱。而且现代温室也可以使用太阳能LED辅助照明来延长植物的生长期，并使用水培系统来节水，在纽约和芝加哥经营屋顶温室的城市农业公司“哥谭之绿”（Gotham Greens）的联合创始人维拉吉·普里（Viraji Puri）说。至于食物里程，垂直农场不可能比哥谭之绿在布鲁克林的屋顶温室更短了，因为后者供货的全食超市（Whole Foods Market）就在它楼下。

垂直农业的最大短板是使用大量LED要耗费高额电力。也就是说，只有种植沙拉菜和香草等高价值、易腐烂的农产品在商业上才是可行的。但这部分市场仍不容小觑。不过，对其他更广泛的农产品来说，其成本可能还是太高了。2014年，美国康奈尔大学生物与环境工程学的名誉教授路易斯·奥尔布赖特（Louis Albright）计算得出，一条由垂直农场种植的小麦制成的面包售价约为23美元。

一个省电的方法是使用只发射植物所需颜色、而不是全光谱白光的LED。植物之所以是绿色的，是因为它们的叶子含有叶绿素。这种色素可以反射光谱中间的绿色光，同时吸收光谱两端的蓝色和红色光，将其用于光合作用。

因弗高利的垂直农场把这种方法再往前推进一步。它使用可以灵活调光的LED。IGS的首席执行官大卫·法夸尔（David Farquhar）表示，虽然这种光源产生的大部分是蓝光和红光，但研究人员现在知道，其他颜色的光在植物生长的不同阶段也起到了重要作用。适时给植物照射一次绿色光能提高

产量，而适时补充红外线光可以提高叶片的质量。这些光源还可以产生各种蓝红混合光。

为了让这些LED更节能，IGS开发了一套低压配电系统。法夸尔说，这可以将现有垂直农场的能源成本降低一半左右。结果是，这四个高架子每年可以生产15到25吨香草、沙拉菜、水果和蔬菜。该公司声称，这比种植面积相当、配备了辅助照明和供暖的水平栽培的传统温室的产量要高出两三倍。而且这套系统能以与温室差不多的单位成本种植所有这些农产品。

因弗高利示范区的任务之一是为不同作物定制专门的照明方法。另一项任务是开发算法，同样是根据不同作物的偏好来控制气候条件。这么做是为了设计出作物专用的天气“配方”，以提高垂直农场种植的各种农作物的产量和质量。所有环节的设计都考虑到了节能。比如用收集到的雨水来灌溉。这些雨水经过净化被循环利用，但每次收集的雨水只有5%被最终消耗掉，其中大部分化作了植物中的水分。通风也是一个闭环，从LED采集多余的热量，同时控制湿度和氧气水平。

通过降低运营成本，这套系统应该能让更多农产品的垂直种植有利可图。IGS已经在萝卜和小芜菁等一些根茎类蔬菜的种植上取得了成功。而小麦和水稻等大田作物可能永远与垂直农场无缘，植株大、分量重的蔬菜也很难种植。也就是说，至少在现有技术条件下，菜单上可能不会出现完全在垂直农场所长成的土豆。

不过，詹姆斯赫顿研究所（James Hutton Institute）的负责人科林·坎贝尔（Colin Campbell）表示，种用土豆倒是完全可以考虑垂直种植。该研究所是受苏格兰政府资助的植物科学研究中心，其总部就在IGS隔壁并与之开展合作。坎贝尔观察到，世界各地的许多田地正在遭受日益严重的病虫害侵袭，如马铃薯胞囊线虫。而垂直农场的受控环境可以将病虫害隔绝在外，在这里，种用土豆能比在广大而环境恶劣的户外更高效地繁殖。等到它们移植到户外时，就能更好地生长。

该研究所的研究人员还在尝试一些可能非常适合室内生长的植物品种，包

括一些从前在筛选能经受集约化农业系统的恶劣环境的作物时被淘汰的老品种。坎贝尔认为，浏览研究所的基因库可能会发现一些被长期遗忘的水果和蔬菜，而它们在垂直农场的安全环境中也许能茁壮成长。

所有这一切可能会受到美食家的欢迎，还会解锁全新的和被遗忘的风味。购物者甚至可能会发现一些种在超市通道上的奇异品种。柏林一家名为Infarm的公司就为商店、仓库和餐馆提供远程控制的搁架式种植柜。当这些种植柜上长成的果蔬被采摘后，该公司的苗圃会再供应新一批香草和沙拉菜，其中包括热那亚罗勒、秘鲁薄荷等奇异植物。

垂直农业不能养活全人类，却会为更多人提供更多新鲜农产品。随着其系统进一步完善，甚至可能出现供人们放置在厨房里的微型垂直种植柜。这就可以证明，不管是日光之下还是LED光之下都并无新事——毕竟这类微型种植柜不就是以前被称作窗台花箱的东西嘛。 ■



Menu pricing

Consider the lobster roll

Why Americans pay more for lunch

THIS SUMMER Pret A Manger, purveyor of sandwiches to desk-workers in the white-collar cities of the West, added lobster rolls to its menu. In Britain they cost £5.99 (\$7.31); in America \$9.99. In both countries they are filled with lobster from Maine, along with cucumber, mayonnaise and more. Rent and labour cost about the same in London as in downtown New York or Boston. Neither sticker price includes sales tax. Yet a Pret lobster roll in America is a third pricier than in Britain, even though the lobster comes from nearer by.

This Pret price gap is not limited to lobster rolls. According to data gathered by *The Economist* on the dozen Pret sandwiches that are most similar in the two countries, the American ones cost on average 74% more (see chart). An egg sandwich in New York costs \$4.99 to London's £1.79, more than double. A tuna baguette costs two-thirds more. The price mismatch is intriguing—the more so for *The Economist*, which publishes the Big Mac index, a cross-country comparison of burger prices, which shows a 43% transatlantic disparity.

Menu pricing starts with a simple rule, says John Buchanan of the consulting arm of Lettuce Entertain You Enterprises, a restaurant group: take the cost of ingredients and multiply by three. Then ask yourself how much customers would expect to pay for a dish of this type, and how much they would expect to pay for it from you. A Pret lobster roll and one from a fancy seafood restaurant are quite different propositions. Lastly, check what the competition charges. “Only a small part of this decision is what I would call scientific,” says Mr Buchanan. “A lot has to do with a subjective

judgment of what the market will bear.”

The lunch market is local. New Yorkers do not care about prices in London. And they—alongside Bostonians and Washingtonians—are used to their local high prices, for reasons that include bigger portions (though not at Pret) and tipping habits. Londoners are keener on sandwich lunches, which means stiffer competition in that part of the market.

Often lunch prices vary by neighbourhood. jd Wetherspoon, a British pub chain, prides itself on low prices, but allows them to differ by branch. In 2017 the Financial Times found that the most expensive Spoons charged over 40% more than the cheapest one. They also vary by time: many restaurants charge more for dinner than for lunch. Perceptions of value for money are relative not absolute. For Pret’s lobster rolls, it’s a case of claws and effect. ■



菜单定价

尝尝龙虾卷

为什么美国人的午餐更贵

今年夏天，为欧美的白领上班族供应三明治的Pret A Manger在菜单中加上了龙虾卷。其售价在英国是5.99英镑（7.31美元），在美国是9.99美元。这两个国家的龙虾卷都裹着缅因州的龙虾，配黄瓜和蛋黄酱等。伦敦的租金、劳动力成本和纽约或波士顿市中心差不多。两国的标价都不包括销售税。尽管美国离龙虾产地更近，但Pret龙虾卷在那里的售价却比英国贵了三分之一。

Pret存在价差的菜品并不只有龙虾卷。本刊收集的两国最为相似的12种Pret三明治的数据显示，美国的定价比英国平均高出74%（见图表）。一个鸡蛋三明治在纽约售价4.99美元，比伦敦的1.79英镑高出一倍多。一条金枪鱼法棍三明治则要贵三分之二。这种价格的差异很有意思。作为巨无霸指数（Big Mac index）的发布者，本刊对此尤其感兴趣。巨无霸指数比较了汉堡包在各国的售价，结果显示大西洋两岸的价差达到43%。

餐饮集团Lettuce Entertain You Enterprises咨询部门的约翰·布坎南（John Buchanan）表示，菜单定价的起始规则很简单，就是将原料成本乘以三。然后再问问自己：顾客会花多少钱买这道菜，又会花多少钱从你这里买这道菜。Pret的龙虾卷和高档海鲜餐厅的龙虾卷就完全是两码事。最后，还要看竞争对手的售价。“我认为这种定价决策只有一小部分是科学的，”布坎南说，“它有很大一部分是基于对市场承受力的主观判断。”

午餐市场是“各自为政”。纽约客不关心伦敦的价格。而且他们和波士顿及华盛顿的居民一样，已经习惯了本地的高价，个中原因包括食物分量更大（尽管Pret的分量不大）和付小费的习惯等。而伦敦人更喜欢拿三明治当午餐，所以当地市场在这一块的竞争更加激烈。

午餐价格往往因地段而异。英国连锁酒吧jd Wetherspoon虽然以自己的低价为骄傲，但也允许各家分店有不同价格。2017年，《金融时报》发现，最贵的和最便宜的Spoons餐厅的价格相差40%以上。价格也因时间而异，许多餐厅的晚市收费比午市高。人们对是否划算的理解是相对而非绝对的。而对Pret龙虾卷来说，这就要看虾钳肉是否讨人喜欢了。■



Productivity

Can get some satisfaction

How to keep your customers happy

A HAPPY CUSTOMER is a repeat customer, or so the saying goes. But how can a business keep clients satisfied? The answer, according to a recent study, is to treat employees well. Glassdoor, a website which let workers assess employers, looked back over the records of 293 companies across 13 industries between 2008 and 2018. It then studied the link between employee satisfaction, based on its own ratings, and the American Customer Satisfaction Index, a benchmark gauge of shoppers' sentiment.

A one-point improvement in Glassdoor's rating (on a five-point scale) translated into a statistically significant 1.3-point increase in customer satisfaction (rated from zero to 100). As might be expected, the link was strongest in industries where workers have the most direct contact with customers, such as retail, restaurants and tourism. In such trades, a one-point gain in employee satisfaction rating raised that of customers by 3.2 points (see charts). Companies with high scores for both employee and customer satisfaction include Southwest Airlines, Trader Joe's, a grocer, and Hilton Hotels. The link is less strong among manufacturing and energy firms.

More pertinent to bosses, Glassdoor also cites a study showing that higher customer satisfaction leads to higher market value. So here is a tip for chief executives: be nice to the front-line staff and your bonus might be bigger. ■



生产率

多些满意

怎么让你的顾客高兴

俗话说，开心才有回头客。但企业如何能让客户满意呢？近期一项研究发现，答案是善待员工。请员工点评雇主的网站Glassdoor在分析了2008年至2018年间13个行业里293家公司的记录后，研究了员工满意度（基于该网站自己的评分）和美国顾客满意度指数（衡量顾客情绪的一个基准）之间的关系。

在Glassdoor上的评分每上升1分（五分制），公司的顾客满意度（百分制）会对应提升1.3分，这在统计上有显著意义。正如所料，在员工与顾客最直接接触的行业中，如零售、餐饮和旅游业，这种关联最为紧密。在这些行业里，员工满意度每提高1分，顾客满意度就上升3.2分（见图表）。员工和客户满意度都高的企业包括美国西南航空、Trader Joe's超市、希尔顿酒店等。而在制造业和能源公司中，这种关联性较弱。

更值得老板们关注的是，Glassdoor还引用一项研究指出，客户满意度高还会带来高市值。所以给CEO们一个小提示：好好对待一线员工，你自己的奖金也许也会水涨船高。 ■



Bartleby

The long and winding career

People are working longer for reasons of choice and necessity

ACROSS THE developed world, the workforce now comes in 50 shades of grey. Since 2008 the average labour-force participation rate of 55- to 64-year-olds in OECD countries has risen by eight percentage points. Depending on your point of view, that trend can be spun as ruthless capitalism requiring workers to spend more years down the salt mines or as a sign that society that is finally recognising the value of its older employees.

A new OECD report, “Working Better with Age”, points out that the employment of older workers is vital, if prosperity is to be maintained. The median age of citizens in the OECD is set to rise from 40 now to 45 in the mid-2050s; on current trends, by 2050 there will be 58 retired people for every 100 workers, up from 41 today.

Many people will be more than happy to work longer. A recent survey of 1,000 British retired people found that a quarter thought they had stopped too early (on average they had quit at 62). A third said that they had lost their purpose in life after they retired.

Bartleby has reached an age at which many of his contemporaries have stopped working. The appeal is understandable. Retirement gives you the chance to sleep late and avoid the morning commute. On a summer’s day, you can enjoy the sunshine; on a winter’s day, you can avoid the cold and rain. No longer do you have to sit through endless meetings or check email obsessively.

But work has many compensations. It keeps the mind active and gives people a purpose in life. The first month of retirement may seem idyllic,

but boredom is bound to ensue. Grand plans to learn languages and travel the world can quickly fizz out. Furthermore, the camaraderie of colleagues provides a social network; spending all week at home can lead to loneliness. It will be a while before Bartleby retires to his seaside cottage, “Dunwritin”.

Working longer should be easier now that most jobs require mental, rather than manual, labour. But the physical strain of being a fireman, miner or construction worker makes it harder to keep working in your 60s.

Of course, many people are working longer not because they enjoy what they do, but because they cannot afford to quit. That is not solely because governments have been pushing up the state retirement age. In practice, the average age at which people actually retire (the “effective” retirement age) is lower than the official age by several years. In part, that is because rather than rely on a state pension, which kicks in at the official age, as their sole source of retirement income, many people supplement it with work-related pensions, which can be taken earlier.

However, companies have been phasing out pensions linked to final salaries and replacing them with “defined contribution” schemes. Under the latter, workers end up with a pot of savings at retirement that needs to be reinvested. The income from such pots has been reduced by very low interest rates. Women tend to have smaller retirement pots (owing to their years spent raising children). That makes their difficulties particularly acute. They need to keep working.

This helps explain the long-term trends. The effective male retirement age across the OECD was 68.4 in the late 1960s and then steadily fell to reach a low of 62.7 in the early 2000s. At that point it started to increase, reaching 65.3 by 2017. For women, the pattern has been similar. The effective retirement age fell from 66.5 in the late 1960s to 60.9 in 2000, and then rebounded to 63.7 by 2017.

These statistics indicate that age discrimination in the workforce has been reduced, if not entirely eliminated. Some countries now have laws prohibiting discrimination on the grounds of age, although surveys suggest older workers still feel disadvantaged, particularly when it comes to promotion.

Two issues seem to hold employers back. The first is that older workers tend to command higher salaries, because of the seniority system. The OECD suggests that the premium for long tenure should be reduced. The second is a skills deficit; one in three 55- to 65-year-olds in OECD countries either lacks computer experience or cannot pass technology tests.

Such deficits can be tackled with proper training, organised by the government or by companies themselves. But the over-55s should take it upon themselves to keep up with technological changes. Become a silver surfer. Your livelihood may depend on it. ■



巴托比

漫长而曲折的职业生涯

延迟退休既是个人选择，也是出于无奈

纵观所有发达国家，劳动人口都在步入“50度灰”的阶段。自2008年以来，经合组织国家55至64岁人口的平均劳动参与率上升了8个百分点。对这种趋势的看法见仁见智——既可以认为它是无情的资本主义要求延长工人辛苦劳动的年限，也可以看作是社会终于开始认识到年长劳动力的价值。

经合组织一份名为《工作能力随年龄增长》（Working Better with Age）的新报告指出，年长劳动力的就业对保持经济繁荣至关重要。现在经合组织国家公民的中位年龄是40岁，到2055年前后很可能会升至45岁。按照目前的趋势，到2050年，退休人员与在职员工的比例会是58:100，而目前这一比例为41:100。

许多人会很乐意延迟退休。最近一项针对1000名英国退休人员的调查发现，四分之一的人认为自己退休过早（他们的平均退休年龄为62岁）。三分之一的人表示自己退休后失去了生活目标。

笔者已经到了很多同龄人都已退休的年龄。退休的吸引力不言而喻。退休后你可以睡懒觉，不用赶早去上班。你可以在夏天享受阳光，在冬天远离寒冷和雨水。你再也不必耐着性子参加没完没了的会议，也不用像患了强迫症一样时不时就要查看电子邮件。

但工作也有很多好处。它让头脑保持活跃，赋予人们生活目标。退休后的第一个月可能看起来诗情画意，但无聊肯定会接踵而至。学习外语和环游世界的宏伟计划很快就会不了了之。此外，同事情谊提供了一个社交网络，而整个星期足不出户孤独感就会降临。相信笔者还要继续工作挺长一段时间才会住到自己的海边小屋“辍笔居”去。

既然大多数工作是脑力劳动而不是体力劳动，那么延迟退休应该更容易落

实。但消防员、矿工或建筑工人到60来岁时会因身体劳损而难以继续工作。

当然，许多人延迟退休并不是因为他们喜欢自己的工作，而是因为“退不起”。这不仅仅是因为各国政府一直在提高法定退休年龄。在现实中，人们真正退休的平均年龄（也就是“实际”退休年龄）要比官方规定的退休年龄还早几年。这在一定程度上是因为许多人并不以在法定年龄才能领取的国家养老金为退休后的唯一收入来源，还有可以提前支取的公司养老金作为补充。

但雇主一直在逐步取消与最终薪酬挂钩的养老金，代之以“固定缴款”计划。按此计划，员工最后退休时拥有的是一笔需要再投资的共同储蓄金。由于利率很低，这类共同储蓄金的收益减少了。而女性因为在抚养子女上花费了时间，持有的储蓄金往往更少。这使得女性的处境尤为困难，需要继续工作。

这可以帮助解释长期趋势。在上世纪60年代末，经合组织国家男性的实际退休年龄为68.4岁，随后稳步下降至本世纪初62.7岁的低点。之后又开始回升，到2017年达到65.3岁。女性的变化也差不多。她们的实际退休年龄从上世纪60年代末的66.5岁降至2000年的60.9岁，到2017年又回升至63.7岁。

从这些统计数字可以看出，劳动力中的年龄歧视即使没有完全消除，也已经有所减弱。一些国家已经制定了禁止年龄歧视的法律，尽管调查显示年长员工仍然感觉自己处于弱势，尤其在涉及晋升时。

雇主的决策似乎受到两个问题的影响。首先，由于论资排辈的设定，他们往往需要向年长的员工支付更高的薪水。经合组织建议降低长期任职带来的工资溢价。第二是技能不足。在经合组织国家55至65岁的人口中，有三分之一要么缺乏计算机技能，要么技术考核过不了关。

政府或企业自己组织的相关培训可以解决这类不足。但55岁以上的员工应该主动跟上技术变迁。把自己打造成银发网民吧，你的生计也许就靠它

了。 ■



Unintended consequences

The numbers guys

Economists have a lot to answer for, argues a veteran analyst

FEW ECONOMISTS worked at the Federal Reserve in the early 1950s. Those who were on the staff of America's central bank were relegated to the basement, at a safe remove from the corridors where real decisions were made. Economists had their uses, allowed William McChesney Martin, then the Fed's chairman. But they also had "a far greater sense of confidence in their analyses than I have found to be warranted". They were best kept down with the surplus furniture and the rats.

The world changes, and it can be hard to say why, writes Binyamin Appelbaum in "The Economists' Hour". Despite the clout of a few individuals such as John Maynard Keynes, economists as a class were once held in almost universally low esteem by serious policymakers, who saw them as trumped-up statisticians with strange views about human behaviour. But in the decades after the second world war, the profession clawed its way out of the basement and up to extraordinary influence.

The rise was made possible by charismatic intellectuals such as Milton Friedman, who in that era spotted the chance to nudge history in their preferred direction. For nearly half a century rumpled theorists held the ear of politicians around the world. Their period of triumph ended in a fog of financial crisis, economic conflict and resurgent nationalism. Mr Appelbaum aims to focus public attention on the role of economists in the miasma's descent.

His is a respected voice in American journalism. Now an editorial writer at the *New York Times*, he spent nearly a decade covering economics and

economic policy in Washington. “The Economists’ Hour” is a work of journalism rather than polemic. It is a well reported and researched history of the ways in which plucky economists helped rewrite policy in America and Europe and across emerging markets.

Some of the stories Mr Appelbaum tells will be unfamiliar. He describes how economists inspired by Friedman persuaded Richard Nixon to abandon military conscription in favour of all-volunteer armed forces. The draft misused resources, they argued, by pressing into service young people whose skills might be better applied elsewhere. The Pentagon might actually save money by relying solely on volunteers, thanks to reduced turnover and thus lower training costs. Nixon had his own reasons for ending conscription. But the economists helped make up his mind.

And they managed to undercut an age-old American scepticism of big business. In the late 19th and early 20th centuries, America had reined in the behemoths built by robber barons. In the 1950s economists were second-class citizens in the antitrust division of the Department of Justice. The economists’ hour changed all that.

George Stigler, a friend of Friedman and a fixture at the University of Chicago, reckoned that “competition is a tough weed, not a delicate flower”, and that in practice firms would struggle to maintain and wield market power. Aaron Director, an economist sympathetic to Stigler’s ideas on competition (and Friedman’s brother-in-law), spent most of his career in Chicago as well, instructing law students in the emerging economic perspective on antitrust issues. He became a mentor to Richard Posner, a legal scholar and later a judge, who promoted the notion that justice in the law meant no more and no less than economic efficiency. They and their disciples worked to turn legal attitudes to antitrust on their head, allowing decades of corporate concentration and increasing market power.

That is not the half of it. Economists helped engineer a wave of deregulation from the 1970s to the 1990s, and provided the intellectual case for tax cuts from the 1960s to the 1980s (much of which this newspaper applauded). All this yielded many benefits: deregulating airlines, to take just one example, made flights cheaper and more accessible. But overall growth never rose as some promised. Inequality widened. Workers and communities increasingly lost out to firms.

Even the profession's triumphs deserve reconsideration, Mr Appelbaum suggests. Economists are proud of their role in the defeat of double-digit inflation in the early 1980s. Yet the recessions stoked by monetarism did immense harm. Unemployment soared, and many manufacturing towns hurt by appreciating currencies never recovered. Economists are often quick to dismiss the possibility that inflation might eventually have fallen on its own, as the effects of high oil prices and elevated defence spending abated.

Could a band of social scientists really wreak so much havoc? Mr Appelbaum's book places economists at the centre of the story, but they were often mere accomplices to a broader movement of conservatives determined to reverse the encroachment of the state. Free-market economists received financial support from business leaders who were more passionate about reducing tax and regulation than about high-minded research. Joseph Coors, a beer magnate, created the Heritage Foundation as a sort of public-relations firm for capitalism. It was soon publishing economists with friendly messages. "Let's get taxes cut under any and all circumstances," Friedman wrote for the think-tank in 1978. Rather than being the tale of an academic discipline's unlikely rise to influence, Mr Appelbaum's book can be seen as an account of the easy ascent of a few ideas that appealed to the wealthy and powerful.

Still, the part played by others does not get the economists off the hook.

Many (of assorted political persuasions) laboured quietly to produce valuable research. But some leading lights ignored critics, including within the profession, who warned that their clever theories did not adequately capture society's complexities. Too many were too impressed with their own intelligence to consider the unintended consequences of their policies. Too few reflected on the implications of the politics that allowed them to enact their ideas.

Often, their theories operated on the assumption that the self-interested actions of the rich would benefit everyone, even as those self-interested rich used the same economists to pursue their own agenda. The end of the economists' hour has created room within the field for views that long struggled to get a hearing. But, in an age of nativism and protectionism, other ways of seeing the world now predominate. It may be some time before the dismal science gets a chance to set things right. ■



非预期后果

数字狂人

一位资深分析家认为，经济学家对于很多问题都负有责任【《经济学家的时刻》书评】

上世纪50年代初，在美联储工作的经济学家很少。就算真有人供职于这家美国央行，也都被贬到了大楼的地下室，与真正做出决策的那几条走廊保持着一段安全距离。时任美联储主席的威廉·麦克切斯尼·马丁（William McChesney Martin）承认，经济学家还是有他们的用处。但是，他们“对自己的分析自信过头，远远超出我认为合理的程度”。他们最好还是继续待在地下室，和多余的家具还有老鼠在一起。

时移世易，而且也很难说清世道怎么就变了，本雅明·阿佩尔鲍姆（Binyamin Appelbaum）在《经济学家的时刻》（The Economists' Hour）一书中这样写道。尽管有凯恩斯等少数有影响力的人士，但经济学家作为一个群体一度几乎在哪儿都不受严肃的政策制定者敬重。在后者看来，经济学家就是一群对人类行为有着奇怪看法的三脚猫统计学家。但是在第二次世界大战后的几十年里，这个行当已经爬出了地下室，收获了非凡的影响力。

这个行业迎来扬眉吐气的一刻，靠的是米尔顿·弗里德曼（Milton Friedman）等具有超凡魅力的知识分子。他们在那个时代发现了推动历史稍稍朝自己偏好的方向走的机会。近半个世纪以来，不修边幅的理论家们在全世界的政客那里都说得上话。他们志得意满的时光在金融危机、经济冲突和再次抬头的民族主义的迷雾中结束。阿佩尔鲍姆想将公众的视线引向经济学家在这片乌烟瘴气的降临中所扮演的角色。

他在美国新闻界备受尊重。他现在是《纽约时报》的社论主笔，报道经济和华盛顿的经济政策已近十年。《经济学家的时刻》更像新闻报道而非辩论文章。本书报道充分，研究透彻，讲述了果敢的经济学家如何改写了美国、欧洲以及所有新兴市场的政策的历史。

阿佩尔鲍姆书中的某些故事不太为人熟知。据他讲述，经济学家们受弗里德曼的启发，说服理查德·尼克松放弃了征兵制，转而支持完全志愿性质的武装力量。他们指出，征兵制滥用了资源，被迫入伍服兵役的年轻人或许本可以在别处更好地运用自己的技能。仅依靠志愿兵来补充兵力实际上或许能让五角大楼节省资金，因为人事变更率会下降，培训成本进而也会降低。尼克松自有结束征兵制的理由，但经济学家帮助他下定了决心。

他们还成功削弱了美国人对大企业由来已久的怀疑态度。19世纪末20世纪初，美国严格约束强盗大亨们打造出的庞大企业。上世纪50年代，经济学家在司法部的反垄断部门是二等公民。经济学家高光时刻的到来改变了这一切。

弗里德曼的朋友、芝加哥大学的资深教授乔治·斯蒂格勒（George Stigler）认为，“竞争是一株劲草，而不是一朵娇花”，在实践中企业很难保持和运用市场支配力。经济学家亚伦·戴雷科特（Aaron Director）赞同斯蒂格勒关于竞争的观点（他还是弗里德曼的妻兄），他也在芝加哥大学度过了职业生涯的大部分时光，指导法律专业的学生从新兴的经济学角度看反垄断问题。他成了理查德·波斯纳（Richard Posner）的导师。波斯纳是一位法律学者，后来成了一名法官，他提倡的观念是法律上的公正无非就是经济效率。这些人及其门徒们扭转了法律界对反垄断的态度，为持续几十年的企业日趋集中和市场支配力壮大创造了条件。

事情还远不止于此。上世纪70年代到90年代，经济学家帮助策划了一波放松管制的浪潮，并在60年代到80年代为减税提供了理论依据（其中大部分得到了本刊的赞同）。所有这些带来了诸多好处。仅举航空公司一例：放松监管使航班更便宜也更便捷了。但总体增长一直未像一些人承诺的那样上升。不平等扩大了。工人和社区的利益在企业的扩张中节节败退。

阿佩尔鲍姆认为，就算是经济学这个行业所取得的胜利也应重新加以考量。经济学家为自己在80年代初挫败两位数通胀率的战役中所发挥的作用感到自豪。然而，货币主义引发的经济衰退造成了巨大的危害。失业率飙升，许多因货币升值而受创的制造业城镇始终未能复原。由于高油价和国

防开支增加的影响减弱，经济学家通常都急于否定通胀最终会自行降低的可能性。

一群社会科学家真的会造成如此严重的破坏吗？在阿佩尔鲍姆的书中，经济学家处于故事的中心位置，但在一场更广泛的保守派决意逆转政府侵犯的运动中，他们只是共犯而已。自由市场经济学家得到了商业领袖的财政资助，然而后者更感兴趣的是减税和减少监管，而不是崇高的研究。啤酒大亨约瑟夫·库尔斯（Joseph Coors）创立了传统基金会（Heritage Foundation），算是一家服务于资本主义的公关公司。很快它就开始发表与自己意见相合的经济学家的研究结果。“让我们把税减下来，不管是在什么情况下。”弗里德曼1978年在为这家智库撰写的文章中写道。阿佩尔鲍姆书中讲述的并不是这门学科出人意料地获得了卓著影响力传奇故事，而是某些引起富人和权贵的兴趣的理念是怎样轻而易举就被奉为圭臬的。

但其他人的所作所为也无法令经济学家摆脱责难。许多人（政治信仰各异）默默地下苦功，开展有价值的研究。但一些领军人物却无视批评者，包括来自经济学家内部的批评声音。批评者曾发出警告，指出他们巧妙的理论并没有充分体现社会的复杂性。太多人沉浸自己的聪明才智中忘乎所以，根本不去考虑其政策会有怎样非预期的后果。而几乎没有人反思政治可能产生的后果，尽管他们自己的想法得以付诸实践靠的就是政治。

他们的理论往往是基于这样的假设：富人出于自利的行为会使所有人受益。而与此同时，这些自私自利的富人却在利用同样这批经济学家来谋求自己不可告人的目的。随着经济学家高光时刻的终结，那些长久以来难以争取到发声机会的观点终于在这门学科内争得了一席之地。但是，在本土主义和保护主义盛行的时代，如今占据主导的是其他看待世界的方式。这门沉闷的科学可能需要一段时间才有机会拨乱反正。■



Flying taxis

Urban aviators

Small hovering craft are being readied to fly people around cities

IN OCTOBER 1908, on a windy field at Farnborough, south-west of London, a handlebar-mustachioed former Wild West showman named Samuel Cody completed the first official controlled flight of a powered aeroplane in Britain. Since then many other pioneering aircraft, from Concorde to the giant Airbus A380, have flown at what became the biennial Farnborough air show. The aerospace centre that stages the show is now preparing for another sort of revolutionary aircraft to take to the sky.

These new planes are variously described as flying taxis, passenger drones or, as the industry terms them, urban air mobility (UAM) vehicles. Around 200 such craft are at various stages of development around the world, according to experts at Farnborough's first global urban air summit in early September. Some prototypes are already carrying out test flights and operators hope to begin commercial services within the next few years. Uber, which runs an app-based taxi-hailing service, aims to start flying passengers in Dallas, Los Angeles and Melbourne, Australia by 2023.

Yet a number of obstacles remain. "No one really knows exactly how it is going to happen," admits François Sillion, head of Uber's Advanced Technologies Centre in Paris. That is because the obstacles are not particularly technological, but regulatory. Regulators are still working out how to certify that these new aircraft are safe, particularly as many will be flown without pilots, carrying passengers aloft as they buzz autonomously around a city.

Although UAM designs are many and varied, they sport some common

features. The aircraft are invariably electrically powered, although some are hybrids with a backup combustion engine. They usually take off and land vertically like a helicopter, but unlike a helicopter use multiple small rotors. Two- and three-seater versions can fly between 30km and 160km between charges at 100-200kph. As the multiple rotors are driven directly by individual electric motors, each rotor can be controlled by computerised flight systems. This provides a high level of stability, in theory making such aircraft easier to fly than a helicopter, and easier to automate. Reassuringly, multiple rotors also mean that such aircraft can rapidly compensate if one or more of their motors fail.

Some aircraft are moving beyond the experimental stage. The 18-rotor VoloCity is being developed by Volocopter, a German firm, based on a prototype (illustrated above) which has flown numerous test flights. One was an autonomous flight in Dubai. On September 9th, Geely, a Chinese carmaker which also owns Volvo Cars, took a minority stake in Volocopter and led a €50m (\$55.1m) funding round to help bring the VoloCity to market. The aircraft can carry two people (one of whom may or may not be a pilot) plus luggage for 35km.

Other types of air taxis use a “tilt wing”. This has multiple rotors mounted on the wings, which tilt up for a vertical take-off and landing, but tilt ahead to operate like a fixed-wing aeroplane with propellers for forward flight. This saves power and increases the range of the aircraft.

Lilium, another German company, uses a variation of the theme with 36 electrically powered fan jets. These look like miniature versions of the turbofans on passenger jets, except they use electric motors. The fans are mounted on the fixed wings of its aircraft and blow downwards for a vertical take-off or landing and backwards for forward flight. The company's five-seater (pictured below) can travel 300km in an hour.

Kitty Hawk, a firm backed by Larry Page, boss of Google's parent Alphabet, has teamed up with Boeing, the world's largest aerospace company, to develop Cora. This two-seater uses 12 lifting rotors on a fixed wing and is pushed along by a rear-mounted propeller. It has a range of about 100km and will be used by Air New Zealand to run an air-taxi service.

Most UAM operators are getting into the air with experimental flying permits, which restrict how their prototypes can be flown and usually only with a pilot. Some aircraft are starting to go through full certification procedures, as all commercial aircraft must before carrying fare-paying passengers. Air-safety authorities are still establishing what the standards should be. In July the EU's Aviation Safety Agency released a "special condition" for the certification of hybrid and electrically powered vertical take-off and landing aircraft. The idea is that the rules will be developed further as flight trials continue. As with conventional aircraft, certification could take several years and cost millions of dollars.

Regulators have set strict operating conditions for people flying small drones, whether as a hobby or for commercial purposes, such as filming, surveying or delivering pizza. This usually involves drones being kept well away from people, buildings, airports and other aircraft. But as air taxis are being designed to provide journeys in just such places, from an airport to the centre of a city for example, these new aircraft will have to be integrated into air-traffic-control systems, says Jay Merkle, the executive director of the Office of Unmanned Aircraft Systems at America's Federal Aviation Administration (FAA).

Various efforts are under way to automate air-traffic-control systems so that air taxis, piloted or autonomous, can be merged with flights by airliners and light aircraft. Fundamental to that will be fitting all aircraft with transponders, similar to those already used on large aircraft. These transponders would transmit and receive the flight plans of other aircraft

in the vicinity automatically so that pilots, or in the case of autonomous aircraft their flight computers, can see and avoid one another. Next year NASA, America's aerospace agency, will begin field tests of systems that could manage such operations in an urban environment as part of a "grand challenge" to industry to find workable solutions.

Some countries, though, are pressing ahead faster than others. Operators already complain they can use a drone to deliver blood in Rwanda but not in America, says the FAA's Mr Merkle. Working with UAM firms on flight trials and sharing information is the best way to reach global standards, reckons Tim Johnson, policy director of the Civil Aviation Authority in Britain. The agency has more than 20 groups planning air-taxi flight trials in Britain. Japan aims to undertake such flights in rural areas, where airspace is less congested, before allowing air taxis into urban locations, said Ito Takanori of the Future Air Mobility Office of his country's Ministry of Economy, Trade and Industry.

Meanwhile, Uber is trying to learn how to run an air-taxi service. To this end it has begun operating a somewhat old-fashioned helicopter service between Lower Manhattan and JFK airport in New York. One thing this has brought home to the company, says Uber's Mr Sillion, is that UAM operators will inevitably get drawn into property and infrastructure projects.

This means building "vertiports", which are landing pads with passenger facilities, parking for air taxis and recharging points for their batteries. Skyports, a London-based startup, is building a prototype vertiport due to open in October in Singapore. It will be used by Volocopter for test flights.

EHang, a Chinese dronemaker, is using a passenger-carrying version it has been testing to develop an air-taxi business in Guangzhou, a city in southern China. It is working with the municipal government to set up a command centre for flying operations and a series of vertiports.

But behind all these plans lurks one more problem. Planning permission for helicopter landing pads is hard to obtain in some cities, largely because of noise objections. Flying taxis, being electrically powered, should be much quieter than helicopters but are still likely to be heard buzzing away overhead, just as drones are. The leaders of some cities, such as Dubai, Guangzhou and Singapore, might be prepared to accept that as the sound of progress. Others might not. And noise, it should be remembered, can ground many an aviator's ambitions. Despite the allure of supersonic travel, Concorde had its wings clipped because of the noise it made going through the sound barrier. ■



飞行出租车

城市飞行家

小型旋翼飞机将载人飞越城市上空

一九〇八年十月，伦敦西南部范堡罗（Farnborough）一片大风吹拂的田野上，留着两撇大八字胡、曾是狂野西部秀巡演（Wild West）演员的塞缪尔·科迪（Samuel Cody）完成了英国首次正式受控动力飞行。自那以后，从协和号到空中客车的巨型飞机A380的众多先驱型飞机都在后来发展为两年一次的范堡罗航空展上做飞行展示。承办该航展的航空中心如今正准备迎接另一种革命性机型翱翔天际。

这些新飞机名号众多，有“飞行的士”、“载客无人机”，或者业界术语“城市空中交通工具”（以下简称UAM）。在9月初于范堡罗举行的全球首次城市空中交通峰会上，与会专家称全球约有200种此类飞机，分别处于不同的研发阶段。部分原型机已开始试飞，运营商希望在未来几年内启动商业服务。网约车公司优步计划于2023年在美国的达拉斯、洛杉矶和澳大利亚的墨尔本启动“飞的”业务。

但目前仍存在一些障碍。“没有人知道这究竟将怎样实现。”优步巴黎高级技术研究中心的负责人弗朗索瓦·司里恩（François Sillion）承认。这是因为主要障碍不在技术层面，而在监管层面。监管机构仍在研究如何认证这些新飞机的安全性，尤其是因为它们大多将在没有飞行员的情况下自主运载乘客在城市上空轰鸣而过。

尽管UAM的设计多种多样，但具有一些共同特征。这些飞机一般由电力驱动，虽然有些是混合动力，配有备用内燃机。它们通常像直升机那样垂直起降，不同之处是使用了多个小型旋翼。两座及三座版的这类飞机每次充电后能以100至200公里的时速飞行30到160公里。各个旋翼分别由不同的电动机直接驱动，因此每个旋翼都能通过计算机飞行系统来控制。这带来了较高的稳定性，从理论上说飞行操作会比直升机更简单，也更容易实现

自动化。更让人放心的是，因为配有很多个旋翼，即便一个或多个电机发生故障，这类飞机也可以迅速做出补偿。

有些飞机已经跨出了实验阶段。由德国公司Volocopter开发的18旋翼飞机VoloCity的原型机（见上图）已完成了大量试飞。其中一次是在迪拜进行的自主飞行。9月9日，中国汽车制造商吉利（拥有沃尔沃汽车）购入了Volocopter的少数股权，并领投了一轮5000万欧元（5510万美元）的融资，帮助将VoloCity飞机推向市场。这款飞机可运载两人（其中一人可能为飞行员）外加行李飞行35公里。

其他类型的“飞的”使用“倾斜机翼”。机翼上安装多个旋翼，可以向上倾斜让飞机垂直起降，也可向前倾，像带有螺旋桨的固定翼飞机那样向前飞行。这样可以节省动力，增加航程。

另一家德国公司Lilium在这类设计上做了些改动，用36台电动喷气发动机提供动力。这些发动机看上去像是喷气客机上的涡轮发动机的微缩版，只是用了电动马达。它们被安装在固定机翼上，向下喷气来让飞机垂直起降，向后喷气来推动飞机向前飞行。该公司的五座版飞机（如下图）的飞行时速可达300公里。

谷歌母公司Alphabet的老板拉里·佩奇投资的小鹰公司（Kitty Hawk）已与全球最大航空航天企业波音联手，开发一款名为Cora的UAM飞机。这款双座飞机在固定翼上安装有12个起降旋翼，并配有后置螺旋桨提供推进力，航程约为100公里。新西兰航空将采用这款飞机提供“飞的”服务。

目前大多数UAM运营商是凭试飞许可证升空的，这对原型机的飞行方式有所限制，通常要求配备一名飞行员。有些UAM飞机已进入全面认证程序，就像所有商用飞机在收费运载乘客前要做的那样。航空安全机构仍在研究制订相关标准。7月，欧盟航空安全局（Aviation Safety Agency）发布了一套关于混合动力和电动垂直起降飞机认证的“特殊条款”。其核心是相关规则将随更多试飞的开展而进一步完善。与常规飞机一样，认证可能需要几年，花费数百万美元。

监管机构已就人们飞行小型无人机订立了严格规定，不论他们是出于爱好或商业目的，例如拍摄、勘测，或送披萨。这类规定通常要求无人机远离人群、建筑、机场和其他飞机。但由于“飞的”恰恰是要在上述地点之间（例如从机场到市中心）运送乘客，这些新飞机必须被整合到空中交管系统中，美国联邦航空管理局（FAA）无人机系统办公室的执行主任杰伊·默克尔（Jay Merkle）表示。

目前人们正在展开各种努力以实现空中交管系统的自动化，好将“飞的”——无论有人驾驶还是自主飞行——和大型客机及轻型飞机统一管理。最根本的方法是在所有飞机上安装应答机，类似大型飞机上配备的那种。这些应答机将自动发送并接收附近其他飞机的飞行计划，这样飞行员或自主飞行计算系统就能“看见”其他飞机，从而避免碰撞。明年，美国国家航空航天局（NASA）将开始对能在城市环境中管理这类飞行的管理系统做实地测试，这是业界寻找可行解决方案的“重大挑战”的一部分。

不过有些国家的推进速度更快些。美国联邦航空管理局的默克尔表示，运营商已经在抱怨，他们可以用无人机在卢旺达运送血样，在美国却不行。英国民航局政策主管蒂姆·约翰逊（Tim Johnson）认为，与UAM公司合作进行飞行试验并共享信息是成功订立相关全球标准的最佳途径。在英国民航局的管辖下，有超过20个团体计划在英国进行“飞的”试飞。日本经济产业省未来空中交通办公室的伊藤隆典（音译）表示，日本计划让“飞的”先在空域不那么拥挤的农村飞行，之后再考虑允许其进入城市区域。

与此同时，优步正在努力学习如何运营“飞的”服务。为此，它开始运行一种不那么新潮的直升机服务，往返纽约曼哈顿下城和肯尼迪机场。优步的司里恩表示，这让公司明白，UAM运营商将不可避免地被牵涉到地产和基础设施项目中。

这意味着要建造“垂直起降机场”，即设有旅客设施、可供“飞的”起降和充电的停机坪。总部位于伦敦的创业公司Skyports正在建设这样一个垂直起降机场的原型，将于10月在新加坡展示，并用于Volocopter的试飞。

中国无人机制造商亿航智能一直在测试一款载客无人机，用于在广州开展“飞的”业务。该公司正与广州市政府合作，准备建立一个飞行指挥中心和一系列“垂直起降机场”。

但所有这些计划的背后都隐藏着另一个问题。在一些城市，直升机停机坪很难获得规划许可，主要是因为人们对噪音的抵制。电动飞的应该会比直升机安静得多，但飞行时仍可能像无人机那样在头顶嗡嗡作响。迪拜、广州和新加坡等一些城市的领导人也许把这视为进步的声音，甘之如饴。其他城市则未必如此。应谨记，很多飞行家的雄心壮志都可能因噪音而搁浅。尽管超音速旅行极具吸引力，但协和号还是因为穿越音障时的噪音而折翼。 ■



Schumpeter

The FredEx conundrum

FedEx's visionary founder is an old-style disrupter in danger of being disrupted

FOR OUTSIDERS, FedEx is synonymous with the business it pioneered: the overnight delivery of packages. For insiders, it might just as well be called FredEx. It is virtually indistinguishable from its founder, Fred Smith, who has been boss since 1971. The 75-year-old, who came up with his idea for air freighting packages at Yale University, is the stuff of folklore. Some of it is apocryphal, such as the story that he got a C at Yale for a paper outlining his idea (he can't recall the grade). But one tale is, if anything, too good to check. In its early days, as the firm flirted with bankruptcy, he saved it with a lucky wager at a blackjack table in Las Vegas.

Mr Smith is an entrepreneur of the old school. The ex-marine dispatched his first 14 planes in 1973—on the first day they carried 186 packages. FedEx is now the biggest cargo airline in the world, with 681 aircraft and an average volume of 15m packages a day. He has played politics as he plays cards, be that securing deregulation of the air-cargo industry in the 1970s, winning protection from American unions or schmoozing congressmen at the FedEx Field, home to the Washington Redskins. Among American firms, FedEx has long been one of the most recognisable, admired and popular to work for. In January the board in effect gave Mr Smith tenure for life, by waiving the firm's retirement age of 75 for executives. "Like a Supreme Court judge," chuckles one admirer.

Shareholders are less giddy. As one of the biggest parcel carriers in America, FedEx ought to benefit from uninterrupted GDP growth. Yet since 2009, when America began its longest economic expansion on record, the company has underperformed the S&P 500 by almost 100 percentage points.

This year it has suffered from the Sino-American trade war, growing competition from Amazon and problems integrating Europe's TNT Express, which it bought in 2016 for \$4.4bn. Such squalls are not good for its financial health, yet FedEx has been investing more than \$5bn a year since 2017 to keep deep-pocketed rivals like Amazon and the e-commerce giant's Chinese counterpart, Alibaba, out of its delivery business. This is a game of chance that Mr Smith is not guaranteed to win.

The biggest stakes are at home. FedEx built its name as a high-end business-to-business firm, offering guaranteed time slots for delivering parcels and factory goods along the supply chain. But e-commerce is raising the importance of delivery to homes, at faster speeds and lower costs. FedEx has responded by expanding its trucking service, which will soon reach most American homes seven days a week. But that clobbers margins. Meanwhile, Amazon is spending heavily on same-day delivery. It is also building an aircraft fleet that, though still a midget compared with FedEx's, will amount to 70 aircraft by 2021. According to Satish Jindel, a logistics consultant, Amazon has leapfrogged its rivals to become the biggest firm in the world at organising warehousing and transport for other companies' goods (as well as its own). Only a few years ago Mr Smith mocked the idea of competition from the likes of Amazon as "fantastical". But in the past two months FedEx has severed its (albeit tiny) remaining ties with Amazon to focus on building its relationship with retailers like Walmart and Target instead. Its main rival, UPS, is sticking with Amazon. This sets the stage for a potentially bruising price war that could further crimp profits.

Its second big challenge is overseas. Besides having to fix TNT, FedEx has found itself in the awkward position of being on the wrong side of both adversaries in the trans-Pacific trade war. In recent months it was forced to apologise to China for diverting packages belonging to Huawei. FedEx said that this was owing to an error. Nonetheless the Chinese government is reportedly threatening to put FedEx on its own blacklist. And the company

has also sued its own government, saying it should not be deputised to “police the contents” of any packages it sends to check that they do not violate export bans.

Besides the ugly geopolitics, global competition is also rising for FedEx. One of the biggest threats comes from Cainiao, a Chinese rival backed by Alibaba that in 2017 pledged to invest \$15bn in cross-border logistics. FedEx claims that its own vast network, extending to 220 countries, safeguards it from such incursions. But it is not used to having tanks the size of Amazon’s and Alibaba’s on its lawn; their troves of data on customers may give them an edge in the delivery wars.

In response, both FedEx and UPS are investing large sums to modernise their fleets and expand their delivery hubs. But though FedEx’s revenues of almost \$18bn in the last quarter have nearly caught up with UPS’s, its profit margins are weaker and it is generating less cash. That worries investors. It could seek to reassure them by reducing purchases of costly items like aircraft, or combining two of its independent businesses in America, FedEx Express and FedEx Ground, to cut costs. But it has rejected both ideas, insisting it is best to invest in growth.

It may be wise to double down this way. However much risk-averse investors may prefer share buy-backs to ambitious capital-spending plans, halting investment could be seen as a flag of surrender by the likes of Amazon. That said, FedEx’s failures—to respond more quickly to the changing e-commerce landscape, to read the runes of geopolitics and to end its stubborn refusal to join its two businesses—reflect a company whose management is long in the tooth. Including Mr Smith, FedEx’s ten top executives average more than three decades at the firm, which is extraordinary.

It is hard not to misread the changing rules of business when you once

rewrote them—even harder when some of your oldest friends are your sounding board. It is clear that the directors have no stomach for replacing their chairman in the foreseeable future. But unless Mr Smith brings in fresh executives, and then listens to them, his days at the business blackjack table should be numbered. Think FredExit, in other words. ■



熊彼特

“弗雷德快递”的难题

联邦快递卓有远见的创始人作为老派“洗牌人”有被“洗牌”之虞

对行外人而言，联邦快递（FedEx）是它所开创的次日达快递业务的代名词。对行内人来说，联邦快递可以干脆叫做弗雷德快递（FredEx）。这家公司与其创始人、自1971年以来一直担任掌门人的弗雷德·史密斯（Fred Smith）几乎浑然一体。这位75岁的老人当年在耶鲁大学求学时想到了空运包裹这个主意。如今他已是某种传奇人物。有些广为流传的故事不足为信，比如说他在耶鲁大学那篇讲述自己创意的论文只得了C（他本人想不起当时的得分）。但有一个故事，也许是因为实在太精彩，大家都不想深究查证。那就是联邦快递创办初期一度濒临破产时，他在拉斯维加斯的21点赌桌上赢了一笔钱，让公司起死回生。

史密斯是位老派企业家。这位前海军陆战队队员在1973年启用了自己的首批14架货运飞机，第一天运送了186件包裹。如今联邦快递已成为世界最大的航空货运公司，拥有681架飞机，平均每天运送1500万件包裹。史密斯的政治手腕与其牌技一样高明，无论是在上世纪70年代争取到政府对航空货运放松管制，还是赢取美国各个工会的保护，或者是在联邦快递球场（FedEx Field，华盛顿红皮橄榄球队的主场）上与国会议员闲聊，左右逢源。在美国企业中，联邦快递一直是最受员工认可、赞赏和欢迎的公司之一。今年1月，公司董事会取消了高管在75岁退休的规定，实际上是让史密斯可以终身任职。“像最高法院法官一样。”他的一位崇拜者笑道。

股东们倒没那么兴奋。作为美国最大的快递公司之一，联邦快递本应得益于美国GDP的持续增长。然而，自2009年美国进入史上最长经济增长期以来，联邦快递的表现已落后标普500指数近100个百分点。今年，这家公司又受到中美贸易战、亚马逊加大竞争力度，以及整合欧洲TNT Express（2016年联邦快递以44亿美元收购该公司）相关问题的困扰。这些风波不利于它的财务健康，但自2017年以来该公司每年投资超过50亿美

元，力求将亚马逊及中国电商巨头阿里巴巴等资金雄厚的对手挡在它的快递业务之外。这是一场拼运气的游戏，史密斯并不能稳赢。

最大的风险在美国国内。联邦快递在供应链中配送包裹和工厂货物，保证时效，由此建立起了高端B2B服务公司的声誉。但随着电子商务的崛起，以更快的速度、更低的成本为顾客送货上门变得愈发重要。为此联邦快递已扩大其货车运输队伍，很快就可以每周七天服务大多数美国家庭。但这有损利润。与此同时，亚马逊正大力投入当日达快递服务。它还在打造自己的机队，预计到2021年将拥有70架飞机——尽管与联邦快递相比还差得很远。物流咨询顾问萨迪希·金德尔（Satish Jindel）称，亚马逊已超越竞争对手，成为为其他公司和自家的货物组织仓储和运输的最大运营商。就在几年前，史密斯还嘲笑认为亚马逊这类公司有威胁是“捕风捉影”。但在过去两个月，联邦快递已砍掉了与亚马逊尚存的些微业务关系，改而专注与沃尔玛和塔吉特等零售商建立关系。联邦快递的主要竞争对手UPS则坚持与亚马逊合作。擂台已经搭好，一场可能进一步损伤利润的惨烈价格战势将打响。

第二大挑战在海外。除了要解决TNT的问题，联邦快递还发现自己夹在跨太平洋贸易战的两个对手之间，处境尴尬。近几个月，联邦快递因转运华为包裹的事件被迫向中国道歉。它表示这是一次操作失误。但据报道，中国政府威胁要将联邦快递列入黑名单。同时，该公司又起诉美国政府，认为它不应该要求自己对递送的包裹做“内容审查”以确保没有违反出口禁令。

除了险恶的地缘政治，联邦快递还要面对日渐激烈的全球竞争。其中一大威胁来自受阿里巴巴支持的中国竞争对手菜鸟，这家公司在2017年承诺投资150亿美元发展跨境物流业务。联邦快递声称自己庞大的物流网络已扩展到220个国家，足以抵御此类进犯。但联邦快递尚未习惯于承受亚马逊和阿里巴巴这种规模的企业带给它的压力——后两者拥有大量客户数据，可能让它们在快递战中占据优势。

为应对竞争，联邦快递和UPS都在大力投资于将货运设备现代化并扩建快

递枢纽站。尽管联邦快递上季度获得了近180亿美元收入，几乎赶上UPS，但利润率较低，产生的现金流较少，令投资者担忧。它可以减少购入飞机等昂贵设备或合并自己在美国的两家独立公司——FedEx Express和FedEx Ground，以降低成本，安抚投资者。但公司已经拒绝了这两个方案，坚持认为投资扩张是上策。

在这条路上加倍下注可能是明智之举。在股票回购与雄心勃勃的资本支出计划之间，无论厌恶风险的投资者多倾向选择前者，但叫停投资可能会被亚马逊等公司视作举旗投降。尽管如此，联邦快递没能更迅速地应对日新月异的电商市场格局，没读懂地缘政治密码，又顽固地拒绝合并旗下两家公司，这都反映出其管理作风的老旧过时。包括史密斯在内，它的十大高管平均已在公司工作30多年，这可很少见。

曾经改写过规则的人很难不误读持续变化的商业规则，尤其当你咨询意见的人还是你的老朋友时。显然，在可预见的未来，董事们并不想把董事长换掉。但除非史密斯请进新高管并听取其意见，否则他在商界21点赌桌上的日子就屈指可数了。换句话说，联邦快递该考虑“弗雷德快退”（FredExit）了。 ■



Schumpeter

The return of the merchant class

Shopify is doing for sellers what Amazon has done for buyers

FOR A CLASS of businessman that has been out of fashion for hundreds of years, the word merchant still has a ring to it. It conjures up medieval Europe, with its mercers, skinners, haberdashers, guilds and gold-buttoned liveries. It brings to mind ambitious venturers, bankrolling crusades and conquests, opening up spice routes and making history—for good and ill. It runs through literature and art, from Chaucer to Shakespeare to Holbein. Then it practically vanishes, first under the iron wheels of industrialisation in the 19th century, then crushed by consumer culture in the 20th. Until recently, the few merchants left sold only grain—or doom. Then came the e-commerce era. At last, merchants are staging a comeback.

Many of today's e-merchants sell in a digital marketplace, akin to a medieval town square. That mostly means Amazon, which handles almost half of American online sales on behalf of 1.9m suppliers. Its reputation for providing support to sellers is iffy. But it compensates by offering them an endless stream of customers, including 100m Prime subscribers who buy frequently and enjoy free, speedy delivery. That persuades sellers to put up with a lot.

Some online retailers, however, prefer to strike out on their own, like the craftsmen of old. They are developing “microbrands” they peddle themselves, handling payment, delivery and other customer relationships. But they can use assistance, of the sort that the guilds of yore offered their predecessors. Enter Shopify, a Canadian software firm whose value has rocketed by 180% in the past year, to \$45bn, eclipsing eBay, a better-known veteran of e-commerce. It is a mite compared with Amazon, valued at

\$870bn. Nonetheless, the Seattle-based giant has reason to look over its shoulder at the upstart tearaway in Ottawa. For Amazon excels at making consumers cheerful. Shopify, by contrast, is focused squarely on its merchants.

The company came about by accident. Its boss, Tobi Lütke, epitomised the new breed of digital merchants when he set out, with friends, to build an online snowboard shop, Snowdevil, in 2004. At the time, selling online meant one of a few things. You could spend a small fortune, either on developing your own sales channel or paying someone like IBM to build one for you, which only deep-pocketed firms could afford. Alternatively, you could rely on Amazon, sacrifice part of your margins and, with your product being delivered in Amazon's boxes, cede control over your relations with the customer. Worse still, you risked being elbowed out if it created its own version of your wares.

Instead, Mr Lütke built his own platform. Within two years he had switched from selling snowboards to software. In the process Shopify glided stealthily into the e-commerce big leagues without going head to head with Amazon, as Walmart, Target and other big retailers have done, sometimes with soul-sapping results. Its success has put further strain on bricks-and-mortar shops, which were already dying in droves.

Unlike Amazon, Shopify keeps out of the relationship between merchants and their customers. To the buyers, it is invisible. To the sellers, who flogged \$41bn-worth of stuff on its platform last year, it can be indispensable. They range from fashionistas of the Kardashian clan, mattress sellers, gym-wear specialists and Canadian marijuana growers to venerable brands such as Lay's potato chips (owned by PepsiCo). Some have grown with Shopify from scratch to selling billions of dollars of merchandise. No wonder Mr Lütke shares a Schumpetarian reverence for entrepreneurs.

Shopify's "software as a service" business is cheap to scale up. It says it is America's third-largest online retailer by volume of goods sold after Amazon and eBay. It generates high margins and recurring revenue from merchants, who pay a monthly fee for the software, based on their sales. On top of that, Shopify collects fees for helping run each stage of their e-commerce business, from designing an online store and advertising on social-media sites such as Instagram to processing payments and arranging logistics. This is the fastest-growing part of its business, though it is less profitable than selling software subscriptions.

As it expands, Shopify is using its clout to secure better terms for advertising on social media, financing and payments for its clients. It is also adapting as e-commerce rapidly changes. To reach more shoppers, e-merchants are building bricks-and-mortar stores. They are using e-commerce to buy from wholesalers. Shopify has used small acquisitions, like a recent purchase of Handshake, a platform for business-to-business e-commerce, to keep up with these trends. In June it said it would offer merchants warehousing and shipping in America using third-party firms that guarantee two-day delivery. This is partly in order to prevent customers from migrating to Amazon Prime. For the most part, it has wisely avoided throwing down the gauntlet directly to Amazon.

A longer-term challenge is to overcome its focus on the English-speaking world, where about three-quarters of its clients are based. As with the merchants of old, the biggest opportunities lie in faraway lands, especially Asia. To get a toehold, Shopify has enabled 17 languages on its platform besides English, including several Asian ones. But it faces stiff competition. Asia's biggest markets are already in the grip of giants such as Alibaba in China, Amazon and Walmart in India, and local firms in South-East Asia. In poorer countries trust in e-commerce remains fragile, making it hard to sell directly to consumers. Yet as Harley Finkelstein, Shopify's chief operating officer, notes, in the early days of e-commerce, when people recoiled at

handing over their credit-card details, trust was lacking in the West, too. In their heyday members of the merchant class were considered grubby hucksters—at least by Europe's medieval nobility and clergy. That did not stop them then. And, if you take Mr Lütke's word for it, it won't stop them now. ■



熊彼特

商贩阶层的回归

Shopify正在为卖家提供亚马逊为买家提供的服务

对于已经过时了几百年的一个商人阶层来说，商贩（merchant）这个词仍牵动人心。它让人想起中世纪的欧洲，想起绸缎商、皮革商、男装商、行会，以及缀着金色纽扣的制服。它还让人想起野心勃勃的投机商，他们资助十字军东征和对外征服、开辟香料之路，创造历史——不管是好是坏。它出现在从乔叟、莎士比亚到霍尔拜因（Holbein）等大师的文学和艺术作品中。然后这个词几乎消失了，先是被19世纪工业化的铁轮碾压，后来又被20世纪的消费文化挤压。到前些年，剩下的少数商贩只能卖粮食或沉寂。电子商务时代到来之后，商贩们终于要卷土重来了。

今天的许多电子商贩都在类似于中世纪城镇广场的数字市场上交易。其中的大鳄是亚马逊，它代表190万个供应商经手了全美近半的在线销售。它在给卖家提供支持方面口碑欠佳，但它通过为它们提供源源不断的客户来弥补不足。这些客户包括一亿经常下单并享受免费快速配送的Prime用户。这让卖家愿意忍气吞声。

然而，一些在线零售商更喜欢自己开辟市场，就像旧时的工匠那样。它们正在开发“微品牌”，自己推广并处理付款、快递以及其他客户关系。但它们可以获得一些协助——就像过去的行会提供给它们的前辈的那种。加拿大软件公司Shopify就充当了这一角色，其市值在过去一年中飙升了180%，达到450亿美元，令更出名的老牌电子商务公司eBay黯然失色。当然，比起市值8700亿美元的亚马逊，这是小巫见大巫。尽管如此，总部位于西雅图的亚马逊还是有理由提防这个来自渥太华的毛头小子。亚马逊擅长哄消费者开心，Shopify则相反，完全专注于服务商家。

Shopify的出现纯属偶然。其老板托比·卢克（Tobi Lütke）起初在2004年与朋友们一起开设了滑雪板网店Snowdevil，正是新型“数字商贩”的典

型。当时做在线销售没有多少选择。你得掏一笔数额不小的钱，自己开发销售渠道或付钱给IBM这样的公司帮你建设渠道。但只有资金雄厚的公司才能负担得起这笔开销。或者你可以依靠亚马逊，牺牲部分利润，用亚马逊的纸箱快递你的产品，放弃对客户关系的控制权。更糟糕的是，如果亚马逊自己推出了同类产品，你就有可能被挤出市场。

而卢克选择了打造自己的平台。在两年的时间里，他从销售滑雪板转向了卖软件。在此过程中，Shopify悄然进入了电商巨头的行列，而没有像沃尔玛、塔吉特（Target）和其他大型零售商那样与亚马逊正面交锋。这样的交锋有时会带来惨烈的结果。Shopify的成功给大批已然衰败的实体商店进一步带来了压力。

与亚马逊不同，Shopify不参与商家与客户之间的关系。对买家来说，Shopify是隐形的。而对去年在Shopify平台上卖出了410亿美元商品的卖家来说，Shopify或许是不可或缺的。这些卖家五花八门，从卡戴珊家族的时尚达人、床垫销售商、健身服专卖、加拿大大麻种植者，到百事可乐旗下的乐事薯片等知名品牌，不一而足。有些商家和Shopify一起从零开始起步，到现在销售规模已达数十亿美元。难怪卢克和熊彼特一样对企业家怀有崇敬之情。

Shopify的“软件即服务”业务的扩张成本很低。它表示，按销售的商品数量计算，自己是继亚马逊和eBay之后的美国第三大在线零售商。它从商家那里获得经常性收入，生成高利润。商家根据自己的销售额按月向它支付软件使用费。除此之外，Shopify辅助商家运行电商业务的每个阶段并收取费用，包括设计网店、在Instagram等社交媒体网站上打广告、处理支付和安排物流等。这是其业务增长最快的部分，尽管比销售软件订阅的利润要低。

随着Shopify的规模不断扩大，它正在利用自身影响力为客户争取更好的社交媒体广告、融资和支付条款。它也在适应电子商务的快速变化。为吸引更多购物者，电子商贩正在建立实体店。它们通过电子商务从批发商那里进货。Shopify已通过小型收购来跟上这些趋势，例如它最近收购了B2B

电商平台Handshake。今年6月，它表示将在美国通过第三方公司为商家提供仓储和运输服务，保证两日送达。这在一定程度上是为防止客户转成亚马逊Prime会员。大体来说，它明智地避免了直接挑战亚马逊。

Shopify面临的一个长期的挑战是如何突破对英语国家的过分倚重——它约四分之三的客户来自英语国家。与旧时的商贩一样，它们最大的机会存在于遥远的土地，尤其是亚洲。为了获得立足点，Shopify的平台除英语之外还支持包括几种亚洲语言在内的17种语言。但它面临激烈的竞争。亚洲最大的那些市场已经处于巨头们的控制之下，比如中国由阿里巴巴主导，印度有亚马逊和沃尔玛驻扎，东南亚的本土公司蓬勃发展。在较贫穷的国家，人们对电子商务的信任度依然不高，所以商家难以直接面向消费者销售。然而，正如Shopify的首席运营官哈雷·芬克尔斯坦（Harley Finkelstein）所言，在电子商务发展的早期，西方世界同样缺乏对电子商务的信任，人们并不愿提供自己的信用卡信息。在商贩阶层的鼎盛时期，其成员被视为奸诈可鄙的叫卖小贩——至少在欧洲中世纪的贵族和神职人员眼中是这样的。但这并没有阻止它们的发展。而如果你相信卢克的话，它也不会阻止它们在今天东山再起。 ■



High-tech fitness

Le maillot jaune

Peloton is the latest example of how the internet is replacing products with services

AS ANYONE IN a CrossFit class or Bikram-yoga studio will tell you, fitness is full of fads. Few make it to the stockmarket. But on August 27th Peloton, an American firm founded in 2012, announced it had filed paperwork for an initial public offering. Peloton describes itself as a “technology fitness media design software retail product apparel experience logistics” company. Its investors reckon it could be worth \$4bn.

Stripped of the aspirational jargon, the firm is in the business of selling high-tech (and high-priced) home exercise bikes. Each bike, which costs \$2,245, comes with a touchscreen, a version of Google’s Android operating system and an internet connection. For a monthly fee, users can tune into streamed exercise sessions, either live or pre-recorded, complete with leaderboards and statistics. The effect is a mix of a studio spinning class and a YouTube live stream, as perky instructors give shout-outs to individual users who are puffing away in their living rooms hundreds of miles away. For those who dislike cycling, a \$4,295 treadmill is also available.

Like many of the current crop of tech “unicorns”—private companies with a valuation of \$1bn or more—Peloton does not do anything so unfashionable as making money. It lost \$196m in the 12 months to June, up from \$48m the year before, as it threw money at attracting new customers. But its efforts seem to be working: it has 511,000 subscribers, more than double the number last year. Revenue has doubled too, reaching \$915m in 2019 (see chart). It is popular among trendsetters. David Beckham, an ex-footballer, is a fan, as is Barack Obama, an ex-president. That aspirational glow allows the firm to get away with gross margins on hardware of 43%, higher even

than Apple's famously lucrative gadgets. Despite its high prices (or perhaps because of them) it also boasts enviable customer loyalty.

Exercise-bike makers used to be in the manufacturing business. But Peloton makes about 20% of revenue from subscriptions, and the share is rising. Margins here are mediocre but should improve as content-production costs are spread over more users. The shift illustrates a broader trend: thanks to the internet, industries that used to be about products are increasingly about services, too. This lets firms replace unpredictable sales with a steady stream of subscription revenue. If they can pull it off. ■



高科技健身 黄色领骑衫

互联网正在促成以服务取代产品，*Peloton*是最新一例

每个参加过混合健身班（CrossFit）或比克拉姆瑜伽（Bikram-yoga）工作室的人都会跟你说，健身全都是一时狂热。这一行几乎没有公司能进入股市。但8月27日，成立于2012年的美国公司Peloton宣布已递交了首次公开募股的文件。Peloton把自己描述为一家“科技健身媒体设计软件零售产品服饰体验物流”公司。其投资者估计其市值可能达40亿美元。

撇去这一串野心毕露的术语，该公司的业务是销售高科技（并且是高价）的家用健身单车。每辆单车售价2245美元，配有触摸屏、谷歌的安卓操作系统，可连接互联网。支付一笔月费后，用户可以观看直播或录制的流媒体健身课程，查看排行榜和统计数据。它就像是健身房的动感单车课程和YouTube直播的混合体，生龙活虎的教练们朝着数百英里外在自家客厅里气喘吁吁的用户们高呼鼓劲。不喜欢骑自行车的人可以买一台4295美元的跑步机。

和很多新一代科技独角兽（估值在10亿美元或以上的私营企业）一样，Peloton不做任何不够时髦的事情，比如赚钱。为吸引新客户，它大把砸钱，以致在截至今年6月的12个月里亏损了1.96亿美元，而上年同期为4800万美元。不过它的努力似乎起效了：它的订户数已达51.1万，是去年的两倍多。收入也翻了一番，今年达到9.15亿美元（见图表）。它在潮流开创者中很受欢迎。前足球运动员贝克汉姆和前美国总统奥巴马都是它的粉丝。这种号召力光环让它的硬件的毛利率达到43%，甚至比苹果公司那些以高利润闻名的产品还要高。尽管很贵（或许正因如此），它的客户忠诚度仍高得令人艳羨。

运动单车制造商过去一直属于制造业。但Peloton约20%的收入来自订阅，而且这一比例还在上升。这部分业务的利润率很寻常，但随着内容生

产成本被分摊到更多用户身上，应该会进一步提升。这种转变体现了一个更广泛的趋势：由于互联网的发展，过去以产品为主的行业也越来越多地转向以服务为主。这可以让公司用稳定的订阅收入取代难以预测的销售收入——如果它们能完成这种转变的话。 ■



Europe's economy

A singular opportunity

Europe's best hope of economic revival lies in reanimating its single market

EVERY FIVE years the appointment of a new team at the European Commission is a chance to steer the European Union (EU) in a fresh direction. On September 10th Ursula von der Leyen, the incoming boss, set out her priorities: managing the transition from fossil fuels, extra dollops of American big-tech bashing and “upgrading our unique social market economy”.

The first two at least have the benefit of being clear. On the economy, however, Europe needs a lot more than blather. In the past decade the trend of economic integration that defined post-war Europe has gone backwards. The “single market”, once breathtaking in its ambition to eliminate all internal EU barriers for goods, services, capital and people, has failed to keep up with the economies it was trying to shape. If Europe wants to create prosperity and world-beating firms, it needs not just to reinvigorate the single market, but also to rediscover that original vision in neglected areas of trade such as services.

The single market still matters—look at the mess Britain finds itself in as it tries to extricate itself from the EU. But a policy originally devised to break down trade barriers in the era of coal and steel has not adapted fast enough to the era of bits and likes. In the past decade Europe’s banks have retrenched to their home markets and its firms have shifted their energies to expanding outside the EU. As a result, Europe still looks like a series of mid-sized economies patched together, not a single rival to China and America.

That is one reason why, even as central bankers administer a drip-feed of

monetary adrenalin, Europe's economy is losing ground to global rivals. It risks becoming a business backwater. A decade ago ten of the world's 40 largest listed firms by market value were based in the EU; now only two are—in 32nd and 36th place. Desperately few of the world's leading startups are European.

Policymakers who ache at the absence of a European tech success on the scale of Google or Amazon pay lip service to the importance of the single market. And yet France and Germany argue that the real answer is dirigiste industrial policy. They have called for mergers of European firms to create industrial “champions” shielded from antitrust rules and Chinese competition.

They should be aiming to complete the single market instead. A functional single market helps firms achieve economies of scale. It is cheaper to make a product that has to meet one set of EU regulations than to try to follow 28 different national rulebooks. Stiffer competition from firms across the continent means that shoppers get better and cheaper stuff. Imagine if the dozens of mobile operators in Europe were free to pitch their data plans to those beyond their national borders. Instead, consumers have to make do with higher-charging local oligopolies.

Innovation spreads faster in a unified market, pepping up productivity. A properly integrated energy grid would boost the most efficient (and greenest) power producers. Banks with loans out across the continent avoid trouble if their home market falls into recession. Capital markets on a continental scale can help them distribute risks beyond the banking sector. Safer banks and deeper markets mean cheaper capital and fewer bail-outs.

For all those reasons, reinvigorating the single market ought to be at the centre of the debate on how to boost Europe's economy. It is not. Since her appointment two months ago Mrs von der Leyen has mentioned the single

market only in passing. The commissioner in charge of the brief, Sylvie Goulard of France, is well regarded, but will have to split her time between internal-market duties, regulating artificial intelligence, and a new defence-industry and space brief.

That might be understandable if the single market were beyond saving. In fact it can be revitalised in three ways. The first is to ensure that its statutes are fully implemented. Too often, national governments flout the edicts of the single market so as to protect a politically connected industry. On average, each European country regulates the workings of nearly 200 professions, making it needlessly tricky for Europeans to move to where the jobs are. No wonder bits of the continent still have double-digit unemployment. The new Brussels team should step up enforcement against governments that fail to apply the rules.

The second way is to focus on the euro. The single currency is in some ways an extension of the single market, even if fewer countries belong to it. It would be more stable if a central fund insured bank deposits. A more substantial euro-zone budget, focused on unemployment insurance, say, could help integrate euro-zone economies. As an added benefit, this would also deepen cross-border links, notably by helping banks become truly European. Here, Mrs von der Leyen has a harder task. Her native Germany will seek to keep progress glacial.

Most ambitious would be a fresh push to remove what structural barriers remain to cross-border European trade. Collecting value-added tax in a neighbouring country would not be so daunting for small businesses if the levy was structured in the same way across Europe, for example. Banks would pitch their wares more broadly if bankruptcy laws were harmonised, and a proper capital-markets union created. Standard contracts for business services (on professional liability, say) would make it easier for German accountants to tout for business in Italy, or for Spanish architects to pitch

their offerings beyond the Pyrenees.

A grand bargain of policies serving up tax reform, services liberalisation and a more robust euro would run into plenty of national red lines. But each country would also have lots to gain. Europe needs to shield itself from the fallout a global trade war might bring. It needs a vision after the departure of Britain, the single market's most reliable champion in Brussels—but also, often, a brake on ambitious projects. Meanwhile, Britons tempted to say good riddance to the single market's frustrations should reflect on how much losing a seat at the table could cost them.

Jacques Delors, a former head of the European Commission who championed closer integration, rightly pointed out that “nobody can fall in love with the single market”. There is nothing flashy about reworking bankruptcy rules or tax regimes. But Europe’s greatest economic project is half-finished business, yielding just half the benefits it could. Europe has few such obvious levers to pull to boost its economy. Time to tug on this one. ■



欧洲经济

独一无二的机会

欧洲经济复苏的最大希望在于重振单一市场

欧盟委员会每五年一次的换届都是引导欧盟朝着新方向发展的机遇。9月10日，即将上任欧盟主席的乌尔苏拉·冯德莱恩（Ursula von der Leyen）提出了自己的工作重点：逐步淘汰化石燃料、多敲打美国的大科技企业，以及“升级我们独特的社会市场经济”。

前两个重点至少很明确。而在经济方面，连篇的套话对欧洲可远远不够。过去十年中，确立了战后欧洲格局的经济一体化趋势已经倒退。“单一市场”想要消除欧盟内部对商品、服务、资本和人员的所有壁垒，这样的抱负一度震撼人心。但一体化的进程未能跟上它试图塑造的那些经济体的步伐。如果欧洲想要创造繁荣和领先世界的企业，它需要的不仅是重振单一市场，还需要在服务等被忽视的贸易领域重新找回最初的愿景。

单一市场仍然很重要——看看英国在试图脱欧时陷入的困境就知道了。但是，原本用来在煤炭和钢铁的时代打破贸易壁垒的政策没能迅速适应数字和社交媒体的时代。过去十年中，欧洲的银行已经退回到本国市场，而欧洲企业则在着力拓展欧盟以外的市场。结果，欧洲看起来仍像是多个中型经济体拼凑在一起，而不是一个能与中国和美国竞争的单一经济体。

这在一定程度上解释了为何即便各家央行在逐步少量实施货币刺激措施，面对全球竞争对手时欧洲经济仍在节节败退。欧洲有可能成为一个商业上的落后地区。十年前，按市值计算，全球40家最大的上市公司中有10家总部位于欧盟，现在只有两家——分别位列第32和第36位。世界上领先的创业公司中来自欧洲的凤毛麟角。

一些政策制定者对欧洲缺乏谷歌或亚马逊那种规模的成功科技企业感到痛心疾首，但只在嘴上大谈单一市场的重要性。然而法国和德国认为，真正的解决之道是由政府直接控制工业政策。它们呼吁欧洲企业合并，以创建

不受反垄断法规限制并可以抵御中国竞争的工业“龙头”。

然而它们的目标应该是完善单一市场。一个正常运转的单一市场有助于企业实现规模经济。比起试图遵循28个国家的不同规定，按一套欧盟法规的要求来生产成本会更低。整个欧洲大陆的企业竞争越激烈，消费者就可以获得更好也更便宜的产品和服务。想象一下，如果欧洲的几十家移动运营商可以自由地跨国界推销流量套餐会怎样。而现实中，消费者只能忍受本地垄断寡头的高额收费。

创新在统一的市场中传播得更快，进而提高生产率。一个恰当整合的能源网将促进那些最高效（和最环保）的电力生产商的发展。在整个欧洲都开展了信贷业务的银行在本国市场衰退时可以避免陷入困境。整个欧洲层面的资本市场可以帮助它们将风险分散到银行业之外。银行更安全，市场更深入，资本也就更便宜，所需的纾困措施也就越少。

鉴于以上原因，在如何促进欧洲经济的辩论中，重振单一市场应该成为核心议题。但实际上并不是。自冯德莱恩两个月前当选以来，她只是顺便提到过单一市场。来自法国的欧盟委员西尔维·古拉德（Sylvie Goulard）负责单一市场政策，她本人备受尊重，但必须在内部市场职务、监管人工智能以及一个新的国防工业和太空政策职务之间分配精力。

如果单一市场已经无药可救，这可能还可以理解。但事实上，可以从三个方面让单一市场重新焕发活力。首先是确保其法令得到充分实施。各国政府常常无视单一市场的法令，以求保护有政治关联的行业。平均而言，每个欧洲国家都会对近200种职业的从业进行监管，欧洲人因工作需要而搬迁时就面临不必要的麻烦。难怪欧洲大陆部分地区仍有两位数的失业率。布鲁塞尔的新欧盟领导团队应加强对未遵守规则的政府的执法力度。

其次是聚焦欧元。单一货币在某种程度上是单一市场的延伸，即使欧元区国家要少于欧盟成员国的数量。如果有一个中央基金确保银行存款的安全，市场会更稳定。例如，以失业保险为重点的更充足的欧元区预算可能有助于整合欧元区经济体。这样还有一个额外的好处，就是加深跨境联

系，尤其是通过帮助银行成为真正的欧洲银行。在这方面冯德莱恩的任务更为艰巨。她的祖国德国将努力拖慢这一进程。

最艰巨的任务将是提供新的推动力，以消除仍存在于欧洲跨境贸易中的结构性障碍。例如，如果欧洲各国的增值税税率相同，那么在邻国收取增值税就不会让小企业那么畏惧了。如果破产法协调一致，并建立适当的资本市场联盟，那么银行将能更广泛地推销其产品。如果商业服务合同（比如职业责任险）是标准化的，德国的会计师要在意大利招徕生意就更容易了，西班牙的建筑师也能更轻松地在比利牛斯山脉的另一边推销自己的设计。

一场推动税收改革、服务自由化和更强劲欧元的政策大谈判会触及许多国家的红线，但各国也都会获益良多。欧洲需要保护自己免受全球贸易战可能带来的影响。在英国脱欧后（英国曾是欧盟单一市场最可靠的支持者），它需要愿景，同时也需要常常对一些雄心勃勃的项目踩下刹车。与此同时，为摆脱了单一市场的麻烦而高兴的英国人应该反思失去欧盟成员国资格会让他们付出多大的代价。

主张进一步一体化的欧盟委员会前主席雅克·德洛尔（Jacques Delors）说得对，“谁都没法爱上单一市场。”重新修订破产规则或税收制度没什么特别夺人眼球的地方。但欧洲最大的经济工程没有完成，仅产生了一半应有的效益。欧洲几乎再没其他显而易见的能拉动经济增长的杠杆了。是时候拉扯拉扯手头这个了。 ■



Corporate America

The descent of man

Ingenious and colourful, “Transaction Man” dodges some hard questions

IN THE 1970S a course on investing at Harvard Business School was nicknamed “Darkness at noon”, because it was held in a basement at lunchtime and badly attended. By the mid-1990s the classes on finance were jammed with wannabe masters of the universe. That telling contrast is among the many illuminating snapshots of the past in Nicholas Lemann’s ambitious new book on corporate America.

Even in the headquarters of capitalism, Mr Lemann reveals, attitudes to business have oscillated wildly, both in boardrooms and on Wall Street. His book is an unusual addition to a growing canon that seeks to explain why, for many ordinary people, the American Dream has come to seem out of reach. Rather than focusing on macroeconomic factors such as growth, productivity or unemployment, in “Transaction Man” Mr Lemann dwells on how companies are run. Its publication is timely, given the recent statement by the Business Roundtable, a group of bosses, that firms should be run for all stakeholders, not just shareholders. But for all its rich reporting and panache, it lacks rigour.

Mr Lemann splits modern American business history into three phases. In the largely benign age of Institution Man, roughly from the 1930s until the 1970s, large corporations dominate, under the control of technocrats who often adopt elements of a corporate welfare state—from job security to pensions and health care. From the 1970s onwards the malign era of Transaction Man begins, in which financial deregulation and more assertive owners see big firms broken up and managers take a more ruthless view of social obligations. In the 2000s the era of Network Man is inaugurated, led

by tech firms seeking to overthrow the old order with platforms that have millions of connected users. The jury is still out on whether this latest phase is an improvement, the book suggests.

Onto this simple structure, Mr Lemann builds many narratives about individuals and institutions. Three people loom large, each representing a distinct phase: Adolf Berle, a thinker born in 1895 who wanted to harness big business for social ends; Michael Jensen, an economist who preached a radical doctrine of shareholder value in the 1970s and 1980s; and Reid Hoffman, a co-founder of LinkedIn and a Silicon Valley guru. The book also tracks the evolution of two firms, General Motors (GM) and Morgan Stanley. As if that were not enough, it follows a working-class neighbourhood on the South Side of Chicago over the decades.

As an intricate feat of storytelling, the author (who writes for the *New Yorker*) just about carries it off. There are dazzling passages. In the prologue he skewers today's elite, whose typical member "is suspicious of politics and provincial concerns; his perspective is global and based on what he regards as universal principles." He lampoons the Clinton administration's chumminess with bankers. Gems are dug from the past. Alfred Sloan, autocratic boss of GM in the mid-20th century, had a private railway carriage, with an office and bedrooms, which he used to travel the country to visit car dealers. Mr Hoffman is depicted in a Californian sushi joint, swapping vacuities with a consultant from McKinsey who proclaims, "There's a non-zero chance that AI will be smarter than humans."

Yet for all the sparkle, the book suffers from two flaws. One is a smouldering identity crisis: it can't make up its mind whether it is a polemic about how America has gone to hell or a more standard history, anchored in empiricism. As a result, the reader often has the uneasy feeling of not being given the full picture. Globalisation is barely mentioned. Mr Lemann never establishes whether the majority of the workforce, or only a small elite

of workers—and their pampered, sometimes reprehensible overlords—benefited during the glory days of behemoths such as AT&T and IBM. Given his generally favourable depiction of such outfits, that is a huge omission. The description of the subprime crisis fails to tackle Fannie and Freddie, presumably because the mortgage giants were, inconveniently, government-sponsored. Mr Lemann is furious about the treatment of GM, which got a bail-out in 2009, but overlooks its inefficiency and bad management.

The second flaw is that “Transaction Man” does not furnish a considered framework for how the economy works and creates prosperity. Although it is never put this clearly, the book’s dominant mental model seems to be a producer-led one in which workers make things and the gains are split between labour and capital. Consumers are an afterthought. The role of creative destruction in raising long-term living standards, partly by shrinking obsolete industries and redeploying resources to new ones, is downplayed.

The result is that the hard questions are dodged. Should inefficient firms with bad products that disadvantage tens of millions of consumers be protected in order to save hundreds of thousands of jobs? Does globalisation mean that the government must bear the burden of social obligations, because if companies do they will find their costs are too high to be able to compete with foreign businesses? Why has economic performance been dismal in many European countries that stuck with corporatism? Read this book for the vivid panorama, not for the logic of its argument. ■



美国企业界 人的演进

《交易人》新颖又生动，但回避了一些难题【《交易人》书评】

上世纪70年代，哈佛商学院有一门投资学课程被戏称为“正午的黑暗”（Darkness at noon），因为它被安排在午餐时间，还是在地下室里讲授，听课的人寥寥无几。到了90年代中期，金融学的课堂上挤满了立志成为“宇宙之王”的学生。这是尼古拉斯·莱曼（Nicholas Lemann）在他讲述美国企业界的野心之作中刻画出的一幅生动的对比图。本书呈现了大量这样富揭示性的历史片段。

莱曼指出，即使在资本主义的大本营——无论是董事会还是华尔街——人们对企业的态度都经历了剧烈的摇摆。为什么对众多普通人来说，美国梦似乎变得遥不可及？在越来越多尝试回答这个问题的权威著作中，莱曼的书增添了非同寻常的一笔。《交易人》（Transaction Man）并不关注增长、生产率或失业等宏观经济因素，而是着眼于企业的运营。该书的问世很及时，因为就在不久前，由一批企业老板组成的商业圆桌会议（Business Roundtable）宣称，公司应该为所有利益相关者而经营，而不仅仅是为股东。但是，尽管本书内容丰富、文笔洒脱自信，却有失严谨。

莱曼将美国的现代商业史分为三个阶段。大约从20世纪30年代到70年代是“体制人”（Institution Man）这个大体上良性的时代。大企业占主导地位，控制这些企业的技术官僚大多采纳了“公司福利国家”的元素，提供工作保障、养老金和医疗等。从70年代往后开始了“交易人”（ Transaction Man）这个恶性时代。金融管制放松，企业所有者更加独断，大公司解体，主管们变得更漠视社会责任。21世纪的头十年开启了由科技公司领导的“网络人”（ Network Man）时代——科技公司试图通过拥有数百万联网用户的平台来推翻旧秩序。本书指出，第三个阶段是否较之前进步了，还不好说。

在这个简单的构架之上，莱曼构筑了大量有关个人和机构的叙事。有三个人绕不过去，分别代表了三个不同阶段：出生于1895年、希望利用大企业来实现社会目标的思想家阿道夫·伯利（Adolf Berle）；在上世纪七八十年代宣扬激进的股东价值学说的经济学家迈克尔·詹森（Michael Jensen）；以及领英的联合创始人、硅谷大佬雷德·霍夫曼（Reid Hoffman）。作者还追溯了通用汽车和摩根士丹利两家公司的发展历程。这似乎还不够，他又跟踪了芝加哥南区（South Side）一个工人阶层居住区数十年来的变迁。

作者（也是《纽约客》的撰稿人）游刃有余地运用了复杂的叙事技巧。书中不乏炫目的段落。在序言中，他尖锐地讽刺了当今的精英阶层，说他们中的典型人物“对政治和地方性事务心存怀疑；他的视角是全球性的，依据他所认为的普适原则”。他嘲讽克林顿政府与银行家打得火热。他从云烟往事中挖掘出珍宝。20世纪中期，通用汽车的老板、独断专行的阿尔弗雷德·斯隆（Alfred Sloan）拥有一列配备了办公室和若干卧室的单节火车，载着他到全国各地会见汽车经销商。霍夫曼出现在加州一家寿司店里，与麦肯锡的一位顾问来了一段言之无物的闲聊，后者宣称“人工智能有非零的几率比人类聪明”。

然而，尽管有这么多亮点，这本书存在两大缺陷。其一是隐隐显现的身份危机：拿不准自己究竟该是一篇关于美国如何走进地狱的辩文，还是一部立足于经验主义的更中规中矩的历史。结果，读者往往会有种没有看到全貌的不安。书中几乎没有提到全球化。莱曼从未做出判断：在AT&T和IBM等巨头的辉煌岁月里，受益的究竟是大多数员工，还是只有少数精英员工和他们被宠坏了的、有时不道德的主子们。鉴于他对这些大企业的整个群体做出了普遍正面的描写，这是一个严重的疏漏。他描写了次贷危机，却没能分析房利美和房地美的问题，想来是因为这两家抵押贷款巨头不巧都是由政府支持的。莱曼对通用汽车在2009年获得政府纾困感到愤怒，却未提及效率低下和管理不善。

第二个缺陷是，《交易人》没有为经济如何运行并创造繁荣提供一个经过深思熟虑的框架。尽管从没有明说，本书的主要思维模式似乎是以生产者

为主导，即工人制造产品，收益由劳资双方分享。消费者事后才被想起。创造性破坏一定程度上通过淘汰过时的产业、将资源重新配置到新产业来提高长期生活水平，它的这种角色被淡化了。

结果就是那些难以回答的问题被回避了。为了保全成千上万的工作岗位，应该保护那些置数千万消费者利益于不顾，生产劣质产品的效率低下的公司吗？全球化是否意味着必须由政府来承担社会责任？因为如果责任落在企业身上，它们会发现要付出的成本太高而无法与外国企业竞争。为什么许多坚持社团主义的欧洲国家经济表现如此惨淡？读这本书，看它那生动的全景就好了，不要在意它论证的逻辑。 ■



Ageing

Rejuvenation juice

Uncovering how the body ages is leading to drugs to reverse it

IN 2016 A startup in California called Ambrosia began offering its customers transfusions of blood from the young. At \$8,000 per litre, it was a service for the wealthy who believed that young blood could slow down or reverse the ageing process, thereby reducing their chances of developing cancers, Alzheimer's disease and heart disease.

Earlier this year America's Food and Drug Administration (FDA) cautioned potential customers that there was no proven scientific benefit to receiving such blood. In response, Ambrosia shut down its clinics. But ill-fated startups aside, there is a kernel of truth to the idea that young blood can be rejuvenating. Experiments in the early 2000s in which mice of different ages had been stitched together to share their circulatory systems, known as heterochronic parabiosis, had demonstrated dramatic improvements in the cognition, muscle repair and liver function of the elderly partners. The race this work sparked to translate the idea into something useful to humans, however, raises issues, not least in the squeamishness and hazards associated with sharing blood.

Perhaps no longer. One of the pioneers of parabiosis, Irina Conboy, a bioengineer at the University of California, Berkeley, has now developed a way to get some of the benefits of parabiosis without any of the gruesome methods. She and other scientists in the field had previously found that not only did old partners benefit from parabiosis, but young partners suffered: the old blood aged them prematurely. Some of the decline was caused by a protein called transforming growth factor beta (TGF-beta). This is normally responsible for regulating everything from cell proliferation to

differentiation and death. As people age, TGF-beta accretes in the blood and this leads to problems such as inflammation or fibrosis.

In a new study published in *Ageing*, Dr Conboy describes a way to slow down this damage. Her team gave ageing mice a cocktail of oxytocin, a hormone, and ALK5 inhibitor, an enzyme. Previous studies showed that these had positive effects on some of the symptoms of ageing. By suppressing the amount of TGF-beta in cells, the ALK5 inhibitor had been shown to stimulate the growth of new brain cells and improve muscle and tissue health. And oxytocin, which activates stem-cell formation in response to tissue damage or atrophy, declines naturally with age.

However, to have any effects, ALK5 inhibitor usually had to be given at very high doses. And when researchers tried to add extra oxytocin by itself, the hormone's benefits were overwhelmed by waste accreted in old blood. By putting them together, however, it was possible to reduce the dose of ALK5 inhibitor by a factor of ten and reap the benefits of the oxytocin.

After seven days on this cocktail, the mice had less inflammation in their brains, more neural stem cells in the brain area responsible for memory and learning, and better cognitive capacity. Their livers had less scarring and fat, and their muscles healed better and faster. In short, their bodies and brains looked a lot like the old mice after parabiosis—but without the drawbacks of a blood buddy.

Because both ingredients of this chemical cocktail are already approved by the FDA, Dr Conboy's team is now planning a clinical trial of 20 volunteers over 65, to see if the cocktail's rejuvenating powers will work in people.

The latest findings have been welcomed, albeit cautiously. Scientists at the American National Institute on Ageing say the latest work may show a way forward in a field that currently seems stuck. But they think it is too early to

advance the research into human trials. The concern is that the drugs being used have not previously been tested together in people. Dr Conboy points out, however, that prescribing approved drugs in multiple combinations is a standard procedure in medicine.

Entrepreneurs in Silicon Valley might have jumped the gun in selling the rejuvenating effects of parabiosis to their clients. Nevertheless, this vampire-like concept is not gone yet—and could still rise up from the dead someday soon. ■



衰老

回春琼浆

揭秘衰老过程带来返老还童药

二〇一六年，美国加州一家名为Ambrosia的创业公司开始为其客户提供输入年轻人的血液的服务。每升血收费8000美元，因此客户都是富人，他们相信年轻人的血液可以减缓或逆转衰老的过程，从而降低自己罹患癌症、阿尔茨海默病和心脏病的几率。

今年早些时候，美国食品和药物管理局（FDA）向潜在客户发出警告称，没有科学证据表明输入这种血液对人体有益。Ambrosia随即关闭了诊所。不过，撇开那些时运不济的创业公司不谈，“年轻人的血液可以让人重焕活力”的想法并非毫无依据。在本世纪初进行的一些实验中，不同年龄的老鼠被缝合在一起，共用血液循环系统，也就是所谓的异时联体共生。这些实验显示，其中年老的老鼠的认知、肌肉修复和肝脏功能都有大幅改善。这激发人们竞相尝试把这种创意用于造福人类，然而却引发了诸多问题，尤其是共用血液带来的不安和危害。

这也许将不复存在。联体共生的先驱之一、加州大学伯克利分校的生物工程师伊丽娜·康博伊（Irina Conboy）目前已经找到了一种方法，无需采取任何让人毛骨悚然的手段便能获得联体共生的一些好处。她和该领域的其他一些科学家过去发现，联体共生在让年老老鼠受益的同时，也让年轻老鼠受害——年老老鼠的血液会让它们提前衰老。衰老的部分诱因来自一种叫做转化生长因子 β （TGF- β ）的蛋白质。细胞从增殖、分化一直到凋亡的过程通常全由它调控。随着人的年龄增长，TGF- β 在血液中累积，导致炎症或纤维化等问题。

在发表于《衰老》（Ageing）杂志的一项新的研究中，康博伊阐述了一种减缓这种损伤的方法。她的研究团队给日渐衰老的老鼠注入催产素（一种激素）和ALK5抑制剂（一种酶）的混合物。以往的研究表明，这两种成

分对部分衰老症状都有减缓作用。ALK5抑制剂会抑制细胞内的TGF- β 数量，从而刺激新的脑细胞生长，增进肌肉和组织的健康。催产素在组织受损或萎缩的情况下会激活干细胞生成，它随年龄增长而自然减少。

不过，要想到明显效果，通常必须注入很大剂量的ALK5抑制剂。如果研究人员试图只加大催产素的剂量，年老老鼠血液中累积的废物会让这种激素不起作用。但如果将两者混合使用，就可能将ALK5抑制剂的剂量减少到十分之一，同时也让催产素起作用。

注入这种混合物七天后，老鼠大脑内的炎症减少，大脑中负责记忆和学习的区域的神经干细胞增多，认知能力提高了。它们肝脏上的瘢痕和脂肪减少了，肌肉愈合得更好更快。总之，它们的身体和大脑看起来很像联体共生之后的年老老鼠，但没有联体共生友伴身上的缺陷。

由于这种化学混合物的两种成分都已获得FDA的批准，康博伊的团队目前正计划对20名65岁以上志愿者开展临床试验，以弄清这种混合物的“逆生长”功效对人类是否有效。

这些最新的研究结果为人们喜闻乐见，尽管仍抱持谨慎的态度。美国国家老龄化研究所（American National Institute on Ageing）的科学家们表示，最新的成果可能让这一领域的研究柳暗花明。但他们认为将这项研究推进到人体试验还为时过早，因为涉及的两种药物此前不曾被同时用于人体。不过康博伊指出，对获批药物进行组合用药是医学上的标准程序。

硅谷的创业者向客户兜售联体共生的逆生长功效可能是操之过急了。不过，这种吸血鬼般的想法并未消亡，在不久的将来仍有可能起死回生。■



Connected computers

Chips with everything

How the world will change as computers spread into everyday objects

ON AUGUST 29TH, as Hurricane Dorian tracked towards America's east coast, Elon Musk, the boss of Tesla, an electric-car maker, announced that some of his customers in the storm's path would find that their cars had suddenly developed the ability to drive farther on a single battery charge. Like many modern vehicles, Mr Musk's products are best thought of as internet-connected computers on wheels. The cheaper models in Tesla's line-up have parts of their batteries disabled by the car's software in order to limit their range. At the tap of a keyboard in Palo Alto, the firm was able to remove those restrictions and give drivers temporary access to the full power of their batteries.

Mr Musk's computerised cars are just one example of a much broader trend. As computers and connectivity become cheaper, it makes sense to bake them into more and more things that are not, in themselves, computers—from nappies and coffee machines to cows and factory robots—creating an “internet of things”, or IoT. It is a slow revolution that has been gathering pace for years, as computers have found their way into cars, telephones and televisions. But the transformation is about to go into overdrive. One forecast is that by 2035 the world will have a trillion connected computers, built into everything from food packaging to bridges and clothes.

Such a world will bring many benefits. Consumers will get convenience, and products that can do things non-computerised versions cannot. Amazon's Ring smart doorbells, for instance, come equipped with motion sensors and video cameras. Working together, they can also form what is, in effect, a

private CCTV network, allowing the firm to offer its customers a “digital neighbourhood-watch” scheme and pass any interesting video along to the police.

Businesses will get efficiency, as information about the physical world that used to be ephemeral and uncertain becomes concrete and analysable. Smart lighting in buildings saves energy. Computerised machinery can predict its own breakdowns and schedule preventive maintenance. Connected cows can have their eating habits and vital signs tracked in real time, which means they produce more milk and require less medicine when they fall ill. Such gains are individually small but, compounded again and again across an economy, they are the raw material of growth—potentially a great deal of it.

In the long term, though, the most conspicuous effects of the IoT will be in how the world works. One way to think of it is as the second phase of the internet. This will carry with it the business models that have come to dominate the first phase—all-conquering “platform” monopolies, for instance, or the data-driven approach that critics call “surveillance capitalism”. Ever more companies will become tech companies; the internet will become all-pervasive. As a result, a series of unresolved arguments about ownership, data, surveillance, competition and security will spill over from the virtual world into the real one.

Start with ownership. As Mr Musk showed, the internet gives firms the ability to stay connected to their products even after they have been sold, transforming them into something closer to services than goods. That has already blurred traditional ideas of ownership. When Microsoft closed its ebook store in July, for instance, its customers lost the ability to read titles they had bought (the firm offered refunds). Some early adopters of “smart home” gadgets have found that they ceased to work after the firms that made them lost interest.

That tilts the balance of power from the customer to the seller. John Deere, an American maker of high-tech tractors, has been embroiled in a row over software restrictions that prevent its customers from repairing their tractors themselves. And since software is not sold but licensed, the firm has even argued that, in some circumstances, a tractor-buyer may not be buying a product at all, instead receiving only a licence to operate it.

Virtual business models will jar in the physical world. Tech firms are generally happy to move fast and break things. But you cannot release the beta version of a fridge. Apple, a smartphone-maker, provides updates for its phones for only five years or so after their release; users of Android smartphones are lucky to get two. But goods such as washing machines or industrial machinery can have lifespans of a decade or more. Firms will need to work out how to support complicated computerised devices long after their original programmers have moved on.

Data will be another flashpoint. For much of the internet the business model is to offer “free” services that are paid for with valuable and intimate user data, collected with consent that is half-informed at best. That is true of the IoT as well. Smart mattresses track sleep. Medical implants observe and modify heartbeats and insulin levels, with varying degrees of transparency. The insurance industry is experimenting with using data from cars or fitness trackers to adjust customers’ premiums. In the virtual world, arguments about what should be tracked, and who owns the resulting data, can seem airy and theoretical. In the real one, they will feel more urgent.

Then there is competition. Flows of data from IoT gadgets are just as valuable as those gleaned from Facebook posts or a Google search history. The logic of data-driven businesses, which do ever better as they collect and process more information, will replicate the market dynamics that have seen the rise of giant platform companies on the internet. The need for standards, and for IoT devices to talk to each other, will add to the leaders’

advantages—as will consumer fears, some of them justified, over the vulnerability of internet-connected cars, medical implants and other devices to hacking.

Predicting the consequences of any technology is hard—especially one as universal as computing. The advent of the consumer internet, 25 years ago, was met with starry-eyed optimism. These days it is the internet's defects, from monopoly power to corporate snooping and online radicalisation, that dominate the headlines. The trick with the IoT, as with anything, will be to maximise the benefits while minimising the harms. That will not be easy. But the people thinking about how to do it have the advantage of having lived through the first internet revolution—which should give them some idea of what to expect. ■



互联计算机

万物皆有芯

计算机向日常物品渗透后，世界将如何变化

八月二十九日，当飓风多利安向美国东海岸移动时，电动汽车制造商特斯拉的老板伊隆·马斯克宣布，行驶在飓风路径上的一些客户会发现他们的汽车在单次充电后续航里程突然增加。和许多现代汽车一样，对马斯克的产品最好的比喻是带车轮的联网计算机。特斯拉产品线中较低价车型的软件禁用了部分电池，以限制其续航能力。在位于帕洛阿尔托（Palo Alto）的总部的电脑键盘上敲几下，特斯拉就能够取消这些限制，让司机能临时使用电池的全部功率。

马斯克这些计算机化的汽车只是一个非常广泛的趋势中的一例。随着计算机以及联网的成本越来越低，把它们置入越来越多本身并非计算机的物品——从尿布、咖啡机，到奶牛和工厂机器人——就变得顺理成章了。“物联网”（IoT）由此诞生。随着计算机逐步进入汽车、电话和电视，这一慢速革命多年来一直在加快步伐。但这一变革即将进入超速发展阶段。一项预测认为，到2035年，全世界将有一万亿台互联计算机，它们被置入食品包装、桥梁和衣服等各种各样的事物中。

这样的世界将带来许多好处。消费者将获得便利，他们使用的产品具有非计算机化的版本不具备的功能。例如，亚马逊的智能门铃Ring配备了动作传感器和摄像头。这种门铃组合起来还可以充当私人闭路监控网，让亚马逊可以为客户提供“数字邻里守望”方案，并将任何有价值的视频传给警方。

随着实体世界中原本瞬息即逝、难以把握的信息变得具体和可分析，企业将得以提升效率。建筑物中的智能照明节省了能耗。计算机化的机械装置可以预测自身故障并安排预防性维护。把奶牛联网后，可以实时跟踪它们的饮食习惯和生命体征，从而提高产奶量并减少生病时的用药。单独来

看，这样的收益很小，但在经济体中一次次累积叠加，它们就是增长的原动力——而且可能推动巨大的增长。

但从长远来看，物联网最显著的影响将体现在世界的运作方式上。可以把物联网视为互联网发展的第二阶段。逐渐主导了第一阶段发展的那些商业模式到了这个阶段仍在延续，比如所向披靡的“平台”垄断，或被批评者称为“监控资本主义”的数据驱动模式。越来越多的公司将成为科技公司，互联网将变得无处不在。结果，有关所有权、数据、监控、竞争和安全的一系列未解决的争议将从虚拟世界蔓延到实体世界。

先说说所有权。正如马斯克所展示的那样，互联网使得公司即使是在卖出产品之后仍能与产品互联，这就让产品变得更像服务而不仅仅是商品。这就模糊了传统的所有权概念。例如，微软在7月关闭其电子书商店后，其客户就无法再阅读已购图书了（微软提供了退款）。一些早早尝鲜“智能”小家电的人发现，生产这些产品的公司退出这些业务之后，它们就无法使用了。

这使得顾客和卖方之间的权力天平向后者倾斜。美国高科技拖拉机制造商约翰迪尔（John Deere）因其软件限制客户自行修理拖拉机而卷入纠纷。由于软件不是出售而是许可使用，该公司甚至认为，在某些情况下，拖拉机买主买的可能根本就不是产品，而只是使用产品的许可。

虚拟商业模式到了实体世界中将会格格不入。科技公司通常都喜欢快速行动，打破常规。但是你不能对冰箱这样的产品发布测试版。智能手机制造商苹果仅在新手机发布后五年左右的时间里为手机提供系统更新服务，安卓智能手机的用户能享受两年的更新就不错了。但洗衣机或工业机械等产品的寿命可达十年或更长。企业将需要研究如何在最初的程序员离开多年后继续支持复杂的计算机化设备。

数据将是另一个纷争触发点。互联网上的商业模式大多是提供“免费”服务，以有价值的私密用户数据来偿付，而在收集这些数据时用户顶多也只是在一知半解地情况下做出知情同意的动作。在物联网中也是如此。智能

床垫能监测睡眠。医疗植入设备观测和调整心跳及胰岛素水平，透明度参差不齐。保险业正尝试用汽车或健身追踪器的数据来调整客户保费。在虚拟世界中，对该跟踪什么数据以及谁拥有生成的数据的争论似乎也漫不经心，不切实际。而在实体世界里，这些问题会带有更多紧迫感。

再来看竞争。来自物联网设备的数据与从Facebook的帖子或谷歌的搜索历史中收集到的数据一样有价值。数据驱动型企业的运作逻辑是收集和处理的信息越多就越有成效，这将复制互联网上巨型平台公司崛起所依赖的市场动力。对统一标准以及物联网设备之间相互通讯的需求将增加领先企业的优势。消费者对联网汽车和医疗植入物等设备易受黑客攻击的担忧（其中一些很合理）也会加强这种优势。

预测任何技术的后果都很难，特别是像计算这样普遍使用的技术。25年前，人们对消费者互联网的到来过于乐观。如今，充斥新闻头条的是从垄断力量到企业窥探和网络激进主义等互联网的缺陷。与对待任何事物一样，应对物联网的诀窍是将其益处最大化，危害最小化。这并非易事。但是，正在思考如何做到这一点的人们有一个优势：他们已经经历了第一次互联网革命，这应该让他们多少能够预见一些未来。■



From the home to the office

Tracking productivity

Companies are taking advantage of their new ability to snoop on their workers—and their customers

WHEN SIEMENS, a big German industrial conglomerate, rebuilt its offices in the Swiss town of Zug, it did not skimp on the project's green credentials. Water from nearby Lake Zug is piped in and fed through pumps to heat or cool the offices. None of the materials used in the building came from more than 800km away. Rain that falls on its grass-covered roof is used to flush the toilets.

It did not skimp on technology, either, for the buildings were designed partly as a showcase for the firm's new "Smart Infrastructure" division. High-tech buildings are one of the most common uses of the sensors and distributed computing that make up the IoT. GSMA Intelligence, a research firm, forecasts that industrial uses of the IoT will overtake consumer ones by 2023, with smart corporate buildings leading the way.

Some of the smarts in the Siemens building are there for the workers. An app called Comfy, made by an American firm called Building Robotics that Siemens bought for an undisclosed sum last year, allows workers to adjust temperature and light levels in their offices with their phones. Over time, the system will learn the preferences of individual workers, and automatically warm or cool their offices. The app can also be used to find unoccupied desks, browse the cafeteria's lunch menu, book meeting rooms and flag up any maintenance that might need doing, such as replacing a broken monitor.

Other features are designed for managers. The building is studded with hundreds of sensors made by another American company, called Enlighted,

which Siemens also bought in 2018. The sensors are integrated with the building's light fixtures, which supply power, and come with a low-resolution infrared camera, a Bluetooth networking beacon and sensors to measure energy consumption, air temperature and light levels. Individual sensors can collaborate with their fellows to establish a wireless network.

Such sensors have all sorts of uses, enthuses Christoph Leitgeb, the building's designer. They can keep track of daylight levels, ramping up the artificial lights on gloomy days and cutting back on sunny ones. The result, reckons Enlighted, can be a 38% saving in energy consumption. Building Robotics claims that better lighting can boost employees' productivity by 23%. The infrared cameras can be used to track employees—or at least, the heat given off from their bodies.

That information can be converted into a heat map of the building, showing popular areas and less-travelled ones, helping managers make the best use of space. Occupancy data can be fed to the heating systems, allowing energy savings when the building is sparsely populated. "It allows us to quantify things that used to be intangible," says Mr Leitgeb.

For now, data gathered by sensors in the Siemens building are anonymous. The cameras see heat blooms, meaning they can record only numbers and general circulation within a building. But more personal tracking is possible, says Mr Leitgeb, via the sensors' Bluetooth beacons, which could track smartphones or building passes. So far Siemens is not making use of that capability—although discussions with its workers "are ongoing".

The firm has big ambitions. "Our goal is to have thousands of buildings like this," says Peter Löffler, head of innovation at Siemens Smart Infrastructure. There are possibilities beyond simple passive tracking, he says. When people are tracked and inventory is kept up to date by beacons on all of a building's equipment, a "digital twin" of the building—essentially a high-

fidelity computer model—can tell occupants where to find anything they need. For a busy hospital that could be a godsend.

Another option is to track customers rather than workers. Xovis, a Swiss firm, offers a tracking technology based on computer vision that can tell the difference between men and women; this information can be used to see how they move around a shop differently. It can also be used to measure waiting times at airports. One Florida mega-church uses the system to monitor attendance. BLIP Systems, a Danish firm, offers a similar service using data gleaned from shoppers' smartphones. Markets and Markets, a research firm, reckons the global demand for such “in-store analytics” is growing by 23% a year and will be worth \$3.2bn by 2023.

Tracking need not be confined to buildings. Insurance firms have been enthusiastic adopters of the surveillance capabilities offered by connected gadgets. Many insurers have offered discounts to drivers willing to install a black box that collects data from their car on acceleration, cornering, braking and the like, and relays it back for analysis. These days, such additional hardware is increasingly unnecessary. Modern cars are stuffed with sensors capable of measuring everything from engine revs to cornering speeds. Ovum, a consultancy, reckons that 80-90% of new cars sold in the rich world now come with SIM cards fitted as standard, allowing them to stream those data across the mobile-phone network.

The next step beyond monitoring drivers is trying to change their behaviour. Aviva, a big British insurer, offers a smartphone app called Aviva Drive that uses GPS to track customers in their cars. Besides offering lower premiums to careful drivers, the app rewards them with cutesy badges (“Fuel Friendly”, perhaps, or “Corner Master”) modelled on the “achievements” common in video games, before rating their driving out of ten. Another possibility, says Jon Hocking, who covers insurance for Morgan Stanley, a bank, might be real-time price adjustment. “It’s fair enough to pay for collision insurance

while you're driving," he says. "But maybe your premium should be lower when you're parked up on your drive at home."

It is not just car insurance. Customers of Ping An, a Chinese insurer that is the world's biggest, can use the firm's facial-recognition software when registering accounts. One of the data-points extracted from a face is a person's body-fat percentage, which is fed into the algorithm that calculates their life-insurance premiums. In 2018 John Hancock Financial, an American firm, said in future it would sell only health-insurance policies that can make use of data gathered from smartphones or wearable devices such as Fitbits, which track how much exercise policyholders are taking. Beam, an American dental-insurance firm, supplies policy-holders with internet-connected smart toothbrushes. Diligent brushers can save 15% on the cost of their premiums.

The limits of public tolerance for such nudging and nannying are not yet clear. "There's definitely a crossover point where this goes from helpful to creepy," says Mr Hocking. Morgan Stanley has done surveys asking people what level of price reduction they would require to share their data. He says respondents in Asia were most willing to trade data for a price cut. Westerners were less keen, and Germans the most wary of all.

But grumpy customers will have to contend with the structural imperatives of the insurance business. Companies that collect more data will be better able to categorise customers as low- or high-risk, says Mr Hocking. In the absence of regulators to stop them, firms employing the latest technology will be able to cream off the lowest-risk business for themselves, leaving their slower rivals to compete for the less profitable clients who remain. That offers a powerful incentive for snooping, no matter how intrusive customers may find it. ■



从家到办公室

追踪生产率

企业正在利用它们窥探员工（还有客户）的新能力

德国大型工业集团西门子在瑞士楚格市改造办公楼时，为追求环保大举砸钱。它用管道引来附近楚格湖的湖水，接入水泵来为办公室供暖或制冷。大楼所用的材料全部来自800公里以内的地区。落在青草覆盖的屋顶上的雨水被收集起来冲马桶。

它在技术上同样没少花钱，因为设计这些大楼的部分用意是给公司新创立的“智能基础设施”部门做展示样板。高科技大楼是构成物联网的传感器和分布式计算技术的最常见用途之一。研究公司GSMA Intelligence预测，到2023年，物联网的工业应用将超过消费端，而智能办公楼将引领这一发展。

西门子大楼里的智能设计有一部分为员工服务。西门子去年以未披露的价格收购了美国公司“建筑机器人”（Building Robotics），后者制作的名为Comfy的应用让员工可以用自己的手机调节办公室里的温度和照明。随着时间推移，这个系统会懂得每个员工的喜好，自动把他们的办公室变得更温暖或更凉快。在Comfy上还可以查找空置的办公桌、浏览餐厅的午餐菜单、预订会议室，以及标记出任何需要的维护，比如更换坏掉的显示器。

其他功能是为主管们设计的。大楼里布满了西门子在2018年买下的另一家美国公司Enlighted制造的数百个传感器。这些传感器装在楼内的灯具座里并由之供电，配有低分辨率红外摄像头、蓝牙网络信标和传感器，用于测量能耗、温度和亮度。每个传感器都可与其他传感器协作建立无线网络。

这样的传感器有各种用途，大楼的设计师克里斯托夫·莱特格布（Christoph Leitgeb）兴奋地介绍。它们可以追踪自然光量，阴天增加人工照明，晴天减少。Enlighted认为这将节省多达38%的能耗。“建筑机器

人”公司声称，更好的照明可将员工的生产效率提高23%。红外摄像头可用于追踪员工——至少可以追踪他们的身体散发的热量。

根据这种热量信息可以生成一张大楼的“热地图”，显示哪些区域人多哪些人少，帮助主管们充分利用空间。空间使用数据可以被提供给供暖系统，在楼内人员稀少时节省能耗。“这让我们可以量化那些过去无法捕捉的东西。”莱特格布说。

目前，西门子大楼里的传感器收集的数据是匿名的。摄像头看到的是“热点”，也就是说，它们只能记录数字和楼内大体的人员流动。但是，莱特格布说，更个体化的追踪是可以做到的。用传感器的蓝牙信标跟踪智能手机或门卡就可以实现。到目前为止，西门子还没有使用这种能力，但称与员工“正在进行”这方面的讨论。

这家公司雄心勃勃。“我们的目标是打造成千上万这样的大楼。”西门子智能基础设施部门的创新主管彼得•洛夫勒（Peter Löffler）表示。他说，除了简单的被动追踪外，还有其他的可能性。当一栋大楼里所有设备上的信标跟踪人员并实时更新库存信息时，大楼就有了一个“数字孪生体”——本质上是一个高保真计算机模型。它会告诉楼内人员去哪里找他们需要的任何东西。这对于繁忙的医院来说可能是一大福音。

另一种选择是追踪顾客而非员工。瑞士的Xovis公司推出了一种基于计算机视觉的追踪技术，可以分辨男女差异，用以分析男女顾客在商店内走动的特点有何不同。它还可以测量机场内的等待时间。佛罗里达的一座大教堂用这个系统监测教堂的访客数量。丹麦的BLIP Systems公司用从购物者的智能手机上收集的数据提供类似的服务。研究公司Markets and Markets估计，全球对这类“店内分析”的需求正以每年23%的速度增长，到2023年将价值32亿美元。

追踪也不必局限于建筑物。保险公司一直在积极地采用互联设备提供的监控功能。许多保险公司都为司机提供这样一个选择：如果他们愿意在自己车上装一个黑匣子，收集加速、转弯、制动等数据，并将其传回以供分

析，就可以获得保费折扣。现在这种额外装载的硬件已经越来越不必要了。新车型里装满了传感器，能测量从引擎转速到转弯速度的所有一切数据。咨询公司Ovum估计，富裕国家目前销售的新车有八九成都把SIM卡作为一项标配，让它们能通过手机网络传输这些数据。

监测司机后的下一步是尝试改变他们的行为。英国大型保险公司Aviva提供的智能手机应用Aviva Drive用GPS追踪客户开车。除为小心驾驶的司机提供较低的保费外，该应用会仿效电子游戏中常见的“战果”，授予他们各种卖萌的徽章（比如“汽油之友”或“拐弯大师”），然后给他们的驾驶行为从零到十打分。该公司负责为摩根士丹利服务的乔恩·霍金（Jon Hocking）说，未来另一种可能性是实时调价。“你在开车时支付碰撞险很公平，”他说，“但当你把车停在自家车道上时，你的保费可能应该降下来。”

还不仅仅是车险。全球最大的保险公司中国平安的客户在注册账户时可以使用该公司的面部识别软件。而从面部提取的数据点之一是客户的体脂率，它被输入计算寿险保费的算法中。2018年，美国的约翰汉考克保险公司（John Hancock Financial）表示，未来它只会销售能利用从智能手机或Fitbit等可穿戴设备上收集的数据的医疗保险，这些数据会追踪投保人的运动量。美国牙科保险公司Beam为投保人提供联网的智能牙刷。努力刷牙的人可以享受保费八五折。

对这种助推改变和过度看护，公众的容忍度有多大还很难说。“一定会有一个临界点，人们从感觉到有帮助到变得毛骨悚然。”霍金说。摩根士丹利曾做过调查，询问人们要拿到多大折扣才愿意分享自己的数据。他说，亚洲受访者最愿意用数据换折扣，相比之下西方民众兴致不高，而德国人则最为警惕。

但那些不满的顾客将不得不与保险业的结构化需求作斗争。霍金表示，收集到更多数据的公司将能更好地把客户分类为低风险或高风险。如果没有监管机构阻拦，采用最新技术的公司能挑走风险最低的业务，留下动作不够快的竞争对手去争夺剩余的利润较低的客户。这为窥探提供了强大的动

力，无论顾客觉得自己受到了多大的侵犯。 ■



Throwaway technology

Cheap as chips

How to build a disposable microchip

EVERY RESEARCH project needs a striking name, and it is hard to think of a better one than “Plastic Armpit”. The idea is to design and build a chip with an electronic nose, which can sample the odours and chemicals in its environment. Such a chip, says James Myers, a senior engineer at Arm, a British-based chip designer, could be usefully attached to all sorts of consumer goods. Its name came from the idea of weaving such a chip into items of clothing, where it could let oblivious wearers know when the need for a shower was becoming urgent.

Despite the jocularity, the project—a collaborative venture between Arm, the University of Manchester, Pragmatic, a firm which makes flexible electronics, and Unilever, a British-Dutch consumer giant—is a serious one. Gartner, a research firm, reckons that 259m PCs were sold last year. Pew, a pollster, puts the number of smartphones in the world at more than 2.5 billion. Arm, whose designs dominate the market for the sorts of low-power microprocessors that go into everything from smartphones to televisions, organises its business around the assumption that there will be a trillion computers in the world by 2035.

Plastic Armpit is an attempt to design the sort of chip that might meet that demand. The goal is to produce a robust, bendable, mass-producible computer, complete with sensors and the ability to communicate with the outside world, for less than \$0.01 apiece. A prototype version, shown off at Arm’s headquarters in Cambridge, looks like a stiffer-than-usual piece of tape festooned with circuit traces.

Mr Myers is keen to talk about applications beyond personal hygiene. He points out that such a sensor could be built into food packaging, where it could replace printed use-by dates with an accurate assessment of when the contents of a package had gone off. That, in turn, could help supermarkets and shoppers reduce waste.

The chip in the Plastic Armpit is cheap and simple. Its logic gates, the basic components of information processing, are crude things as big as those that were standard in the 1970s, and it has only 1,000 of them. The sensors, each tuned to a different class of odiferous chemical, are simple too, generating imprecise, rough and ready signals. Most computer scientists would look to the modern cleverness of machine learning to make up for the sensors' deficiencies. But how to do so on such a simple chip?

Cramming a machine-learning algorithm into such a limited machine required cutting everything to the bone. The chip uses a simple form of machine learning called a naive Bayesian classifier. Flexibility of use was sacrificed, too: to keep things as cheap and simple as possible the algorithm is etched directly into the plastic, meaning the chips are not reprogrammable. A chip designed to monitor the chemicals given off by strawberries would be useless for chicken. "If you want it to do something new, you'll need to design and print a new circuit," says Mr Myers.

Since chip design is expensive, and chip designers scarce, he and his team have been working on software tools to simplify that task. The idea is to describe a new algorithm in Python, a widely used programming language, and then have software turn it into a circuit diagram that can be fed into Pragmatic's chipmaking machines. That approach has attracted interest from DARPA, the Pentagon's most ambitious research outfit, which is looking into ways to do simple, quick chip design as part of its \$1.5bn Electronics Resurgence Initiative.

The Plastic Armpit demonstration model is, for now, powered by a battery. A reliable source of power means the chip can keep a constant eye on the things it is looking after. In future, says Mr Myers, and for applications where only intermittent monitoring is necessary, it should be possible to do without. The chip has an antenna etched onto its plastic substrate to allow it to communicate with the outside world. The idea is that a smartphone, or a specialised wireless reader device, can be held near the chip. The reader emits radio waves that are used to transfer data, but which also induce enough of a current in the chip to jolt it into life (contactless credit cards work in a similar way).

Some chips are already capable of harvesting more common sorts of ambient energy, capturing everything from sunlight to heat to vibration. Matt Johnson, the boss of Silicon Labs, an IoT-focused American chipmaker, says that, for now, such harvesting is mostly used to supplement a battery rather than to replace it. The chief constraint is wireless data transmission, which uses much more energy than data processing. “But things are improving with every generation,” he says. Soon there will be an “alignment” between what sort of consumption is required and what harvesting can provide. A report in 2018 from Semico Engineering, a market-research firm, reckoned that the market for energy-harvesting devices might be worth \$3.4bn by 2022.

Self-powering chips would be especially useful, says Mr Johnson, for situations where battery replacement is a chore—monitoring devices in structures such as bridges or tunnels. It may prove necessary for other reasons, too. Arm estimates that powering each of the trillion chips it forecasts by 2035 with a single button cell, the sort used in watches, would require three times as much lithium (vital to high-performance batteries) as the world produces in a year. After all, says Arm’s Paul Williamson, a trillion is “quite a big number, when you think about it”. ■



一次性技术

廉价如芯

如何制造出一次性微芯片【技术季刊《物联网》系列之四】

每个研究项目都需要一个醒目的名字——很难想出比“塑料腋窝”更好的了。其创意是设计和制造出带有电子鼻子的芯片，可以对环境中的气味和化学物质采样。英国芯片设计公司安谋的高级工程师詹姆斯·迈尔斯（James Myers）说，这种芯片可以贴到各种消费品上派用场。它的名字源于将这种芯片编织到衣物中的想法，可以让健忘的穿着者知道自己真的该冲个澡了。

尽管名字戏谑，但这个项目很较真。它由安谋、曼彻斯特大学、生产柔性电子产品的公司Pragmatic，以及英荷消费品巨头联合利华合作开展。据研究公司高德纳估计，去年全球售出了2.59亿台个人电脑。皮尤民调估计，全球智能手机的数量已超过25亿。安谋的设计主宰了各种低功耗微处理器市场，用于从智能手机到电视的各种物品。该公司对自身业务的规划围绕这样的假设展开：到2035年全球将有上万亿台计算机。

“塑料腋窝”就是在尝试设计出可能满足这种需求的芯片。它的目标是生产一款坚固、可弯曲、可大量生产的计算机，配备可与外界通信的传感器，每台的价格低于0.01美元。在位于剑桥的安谋总部展示的原型版本看起来像一块比平常稍硬的胶带，上面布满了电路走线。

迈尔斯很愿意谈论个人卫生以外的应用。他指出，这种传感器可以安装在食品包装中，代替印刷的有效期来准确评估包装中的内容物何时变质。这继而可以帮助超市和购物者减少浪费。

“塑料腋窝”中的芯片既便宜又简单。它的“逻辑门”（信息处理的基本元件）粗大得和1970年代使用的标准件一样，而且只有1000个。每个传感器也都很简单，用于不同类别的有气味的化学物质，会产生不精确、粗糙而便于使用的信号。大多数计算机科学家都希望借助机器学习的现代智慧来

弥补传感器的不足。但是，在这么简单的芯片上怎么做到呢？

要将机器学习算法塞入如此受限的机器，就需要把所有东西都简化到极致。这款芯片使用一种简单形式的机器学习，称为朴素贝叶斯分类器。使用上的灵活性也被牺牲掉了：为让产品尽可能便宜和简单，算法被直接蚀刻到塑料中，意味着芯片不可重新编程。如果芯片被设计用于监控草莓释放的化学物质，那它对鸡肉就毫无用处。迈尔斯说：“如果您希望它做新的事情，就需要设计和印刷新的电路。”

由于芯片设计昂贵且设计师稀缺，迈尔斯和他的团队一直在研究软件工具以简化该任务。其想法是用广泛使用的编程语言Python来描述一种新算法，然后用软件将其转换成能够被输入Pragmatic公司的芯片制造机的电路图。这种方法引起了五角大楼最雄心勃勃的研究机构DARPA的关注。作为其投资15亿美元的“电子复兴计划”的一部分，它正在研究简单快速的芯片设计方法。

目前，“塑料腋窝”的演示模型由电池供电。可靠的电源意味着该芯片可以始终监控它关注的东西。迈尔斯说，将来，对于只需要间歇监视的应用，电源应该是可以省掉的。芯片的塑料基板上刻有一个天线，可与外界通信。其思路是可以将智能手机或专用的无线读取器设备放在芯片附近。读取器发出用于传输数据的无线电波，但也会在芯片中感应出足够大的电流让其工作（非接触式信用卡的工作原理与此类似）。

一些芯片已经能够采集更常见的环境能量，捕获从阳光到热到振动的一切。专注于物联网业务的美国芯片制造商芯科科技（Silicon Labs）的老板马特·约翰逊（Matt Johnson）说，目前这种采集主要作为电池的补充而不是替代。主要的限制因素是无线数据传输，它消耗的电量比数据处理要多得多。“但是每一代产品都在改进。”他说。在不久的未来，耗电的需求和采集的供应之间会达到“契合点”。市场研究公司Semico Engineering在2018年出具的一份报告估计，到2022年，能量采集设备的市场规模或可达到34亿美元。

约翰逊说，在更换电池很麻烦时——比如桥梁或隧道等结构中的监视设备——自供电芯片特别有用。这种芯片还可能因为别的原因而变得必要。安谋估计，到2035年，如果要为它预测中的万亿个芯片供电，哪怕每个芯片只需要一粒手表用的纽扣电池，对锂（它对高性能电池至关重要）的需求将是全世界目前每年锂产量的三倍。毕竟，安谋的保罗·威廉姆森（Paul Williamson）说，一万亿是“一个挺大的数字，如果你想一想的话”。 ■



Free exchange

Common sense

There are more ways to look after public resources than nationalisation and privatisation

IT SOUNDS VAGUELY elvish, like something from the pages of Tolkien. In fact, the Charter of the Forest is one of Britain's founding political documents, dating from the same period as Magna Carta, the "Great Charter", as the Charter of Liberties was known to distinguish it from its sylvan partner. Whereas Magna Carta concerned the interests of a few privileged barons, the Charter of the Forest was intended to safeguard those of commoners—in particular, their time-honoured right to make a living from the bounty of the great wild commons. As an economic institution, the commons now seems as old-fashioned as constitutional documents sealed by noblemen in meadows. To many economists, the spread of private property rights was essential to the creation of the modern world. But the shortcomings of commons can be overstated. They could usefully be granted a place in public policy today.

An ecologist, Garrett Hardin, coined the phrase "the tragedy of the commons" in a (shockingly eugenicist) essay in *Science* in 1968. But the free-rider problem that afflicts public goods has been well-known to economists for a century. Consider a pasture on which every herdsman may graze his cattle. Each has an incentive to use it as intensively as possible: since it is open to all, restraint exercised by one herdsman simply frees up grass to be chomped by another's animals, leaving those who hold back worse off, not just relatively, but in absolute terms. The common pasture will inevitably end up overgrazed to the point of ruin. Many valuable public resources are similarly prone to overconsumption. Roadways become congested, waterways overfished and slices of electromagnetic spectrum

crowded into uselessness, to the detriment of total social welfare.

Two possible remedies are typically proposed. Governments may regulate access to the commons, as is usually the case with airspace, for instance. Or control over it may be sold, establishing a property right where none existed before. Economists tend to prefer the latter. Private owners have an incentive to use a resource sustainably, in order to maintain its long-term value. Privatisation should boost investment and innovation, too, since the profits flow to the owner.

Many economists see the spread of property rights as essential to kindling modern economic growth. Between the 16th century and the 19th most common land in England and Wales was enclosed and deeded to private owners. Economic historians long reckoned that enclosure, though unjust and brutal, spurred progress and laid the groundwork for industrialisation. Large tracts could be farmed more productively, freeing labourers to work in urban factories while also providing food to support them. "The break-up of the peasantry was the price England paid...to feed her growing population," wrote Peter Mathias, an economic historian, in 1983. The Industrial Revolution seemed to bury the concept of the commons for good.

But such orthodoxies are being revisited. Privatising shared resources, it turns out, does not always lead to a productivity boom. More recent research suggests that enclosure may not have been such a boon for British agriculture or industry. Research by Robert Allen, an economic historian at New York University Abu Dhabi, concludes that the big, capitalist estates which resulted from enclosure were not much more productive than common land farmed by the yeomanry. Nor did the great lords who gained control of large tracts funnel their profits into industry. Most indulged in fine living; many were debtors rather than savers. As Guy Standing of the School of Oriental and African Studies in London writes in his book, "The Plunder of the Commons", property rights can create an incentive for

owners to use resources well, but they also grant the liberty to squander the fruits of their holdings.

If privatising land raises productivity less than might have been expected, that could be because commons are not as doomed as used to be thought. In fact, many were well cared for. Elinor Ostrom, a Nobel prizewinner in economics, studied how rural villages around the world manage shared resources such as land or irrigation systems. The Swiss commune of Törbel, for instance, has successfully shared irrigation resources for more than half a millennium. An exclusive focus on states and markets as ways to control the use of commons neglects a varied menagerie of institutions throughout history. The information age provides modern examples, for example Wikipedia, a free, user-edited encyclopedia. The digital age would not have dawned without the private rewards that flowed to successful entrepreneurs. But vast swathes of the web that might function well as commons have been left in the hands of rich, relatively unaccountable tech firms.

Mr Standing thinks that the decline of commons caused useful civic concepts to fall into disuse. Medieval commoners expected both to benefit from and to help manage unowned social wealth. Prosperity today similarly depends on shared public resources, from customary behaviour that supports the rule of law to accumulated scientific knowledge to the environmental services provided by clean air, waterways and so on. Some institutional creativity might allow more resources to be managed as commons, reducing concentrations of wealth and power without much loss of economic efficiency.

A world rich in healthy commons would of necessity be one full of distributed, overlapping institutions of community governance. Cultivating these would be less politically rewarding than privatisation, which allows governments to trade responsibility for cash. But empowering commoners

could mend rents in the civic fabric and alleviate frustration with out-of-touch elites. In her Nobel lecture Ms Ostrom said that public policy should “facilitate the development of institutions that bring out the best in humans”. That sounds like common sense. ■



自由交流

公共知识

除了国有化和私有化，管理公共资源还有其他办法

《森林宪章》（Charter of the Forest）这名字听起来有些奇幻，像是从托尔金的作品里蹦出来的。但它其实是英国的根本性政治文件之一，与《大宪章》出自同一时期（《大宪章》全称为《自由大宪章》，被广泛叫做《大宪章》而与《森林宪章》明确区分）。《大宪章》关注少数特权贵族的利益，《森林宪章》则旨在保护平民的权益，尤其是他们依靠广袤的野外公地的丰厚馈赠谋生的古老权利。“公地”这种经济制度如今看来就像贵族在草地上签署的宪法文件一样古旧。对许多经济学家来说，私有产权的扩展对现代世界的形成至关重要。然而公地的缺点有可能被夸大了。在当今的公共政策中应该有它的一席之地。

一九六八年，生态学家加勒特·哈丁（Garrett Hardin）在《科学》杂志上发表的一篇（极度鼓吹优生的）文章里首创了“公地悲剧”（tragedy of the commons）一词。但对于公共物品被搭便车滥用的问题，经济学家们在百年前便已熟知。比如有一片草地，每个牧民都可以在上面放牧自家的牛群，那么他们都会尽可能密集地使用它：既然它对所有人开放，假如一个牧民克制放牧，只会让另一个牧民的牛吃到更多草，克制自律的人反而吃亏，而且损失是绝对的，而不仅仅是相对的。公共牧场将不可避免地因过度放牧而毁灭。许多有价值的公共资源同样容易被过度消费。道路变得拥挤，河道被过度捕捞，电磁频谱频段拥堵到无法使用，令社会整体福祉受损。

人们通常会提出两种可能的补救办法。政府可以管制对公共资源的使用，例如像管制空域那样。或者还可以出售公共资源的控制权，建立以往不存在的财产权。经济学家倾向选择后者。私人所有者更有动力以可持续的方式使用资源，以保持其长期价值。私有化也会促进投资和创新，毕竟利润是流向所有者的。

许多经济学家认为，产权的推广是点燃现代经济增长的关键。从16世纪到19世纪，英格兰和威尔士的大部分公地被圈起来转给私人所有。经济史学家一直认为，这种圈地运动虽然野蛮又不公，但能激发社会进步，为工业化奠定了基础。大片土地能得到更高效的耕种，既释放出劳动力到城市里的工厂工作，也为这些工人提供了食物。1983年，经济史学家彼得·马蒂亚斯（Peter Mathias）写道：“农民阶层的分裂是英格兰……为养活不断增长的人口……付出的代价。”工业革命似乎把公地的概念永久埋葬了。

但人们已开始重新审视这类正统观念。事实证明，公共资源的私有化并非总能提升生产率。较近期的研究表明，对英国农业或工业而言，圈地可能没有带来那么多的好处。纽约大学阿布扎比分校的经济史学家罗伯特·艾伦（Robert Allen）经研究得出结论，因圈地发展而来的大型资本主义庄园的生产效率并不比自耕农耕作的公地高很多。控制大片土地的地主也没有将自己所获的利润输送到工业发展中。他们大多沉迷奢华生活，许多人非但没有攒下财富，还欠债累累。伦敦大学东方与非洲研究学院的盖伊·史坦丁（Guy Standing）在其著作《公地掠夺》（The Plunder of the Commons）中写道，产权能激励所有者充分利用资源，但也给予了他们浪费自家成果的自由。

如果土地私有化对生产率的促进低于预期，原因可能是公地不像以往人们所想的那样注定被糟蹋。事实上，很多公地都得到了不错的照管。诺贝尔经济学奖获得者埃莉诺·奥斯特罗姆（Elinor Ostrom）研究了世界各地的农村如何管理土地或灌溉系统等公共资源。举例来说，在瑞士的特伯尔社区（Törbel），500多年来人们一直共用灌溉资源，运转良好。若只考虑通过国家和市场来控制公地使用，就忽视了自古以来各种社会机构所发挥的作用。信息时代提供了一些现代的例子，比如由用户编辑的免费百科全书维基百科。假如没有私人奖励流向成功企业家，数字时代根本不会到来，但大量网络资源原本可以作为公地正常运作，却落入了财力雄厚但又相对无需负责的科技公司手中。

史坦丁认为，公地的衰落导致一些有价值的公民理念被弃之不用。对于无主的社会财富，中世纪的平民会希望参与其管理并从中获益。当今的繁荣

发展同样依赖共享的公共资源，包括支持法治的习惯行为、积累的科学知识、洁净的空气和水道等环境服务。在制度上发挥创意也许能把更多资源作为公地来管理，在减少财富和权力集中的同时又不会牺牲多少经济效率。

一个充满健康公地的世界必定遍布分散而又重叠的社区治理机构。私有化可以让政府用权责换来金钱，相比之下，培育民间治理机构的政治回报较低。但赋予民众权力可以修复社会结构中的裂缝，减轻人们对那些高高在上的精英的不满。奥斯特罗姆在其诺贝尔奖演讲中表示，公共政策应该“帮助发展能带来人类最美好一面的社会机构”。这听起来就是共识嘛。 ■



Connected future

A planetary panopticon

For better or worse, the IoT will bring the business models that run the internet into the rest of the world

IN JULY THE Bank of England announced that its new £50 note would carry a picture of Alan Turing, a British mathematician widely regarded as the intellectual father of computer science. Along with excerpts from a seminal paper in 1936 and a binary representation of his date of birth, the new note contains a quotation from 1949, when only a handful of computers existed in the world. “This is only a foretaste of what is to come,” it begins.

Turing’s remark remains true today. Computers have already changed the world in ways that their inventors could never have imagined. Turing could no more have predicted Instagram celebrities and high-frequency trading than Karl Benz, an automotive pioneer, could have predicted suburbs and strip malls. And that is in a world with tens of billions of computers. If predictions about the IoT are correct, that number could rise a hundred-fold.

Clues about what is to come can be glimpsed in changes that have already happened. In the quarter of a century since the internet first became a consumer phenomenon, it has upended businesses. Data are the currency of the online world, gathered, analysed, sold and occasionally stolen in a business model that has built some of the world’s most valuable companies—but which is attracting increasingly unfriendly scrutiny from governments and regulators, and which its critics decry as “surveillance capitalism”.

Ubiquitous computing offers the companies which master it the ability to mine data from the real world in the way that big tech firms now mine

them from the virtual one. The result will be a slow-burning revolution of quantifiability in which knowledge that used to be fuzzy or incomplete or even non-existent becomes increasingly precise. That will give rise to what sports coaches call “marginal gains”. A 10% decrease in costs or a 15% cut in energy use are individually unexciting. Put enough of them together, though, and they will amount to a revolution in productivity.

This will change how companies operate. In a world in which more things are computerised, more companies will come to resemble computer firms. In expensive, high-tech industries, where the economics of the IoT have made sense for decades, the results of this are already visible. Rolls-Royce, a big British maker of jet engines, launched its “Power by the Hour” service in 1962, offering to maintain and repair its engines for a fixed cost per hour. Its digital transformation began in earnest in 2002, built around the ability to do continuous, real-time monitoring of its products. Real-time data mean that the firm’s engineers can watch engines wear out as they fly. When something needs fixing, they can arrange for repair teams to be waiting on the ground. The firm’s data offer flying tips to pilots that can result in fuel savings worth hundreds of thousands of dollars.

A changing business has meant a changing culture. The firm now hires computer programmers as well as aeronautical engineers. It has an internal software division, called r2 Data Labs, which is run like a startup, to look for new ways to turn the flood of data into new businesses. It even plans to remodel parts of its industrial-looking campus, replacing the low brick buildings with the manicured-lawn-and-mirror-glass architecture popular in Silicon Valley. After all, says Andrew Hutson-Smith, the head of r2, “We’re competing with Facebook and Google for staff.”

Rolls-Royce is not alone. General Electric, its chief rival in the jet-engine business, offers similar services. As costs falls, the model will spread. At an IoT conference in London earlier this year, companies from TVH, a Belgian

firm that makes forklifts and industrial vehicles, to ABB, a Swedish heavy engineering firm, were lining up to describe the benefits of what Alexandra Rehak, an IoT expert at Ovum, a firm of analysts, describes as “servicisation”.

If ubiquitous computing will turn companies of things into companies of services, the IoT will transform consumers of things into computer users, with all that implies. Like social networks or email, smart gadgets offer convenience and comfort, at the price of turning everything done with them into fuel for an ever more pervasive data economy.

Smart televisions already watch the users watching them, sending back data on programme choices and viewing habits; some even monitor background conversation. These data, sold on to advertisers and programme-makers and crunched by machine-learning systems, subsidises the price of the televisions themselves (which explains why non-connected, “dumb” televisions have become very difficult to buy). Consent is murky. In 2017 Vizio, an American TV-maker, was fined \$2.2m by the Federal Trade Commission after regulators found it was not properly seeking users’ permission to harvest and resell information on viewing habits.

Nor is it just televisions. Smart scales monitor weight and fat percentage, a gold mine for the fitness industry. iRobot, maker of the Roomba line of robot vacuum cleaners, caused a furore in 2017 when it revealed plans to share the maps its products build up of users’ homes with Google, Amazon or Apple (it has since said it would not share such data without its users’ explicit consent). Gadgets from high-tech locks to new cars come with privacy policies running to thousands of words (see chart).

Refuseniks might choose not to put such gadgets in their home. But outside, in public places, they will be surveilled anyway. The advertising industry is already experimenting with “smart” billboards, which can use cameras and

facial-recognition software to assess people's reactions to their contents. Hundreds of American police departments can request access to video recorded by Ring, an Amazon subsidiary that makes camera-equipped doorbells. Internal company emails also show Ring providing suggested talking points for police officers to help them persuade homeowners to buy its products, and to allow their recordings to be shared. The American Civil Liberties Union, a campaigning organisation, complains that the result is a half-private, half-public, murkily regulated video-surveillance network.

Consumers may discover other downsides. Computerisation allows data to flow from users to companies, but it also allows power and control to flow in the other direction. Most smart-home services require a durable connection to remote servers that can fail without warning. Apple is famously unwilling to allow its customers to have broken iPhones repaired anywhere except in its own shops, going so far as to use software updates to disable replacement touchscreens installed by cheaper third-party fixers. John Deere, an American tractor-maker, has spent four years facing down a rebellion from farmers angry at being subject to similar restrictions. Its products have become so computerised that the firm has argued that farmers no longer own their tractors, but merely purchase a licence to operate them.

If the IoT continues along these lines, it has the potential to reshape the entire world in Silicon Valley's image. One reading of the history of the internet is that, for all the hand-wringing about privacy and control, they are dogs that have never truly barked. The rise of surveillance capitalism proves that, in the end, consumers are willing to trade their data for the products and conveniences that it offers. A survey in 2016 by the Interactive Advertising Bureau, a trade body, reported that 65% of IoT users seemed happy to see advertising on their devices, presumably in return for lower prices.

Another reading, though, is that the business models of the internet established themselves early, at a time when neither regulators nor consumers properly understood the technologies underlying them, and when not even the most avid techies could have predicted all their implications.

These days, things are different. Blamed for everything from addicted children to nurturing terrorism, Big Tech has lost its Utopian shine. That disillusionment has fed back into gloomy predictions about the IoT. In many ways, that is valuable, for if problems can be foreseen they can be more easily prevented. But if the techno-optimism that infused the 1990s and 2000s now looks naive, the techno-pessimism that is fashionable today can be similarly overdone. Like the original internet, the IoT promises huge benefits. Unlike the original internet, the IoT will mature in an age that has become sceptical about where a connected, computerised future might lead. If it has to earn the trust of its users, it will be the better for it in the long run. ■



联网的未来

环球全景监狱

无论是福是祸，物联网都将把互联网的商业模式带到世界其他地方【技术季刊《物联网》系列之六】

今年七月，英格兰银行宣布其新版50英镑纸币上将印有阿兰·图灵（Alan Turing）的肖像。图灵是英国数学家，被广泛誉为计算机科学之父。新钞除印有他于1936年发表的一篇开创性论文的节录、以二进制表示的出生日期外，还有一句他在1949年说的话——当时世界上还只有零星几台计算机。“这只是即将到来之事的前奏，”开头这样写道。

图灵这句话至今仍然适用。计算机已经以其发明者无法想象的方式改变了世界。图灵没法预见Instagram红人和高频交易，就像汽车业先驱卡尔·本茨（Karl Benz）预测不到郊区和大卖场。而这只是一个拥有数百亿台计算机的世界。如果对物联网的预测是正确的，这个数字可能会增加一百倍。

未来会发生什么，从已经发生的变化中可以窥见端倪。自互联网首次成为一种消费现象后的25年来，它已经颠覆了商业运作。数据成了网络世界的货币，它们被收集、分析、出售，有时还被窃取。这样的商业模式打造出了世界上最有价值的一些公司，但也招致政府和监管机构敌意日益强烈的审查，其批评者斥之为“监视资本主义”。

无所不在的计算为擅长计算的公司提供了从现实世界中挖掘数据的能力，就像大型科技公司现在从虚拟世界中挖掘数据一样。其结果将是一场缓慢的“可量化革命”：那些过去模糊、不完整甚至根本不存在的知识变得越来越精确。这将生成体育教练们所说的“边际收益”。单个商家的成本降低10%或能耗减少15%并不令人兴奋。但把大量这样的变化累积在一起，将等同于掀起一场生产率革命。

这将改变企业的运作方式。在一个更多物品被计算机化的世界里，更多企

业会变得像计算机公司。在昂贵而高科技的产业中，物联网产生经济效益已经有几十年了，这种变化的影响已经显现。英国大型喷气发动机制造商罗尔斯-罗伊斯（Rolls-Royce）于1962年推出“小时动力”服务（Power by the Hour），按每小时固定价格为发动机提供维护和维修。它从2002年就开始坚定地围绕持续、实时地监控自家产品的能力进行数字化转型。实时数据意味着公司的工程师可以观察发动机在空中运行时的损耗情况。当有东西需要修理时，他们可以安排维修队伍在地面等待飞机降落。该公司的数据还为飞行员提供飞行技巧，可节省价值几十万美元的燃油。

业务的变化带来文化的改变。该公司如今不但要雇用航空工程师，还要雇计算机程序员。它有一个名为“r2数据实验室”的内部软件部门，像创业公司那样运行，旨在寻找新方法来将大量数据转化为新业务。它甚至计划改建自己充满工业时代气息的工作园区，用硅谷流行的整齐的草坪和玻璃幕墙建筑取代低矮的砖房。毕竟，r2的负责人安德鲁·赫特森-史密斯（Andrew Hutson-Smith）说，“我们正在和Facebook及谷歌争抢员工。”

罗尔斯-罗伊斯并非特例。它在喷气发动机业务中的主要竞争对手通用电气也提供类似的服务。随着成本的下降，这种模式将扩散开来。今年早些时候在伦敦举行的一个物联网大会上，从生产叉车和工业车辆的比利时公司TVH，到瑞典重型工程公司ABB，许多公司纷纷描述被Ovum分析公司的物联网专家亚历山德拉·雷哈克（Alexandra Rehak）称之为“服务化”的益处。

如果无处不在的计算将把卖商品的企业转变为卖服务的企业，那么物联网将把消费商品的人转变为计算机用户，一并带来这种变化的所有影响。和社交网络或电子邮件一样，智能电子产品为人们带来方便和舒适，而其代价是把所有在这些设备上做的事转化成驱动日益渗透的数据经济的燃料。

智能电视已经在观看观看它的人，把有关节目喜好和观看习惯的数据传回给制造商；一些电视机甚至还监听客厅里的对话。这些数据被卖给广告商和节目制作人，由机器学习系统分析处理。这补贴了电视机本身的价格（这就解释了为何如今已经很难买到不能联网的“蠢货”电视机）。知情同

意模糊不清。2017年，美国电视制造商Vizio被联邦贸易委员会（FTC）罚款220万美元，因为监管机构发现该公司没有适当向用户征求获取和转售观看习惯信息的许可。

不仅仅是电视机。智能秤监测体重和体脂率，这是健身行业的金矿。生产了Roomba机器人吸尘器系列的iRobot公司在2017年激起轩然大波：该公司透露它计划与谷歌、亚马逊或苹果共享机器人勘测到的用户住宅地图（事发后该公司表示，未经用户明确同意不会共享这类数据）。从高科技锁具到新车的各种设备都附有长达数千字的隐私政策（见图表）。

拒绝合作者可能会选择不把这些设备弄进家里。但在户外，在公共场所，他们无论如何还是会受到监视。广告业已经在测试“智能”广告牌，用摄像头和面部识别软件来评估人们看到广告内容时的反应。成百上千的美国警局可以要求访问由亚马逊子公司Ring生产的配备摄像头的门铃拍到的视频。公司内部电邮还显示，Ring还为警察提供了谈话要点建议，帮助他们说服房主购买这种门铃并共享录到的视频。竞选组织美国公民自由联盟（American Civil Liberties Union）抱怨说，这制造出了一个半私人、半公开，监管模糊的视频监控网络。

消费者可能还会发现其他弊端。万物计算机化让数据从用户流向企业，同时也让企业获得权力和控制他们。大多数智能家居服务都需要与远程服务器持久连接，这些服务器可能在没有预警的情况下发生故障。众所周知，苹果不愿意让客户在除自己的商店以外的地方修理iPhone手机，甚至于利用软件更新来禁用由收费更便宜的第三方店家安装的新触屏。美国拖拉机制造商约翰迪尔（John Deere）过去四年里一直在和受到类似限制而奋起反抗的农民对峙。其产品的计算机化程度已经非常高，以至于该公司提出，农民不再拥有拖拉机，他们不过是买下了操作拖拉机的许可。

如果物联网继续沿着这些路线发展，它有可能以硅谷的景象重塑整个世界。对互联网历史的一个解读是，即便有各种有关隐私和控制的焦虑不安，大家也不过是说说而已。“监控资本主义”的兴起证明，消费者最终还

是愿意用自己的数据换取它提供的产品和便利。2016年，行业组织互动广告局（Interactive Advertising Bureau）的一项调查显示，65%的物联网用户似乎乐于在自己的设备上看到广告，想来是为了换取更低的价格。

但另一个解读是，互联网的商业模式很早就自我确立了，而当时无论监管机构还是消费者都没有正确理解其背后的技术。甚至连最狂热的技术达人都无法预测它们的全部影响。

如今的情况有所不同。从儿童网瘾到滋养恐怖主义，科技巨人们被怪责为一切的罪魁祸首，已经失去了乌托邦的光芒。这种幻灭情绪进一步促成了对物联网的悲观预测。从许多方面看，这是有价值的，因为如果问题可被预见，就更容易预防。但是，如果在上世纪90年代和本世纪头十年里弥漫的技术乐观主义现在看起来太过幼稚，那么当下大行其道的技术悲观主义同样可能走过了头。与最初的互联网一样，物联网有望带来巨大的好处。与最初的互联网不同，物联网将在一个已经对互联的、计算机化的未来可能走向何处抱持怀疑的年代里成熟起来。如果它必须赢得用户的信任，那长远而言对它反而是件好事。 ■



Computerised farming

The cow of tomorrow

Sensors and machine learning are finding their way into the farmyard

LIKE ELITE athletes, dairy cows have exacting nutritional requirements. “If you’re slightly up on protein, or down on carbs, you’ll see a drop in milk production,” says Robbie Walker, the boss of Keenan Systems, an Irish firm which makes feed-mixing wagons.

For that reason, the firm’s latest products have gone digital. With the help of Intel, a big American chipmaker, Keenan has developed a computer that can be attached to its wagons. Every day the firm’s nutritionists load the computer with the herd’s dietary requirements. Sensors on the wagon weigh what the farmer puts into the mixer and compare it with what the recipe calls for. “It’s a bit like making a cake,” says Mr Walker. “Even if you’re being careful, you usually put in a little too much of one ingredient, or not enough of another.”

The collected data are transmitted over the mobile-phone network to the nutritionists, who can analyse any deviations from the ideal in what the animals were fed. A big deviation triggers a text message to the farmer. Smaller ones are noted, and the feed mix for the following day tweaked to correct any nutritional deficits that might have crept in.

Keenan is not the only firm trying to computerise cattle-farming. Cainthus, another Irish company, is one of several startups hoping to use computer vision to boost farmyard productivity. It uses cameras to track cows in barns and fields, relying on machine learning to analyse the images. The technology is sensitive enough, says David Hunt, the firm’s boss, to track individual animals, and to alert farmers if a cow is not feeding when it

should be, or moving in a way that suggests it might be sick.

For now, he says, the company is working mainly on Friesian and Holstein cows, whose distinctive markings “mean they’re basically walking QR codes”, though he hopes to expand to other breeds eventually. The technology works well enough to have persuaded Cargill, an agriculture-focused conglomerate and America’s largest private company, to take a minority stake in Cainthus in 2018.

An alternative approach is to put the sensors inside the cows themselves. An Austrian firm called smaXtec has developed a sensor that can be swallowed. It lodges inside the reticulum, one of a cow’s four stomachs, and stays there for the rest of the animal’s life, monitoring body temperature, movement and stomach acidity, and uploading the results when the cow is near a wireless detector.

When fed to machine-learning algorithms, says Stefan Rosenkranz, smaXtec’s co-founder, those data can be used for all kinds of things. They can detect when animals are in heat, and spot the early signs of calving up to 15 hours before it happens. They can identify diseases several days before they become obvious to human observers, allowing early treatment and a 15-30% drop in antibiotic use. A new sensor, due out next year, will add the ability to monitor digestion. Sales are doubling every year, says Mr Rosenkranz. And with 278m dairy cows in the world, there is no shortage of customers. ■



畜牧业计算机化

明日之牛

传感器和机器学习正在进入农场

和精英运动员一样，奶牛有严格的营养要求。“如果给它的蛋白质稍多了些，或者碳水化合物少了些，产奶量就会下降。”爱尔兰饲料搅拌车制造商Keenan Systems的老板罗比·沃克（Robbie Walker）说。

为此，这家公司最新的产品已经数字化。在美国芯片巨头英特尔的帮助下，Keenan已经开发出可被加装到饲料车上的计算机。每天，公司的营养师都会往这台电脑输入牛群的饮食要求。饲料车上的传感器会给农民放进搅拌器的东西称重，并与配方要求的量做比较。“有点像做蛋糕，”沃克说，“就算你很小心，也经常会把一种料放得太多，或者另一种放得不够。”

收集到的数据通过手机网络发送给营养师。营养师会分析奶牛的摄食是否有任何偏离理想数字的情况。如果有很大的偏差，他们会给农场主发消息。较小的偏差会被标记出来，在第二天调整饲料组合，以纠正可能正在悄悄发生的营养不足。

Keenan并非唯一一家尝试把养牛业计算机化的公司。另一家爱尔兰公司Cainthus和其他几家创业公司希望利用计算机视觉来提高农场的生产率。Cainthus用摄像头追踪谷仓和田地里的奶牛，依靠机器学习分析影像。公司老板大卫·亨特（David Hunt）说，这种技术的敏感度足以追踪单头奶牛，在发现某一头奶牛没有正常进食、或运动方式显示它可能生病的时候提醒农场主。

他说，目前公司的技术主要面向弗里斯安奶牛和荷斯坦奶牛，它们身上独特的花纹“简直就是行走的二维码”。不过他希望最终能扩展到其他品种。这项技术的成效很不错，吸引到美国最大的私营公司、专注于农业的企业集团嘉吉（Cargill）在2018年收购了Cainthus的少数股权。

另一种方法是把传感器放进奶牛体内。奥地利公司smaXtec研制出了一种可以吞下去的传感器。之后它就永久地待在奶牛的蜂巢胃（它的四个胃之一）里，监测它的体温、移动及胃酸度，并在牛靠近无线探测器时上传测量结果。

smaXtec的联合创始人斯特凡·罗森克兰兹（Stefan Rosenkranz）说，数据被输入机器学习算法后就可有各种用处。它们能发现动物是否处于发情期，并提前多达15小时发现产犊的迹象。它们能比人类观察者提前几天识别出疾病，这样就能尽早提供治疗，令抗生素用量减少15%到30%。将于明年推出的一款新传感器还将增加监测消化的功能。罗森克兰兹表示，销售额每年都在翻番。全世界有2.78亿头奶牛，不怕无人光顾。■



Ubiquitous computing

Chips with everything

Drastic falls in cost are powering another computer revolution, says Tim Cross

THE INTERNET OF THINGS (IoT) is a clumsy name for a big idea. It holds that, despite all the changes the computer revolution has already wrought, it is only just getting started. The first act, in the aftermath of the second world war, brought computing to governments and big corporations. The second brought it to ordinary people, through desktop PCs, laptops and, most recently, smartphones. The third will bring the benefits—and drawbacks—of computerisation to everything else, as it becomes embedded in all sorts of items that are not themselves computers, from factories and toothbrushes to pacemakers and beehives.

The magic of computers is that they provide in a machine an ability—to calculate, to process information, to decide—that used to be the sole preserve of biological brains. The IoT foresees a world in which this magic becomes ubiquitous. Countless tiny chips will be woven into buildings, cities, clothes and human bodies, all linked by the internet.

Up close, the result will be a steady stream of quotidian benefits. Some will arise from convenience. Microchipped clothes could tell washing machines how to treat them. Smart traffic systems will reduce waiting times at traffic lights and better distribute cars through a city. Some will be the sorts of productivity improvements that are the fundamental drivers of economic growth. Data from factory robots, for instance, will allow algorithms to predict when they will break down, and schedule maintenance to ensure that does not happen. Implanted sensors will spot early signs of illness in farm animals, and micromanage their feeding. Collectively, those benefits will add up to a more profound change: by gathering and processing vast

quantities of data about itself, a computerised world will allow its inhabitants to quantify and analyse all manner of things that used to be intuitive and inexact.

One way to understand the IoT, says Martin Garner at CCS Insight, a firm of analysts, is by analogy with another world-changing innovation. Over the past century electricity has allowed consumers and businesses, at least in the rich world, access to a fundamental, universally useful good—energy—when and where they needed it. The IoT aims to do for information what electricity did for energy.

As befits such a dramatic ambition, the heralds of the IoT are fond of very big numbers. Bain Capital, a management consultancy, reckons total spending on it will reach \$520bn by 2021. McKinsey, another consultancy, is giddier still about the future: it reckons the economic impact of the IoT could be as much as \$11.1trn every year by 2025. Arm, a chip-design firm specialising in the sort of low-power chips the IoT needs, thinks there could be a trillion such devices by 2035, meaning that computerised, networked gizmos would outnumber the humans that control them by well over a hundred to one.

Like most futures, a lot of the IoT is already here—it is just not (yet) evenly distributed. The idea of building computers into other things is not new. Nuclear missiles, jet fighters and the billion-dollar spacecraft that carried astronauts to the Moon were all early uses. At first, computers were prohibitively expensive. But costs have fallen steadily and rapidly. The price of computation today is roughly one hundred-millionth what it was in the 1970s, when the first microprocessors became commercially available (see chart). According to figures collected by John McCallum, a computer scientist, a megabyte of data storage in 1956 would have cost around \$9,200 (\$85,000 in today's prices). It now costs just \$0.00002.

Operating costs have fallen, too. Jonathan Koomey of Stanford University reckons that between 1950 and 2010 the amount of number-crunching possible with a kilowatt-hour of energy grew roughly a hundred-billion-fold. That means that even cheap, battery-powered chips now offer performance better than the supercomputers of the 1970s. Giving those computers access to the world is also cheaper. Partly thanks to smartphones, which are packed with everything from miniaturised cameras to gyroscopes and accelerometers, the cost of tiny sensors is dropping. Goldman Sachs, a bank, says that the average cost of the sort of sensor used in the IoT fell from \$1.30 to \$0.60 between 2004 and 2014.

Over the past few decades, those trends have transformed airliners and cars, which have become networks of computers with wings or wheels. They have spread to washing machines and smoke alarms, to thermostats and to medical devices implanted into human bodies. In July, 50 years after the computer-assisted landings on the Moon, Pampers, an American firm, announced Lumi, a sensor designed to be clipped to disposable nappies. It monitors sleep patterns and sends smartphone alerts to parents whenever their little darlings need changing.

To create an IoT you need more than just a trillion cheap computers. You also need ways to connect them to each other. Data on telecoms costs are fuzzier than those on computing. But better technology has cut costs there, too. In 1860, sending a ten-word telegram from New York to New Orleans cost \$2.70 (about \$84 in today's money). These days, speeds are measured in megabits per second. (A megabit is equal to roughly 2,700 ten-word telegrams). Connection speeds of tens of megabits per second can be had for a few tens of dollars a month. As telecommunications have got cheaper, they have spread. The International Telecommunications Union, a trade body, reckons that 51.2% of the world's population had internet access in 2018, up from 23.1% ten years ago.

The final ingredient is a way to gather all the data that a trillion-computer world will generate and to make sense of it all. Modern artificial-intelligence techniques excel at extracting useful patterns from large quantities of raw data. Ubiquitous communications mean that data gathered by comparatively simple chips can be analysed by much more powerful machines in the data centres that make up the cloud.

Attracted by the lure of new business, and fearful of missing out, firms are piling in. Computing giants such as Microsoft, Dell, Intel and Huawei promise to help industries computerise by supplying the infrastructure to smarten up their factories, the sensors to gather data and the computing power to analyse what they collect. They are competing and co-operating with older industrial firms: Siemens, a German industrial giant, has been on an IoT acquisition spree, buying up companies specialising in everything from sensors to office automation. Consumer brands are scrambling, too: Whirlpool, the world's biggest maker of home appliances, already offers smart dishwashers that can be controlled remotely by a smartphone app that also scans food barcodes and conveys cooking instructions to an oven.

The computerisation of everything is a big topic, and one that will take decades to play out. This report aims to serve as a guide, and to offer a way to think about what such change might mean. It will look at consumer and industrial applications. It will also examine the new sorts of chips that might make the IOT work, which will cost less than a cent each and will be able to harvest the energy they need to run from sunlight or ambient heat.

It will examine the downsides, too. A world of ubiquitous sensors is a world of ubiquitous surveillance. Consumer gadgets stream usage data back to their corporate makers. Smart buildings—from airports to office blocks—can already track the people who move through them in real time. Thirty years of hacks and cyber-attacks have proved that computers are insecure machines. As they spread, so will that insecurity. Miscreants will

be able to exploit it remotely and at a huge scale.

The place to start is where the new computing revolution has already made its most visible mark, and where most people will—or do already—encounter the IoT: in their homes, and the consumer gadgets that fill them. ■



无所不在的计算

万物皆有芯

本专题报道作者蒂姆·克罗斯说，成本的急剧下降正在推动另一场计算机革命【技术季刊《物联网》系列之一】

物联网（IoT）这个别扭的名字背后是一个宏大的想法。它认为，尽管计算机革命已经带来了这么多变化，但这部大戏还只是刚刚开场。它的第一幕发生在第二次世界大战后，把计算带入了政府和大公司。第二幕是通过台式机、笔记本电脑，以及最近的智能手机把它带给了普通人。第三幕会把计算机化的所有优点——还有缺点——带给其他所有东西。从工厂、牙刷，到起搏器和蜂箱，计算机被嵌入到了各种各样本身并不是计算机的物品中。

计算机的魔力在于，它用一台机器提供了一种能力——计算，处理信息和做决策——而这曾经是生物大脑的专属。物联网预见了一个让这种魔力变得无处不在的世界。无数微小的芯片将被编织进楼房、城市、服装和人体，而一切都通过互联网连接在一起。

具体而言，这会为日常世界带来源源不断的好处。一些源于便利。有微芯片的衣服可以告诉洗衣机如何处理。智能交通系统将减少人们在交通信号灯前的等候时间，并让汽车在城市中的分布更合理。一些有关生产率的提高，而这是推动经济增长的根本动力。例如，来自工厂机器人的数据可让算法预测它们何时会出故障，并安排维护以确保这不会发生。植入的传感器将发现家畜发病的早期迹象，并对其饲养进行微管理。总的来说，这些好处将会总和成一种更深远的变化：一个计算机化的世界收集和处理有关它自身的海量数据，将使居民能够量化和分析过去他们依赖直觉的各种不精确的事物。

分析公司CCS Insight的马丁·加纳（Martin Garner）说，理解物联网的一种方式是把它与另一种改变世界的创新做类比。在过去的一个世纪中，电力使消费者和企业（至少在富裕国家）无论何时何地都可以使用这种基本

而普遍有用的东西——能源。物联网之于信息就像电力之于能源。

与如此雄心相呼应，物联网的预言者喜欢庞大的数字。管理咨询公司贝恩资本估计，到2021年，在这方面的总支出将达到5200亿美元。另一家咨询公司麦肯锡对未来的预测甚至更为激动：它认为，到2025年，物联网的经济影响可能会高达每年11.1万亿美元。芯片设计公司安谋（Arm）专门研究物联网所需的低功耗芯片，它认为到2035年可能会有一万亿个这样的设备，这意味着计算机化的联网小发明与控制它们的人的数量之比要大大超过100:1。

像大多数未来场景一样，物联网有很大一部分已经到来——只是（尚未）均匀分布。将计算机融入其他事物的想法并不新鲜。核导弹、喷气式战斗机和将宇航员带到月球的价值数十亿美元的航天器都是它早期的应用。起初，计算机昂贵得令人却步。但成本却持续、迅速地下降。相比1970年代第一批微处理器刚刚投入商业使用时，今天计算机的价格大约是那时的一亿分之一（见图表）。根据计算机科学家约翰·麦卡勒姆（John McCallum）收集的数据，1956年一兆字节的数据存储成本约为9200美元（按今天的价格计算为85,000美元）。现在它只要0.00002美元。

运营成本也下降了。据斯坦福大学的乔纳森·库米（Jonathan Koomey）估计，从1950年到2010年，一度电可能完成的数字运算量增长了约1000亿倍。这就是说，即使是由电池供电的廉价芯片，其性能也要比1970年代的超级计算机好。让这些计算机与世界相连接也更便宜了。微型传感器的成本在下降，这在一定程度上要归功于智能手机的普及——这些手机里头从微型相机到陀螺仪和加速度计应有尽有。银行高盛表示，2004年至2014年间，物联网中使用的传感器的平均成本从1.30美元降到了0.60美元。

过去几十年中，这些趋势已经改变了客机和汽车，让它们变成了带翅膀或轮子的计算机网络。它们还扩散到了洗衣机、烟雾报警器、温控器，以及植入人体的医疗设备中。今年7月，即计算机辅助登月50年后，美国公司帮宝适宣布推出可夹在纸尿布上的Lumi传感器。它会监控睡眠模式，并

在需要为小宝贝更换纸尿布时向父母的智能手机发送警报。

要创建一个物联网，你需要的不只是一万台廉价计算机。你还需要将它们连接起来的方法。比起计算成本，电信成本的数据要模糊一些。但技术进步让这方面的成本也下降了。1860年，从纽约向新奥尔良发送十个词的电报的费用为2.70美元（约合今天的84美元）。如今的数据传输速度以兆位/秒为单位。（一兆位约等于2700份十词电报）。一个月只需花几十美元就可获得每秒数十兆位的连接速度。随着电信变得越来越便宜，它们变得更普及。据行业组织国际电信联盟估计，2018年全球有51.2%的人口可以使用互联网，而十年前这一比例为23.1%。

最后一个要素，是要有一种方法来收集这个万台计算机组成的世界生成的所有数据并充分理解它。现代的人工智能技术擅长从大量原始数据中提取有用的模式。无处不在的通信意味着，由相对简单的芯片收集到的数据可以用组成了“云”的数据中心中性能强大得多的机器来分析。

企业蜂拥而入——它们被新业务的诱惑所吸引，害怕错失机会。微软、戴尔、英特尔和华为等信息技术巨头承诺帮助工业部门计算机化：为它们提供基础设施来让工厂智能化，提供传感器来收集数据，提供计算能力来分析收集到的信息。它们与较老的工业企业既竞争又合作：德国工业巨头西门子一直在疯狂收购物联网相关企业，包括从专营传感器到办公室自动化的各种公司。消费者品牌也不甘落后：全球最大的家用电器制造商惠而浦已经推出了可以通过智能手机应用远程控制的智能洗碗机，这个应用还可以扫描食物条形码，将烹饪指令传送给烤箱。

万物计算机化是一个大命题，并且需要数十年才能实现。本专题报道旨在提供一个指南，并给出一种方法来思考这种变化可能意味着什么。它会审视消费者和工业应用，还将研究可能使物联网成为现实的新型芯片——它们单片成本不到一美分，并且能从阳光或环境热量中获取运行所需的能量。

本报道也将探讨弊端。传感器无处不在的世界里，监视也无处不在。消费

电子产品将使用情况数据传回给制造商。从机场到办公大楼的智能建筑已经可以实时跟踪在其中通行的人员。30年来的黑客和网络攻击已证明计算机是不安全的机器。随着它们的扩散，这种不安全也将蔓延。不法之徒将能够远程大规模利用这一网络。

我们先来看看这场新的计算革命已经表现得最为显著，并且大多数人将会——或者已经——遭遇物联网的地方：自己的家，还有充斥其中的消费电子产品。 ■



Cyber security

Hack the planet

A connected world will be a playground for hackers

AS WAYS TO break into casinos go, a fish tank is an unusual route. Yet that is what was used in an unnamed American gambling house in 2017. It had invested in a fancy internet-connected tank in which the temperature and salinity of the water were remotely controlled. Its owners were not naive: when they installed it, they isolated its controls on their own specific part of their company network, away from all their sensitive systems.

It made no difference. According to Darktrace, a computer-security firm, attackers from Finland managed to break into the tank's systems, then used it as a stepping stone for the rest of the casino's networks. They made off with around 10GB of data.

Computer security is already hard. Everyone from the central bank of Bangladesh to America's National Security Agency has suffered hacks or data breaches. The IoT will make things worse. A world in which more objects are computers is a world with more targets for miscreants.

David Palmer, Darktrace's director of technology, reels off a list of examples. "We've seen corporate espionage between suppliers inside a power station," he says. "One supplier was using [their] access within the network to look at the performance characteristics of another supplier's equipment." His firm also discovered an attack on fingerprint readers that controlled access to a luxury-goods factory, and malware which spread through a hospital department after infecting a connected fax machine.

Other incidents have been spectacular enough to make the news. In 2016 millions of people in America found themselves struggling to reach many

websites, including those of Twitter, Amazon, Netflix and Reddit. The culprit was a piece of IoT-focused malware called Mirai. By exploiting a list of default usernames and passwords, which most users never change, Mirai had infected hundreds of thousands of connected devices, from smart energy meters to home CCTV cameras and connected baby monitors.

Each infected gadget became part of a “botnet”, a group of computers in thrall to the malware. The botnet then performed a “distributed denial-of-service attack” against Dyn, a company that helps maintain the routing information that allows browsers to reach websites. By deluging Dyn’s servers with junk messages generated by the subverted devices, the botnet prevented them from responding to legitimate requests.

But the IoT will do more than simply give hackers new targets. As computers spread into objects that can interact with the physical world, it will enable attacks that endanger life and property.

In 2015 a pair of security researchers from Twitter, a social network, and IOactive, a cyber-security firm, staged a demonstration for *Wired*, a technology magazine, in which they remotely took control of a car while it was being driven. They were able to turn on the stereo and the windscreen wipers, cut the engine, apply the brakes and even, in some circumstances, control the steering wheel. As a result Fiat Chrysler, the car’s manufacturer, announced it would recall 1.4m vehicles. Security researchers have demonstrated an ability to hack into medical devices, including pacemakers and insulin pumps.

Hacking an insulin pump would be a convoluted way to kill someone. But less drastic sorts of crime will be possible, too. Ransomware, which prevents use of a computer until cash is paid, is a natural fit for a world where everything is connected. Ransomware for cars or home-lighting systems is a popular near-future prediction at computer-security conferences. Some

accidental infections have already happened. In 2018, 55 speed cameras in Victoria, Australia, were infected by a piece of ransomware that was designed to attack desktop computers. In June Avast Software, a Czech cyber-security firm, demonstrated how to install ransomware on a networked coffee machine, making it gush boiling water and constantly spin its grinder until the victim pays up.

Companies are aware of the danger. A survey of managers by Bain & Company, a consulting firm, found that worries about security were the single biggest barrier for companies thinking of adopting IoT technologies. Consumers are worried, too. A survey of 2,500 of them by Ernst & Young, a management consultancy, found that 71% were concerned about hackers getting access to smart gadgets.

Patching up the holes will not be easy. One reason is that computers, and computer software, are complicated. Ford's best-selling F150 pickup truck, for instance, is reckoned to have around 150m lines of code. A general rule is that good programmers working under careful supervision average about one bug per 2,000 lines of code. That means that almost any computerised gadget will be riddled with bugs.

Another problem is that few of the companies making connected gadgets have much experience with cyber security—or the incentives to take it seriously. Good security costs money, and the better it is, the less its benefits are visible to the end-user. Attacks like Mirai, in which the costs fall not on the gadget-makers or their owners but on unrelated third parties, muddy things even more. The upshot is that basic precautions are routinely ignored. A paper published in June by Stanford University analysed telemetry from 83m connected devices and found that millions used old, insecure communication protocols or weak passwords.

One option is to learn from others. In February the Industrial Internet

Consortium, a trade body focused on industrial deployments of the IoT, published a guide to security written by experts from veteran firms such as Fujitsu, Kaspersky Labs and Microsoft. Another is to outsource the problem to those better suited to dealing with it. Arm has fortified its chip designs with built-in security features, as has Intel, the world's biggest chipmaker.

Big computing firms are trying to turn security into a selling point. Microsoft sees the IoT as an important market for its cloud-computing business. Under the Azure Sphere brand it has developed a security-focused, low-power microcontroller designed to be the brains of a wide range of IoT devices (these are smaller, cheaper and less capable than a microprocessor). Those micro-controllers run a security-focused version of the Linux operating system and communicate through Azure's cloud servers, which have extra security features of their own. Mark Russinovich, Azure's chief technology officer, says many of the security features were inspired by lessons from the firm's Xbox video-gaming division, which has plenty of experience designing hack-resistant computers. Starbucks, a coffee chain whose connected coffee machines can download new recipes, is one early customer.

Governments are getting involved, too. In 2017 America's Food and Drug Administration issued its first cyber-security-related product recall, having found that some wireless pacemakers were vulnerable to hacking. The following year California became the first American state to mandate minimum security standards for IoT products, including a ban on the use of default passwords. Britain's government is mooted similar laws to require manufacturers to provide contact details for bug-hunters and to spell out how long products can expect to receive security updates.

But whereas widget-makers can learn much from the computing giants, some lessons will have to flow in the other direction, too. The computing industry moves at high speed. Smartphones, for instance, rarely receive

security updates for more than five years. That sort of institutional neophilia is not going to work with products like cars or factory robots, which can have much longer lifespans, says Mr Palmer. Employing the programmers necessary to provide support for dozens of models for decades, he says, will be an expensive proposition.

Looming over everything, says Angela Walch, an American lawyer who specialises in tech, is the question of legal liability. The software industry uses licensing agreements to try to exempt itself from the sort of liability that attaches to firms that ship shoddy goods. Such an exemption, she says, amounts to an enormous de facto subsidy.

So far courts (at least in America) have been broadly happy to enforce such disclaimers. Ms Walch says any attempt to change that would be fought by the software industry, which has long argued that holding it liable for mishaps would stifle innovation. But that line will become harder to defend as software spreads into the sorts of physical goods that, historically, have not been granted such legal exemptions. “What are we saying?” she asks. “That if buggy software or compromised software kills someone, you won’t be able to claim?”

Bruce Schneier, an American security expert, thinks that, in the long run, the consequences of poor security could mean that businesses and consumers reach “peak connectivity” and begin to question the wisdom of connecting everyday objects. He draws an analogy with nuclear energy, which enthusiasts once saw powering everything from cars to catflaps. These days “we still have nuclear power,” he writes, “but there’s more consideration about when to build nuclear plants and when to go with some alternative form of energy. One day, computerisation is going to be like that, too.” ■



网络安全

入侵全球

互联世界将成为黑客的游乐场【技术季刊《物联网》系列之五】

说起入侵赌场的方式，鱼缸是一条不寻常的路线。但2017年在一家名称不详的美国赌场中用的就是这个。这个赌场买了一个时髦花哨的联网鱼缸，缸中的水温和盐度可以远程控制。赌场业主也不傻：安装时他们把它的控制系统隔离在了公司网络中的一个特定部分，远离所有敏感系统。

这一点用也没有。据计算机安全公司Darktrace称，来自芬兰的攻击者设法入侵了鱼缸的系统，然后以其作为跳板攻入赌场的其他网络。他们窃取了大约10个G的数据。

计算机安全本已是一桩难事。从孟加拉央行到美国国家安全局，每一家都遭受过黑客攻击或发生过数据泄露。物联网将使情况变得更糟。在有着更多计算机的世界里，歹徒也就有了更多的攻击目标。

Darktrace的技术总监大卫·帕尔默（David Palmer）一口气列出了一串例子。“我们见过一个电厂内部供应商之间的间谍活动，”他说，“一个供应商用他们在网络中的访问权限来查看另一家供应商设备的性能特征。”他的公司还发现有人攻击一家奢侈品工厂控制访问权限的指纹读取器，还有恶意软件在感染了联网的传真机后在医院部门间传播。

还有些事件足够轰动，上了新闻。2016年，美国有几百万人发现自己好多网站都上不了，包括推特、亚马逊、网飞和Reddit。罪魁祸首是一种名叫“Mirai”的恶意软件，专门攻击物联网设备。通过利用大多数用户从未更改过的默认用户名和密码，Mirai感染了几十万个联网的设备，从智能电表到家用闭路摄像头或联网的婴儿监视器都在其列。

每个受感染的电子设备都成了“僵尸网络”的一部分，这个网络也就是一批被这个恶意软件控制的计算机。然后，僵尸网络对Dyn公司发动了“分布式

拒绝服务攻击”。Dyn帮助维护让各个浏览器可以访问网站的路由信息，而僵尸网络让被入侵设备生成的垃圾消息淹没了Dyn的服务器，让它们无法响应合法请求。

但物联网能做的不仅是为黑客提供新的目标。随着计算机扩散到可与物理世界交互的物体中，它将使威胁生命和财产的攻击成为可能。

2015年，来自社交网络推特和网络安全公司IOactive的两位安全研究人员为技术杂志《连线》做了一场演示。他们远程控制了一辆行驶中的汽车。他们能够打开音响和雨刷、切断发动机、刹车，甚至在某些情况下控制方向盘。为此，这辆车的制造商菲亚特克莱斯勒宣布将召回140万辆车。安全研究人员已经演示过入侵医疗设备的能力，包括起搏器和胰岛素泵。

靠入侵胰岛素泵来杀人是有点太过复杂了。但还有可能发生不那么极端的犯罪。勒索软件逼迫用户付钱，不然就用不了计算机，它们在一个万物互联的世界里可谓如鱼得水。在计算机安全会议上，人们常常预测很快会出现针对汽车或家庭照明系统的勒索软件。一些意外感染已有发生。2018年，澳大利亚维多利亚州的55台测速摄像机被一个勒索软件感染，这个软件原本是专门设计用来袭击台式计算机的。6月，捷克网络安全公司Avast Software演示了如何在联网的咖啡机上安装勒索软件，使它喷出沸水并不断旋转研磨机，直到受害者付款为止。

企业意识到了这种危险。咨询公司贝恩对主管们的一项调查发现，对安全性的担忧是公司考虑采用物联网技术时的最大单个障碍。消费者也感到担忧。管理咨询公司安永对2500名消费者的一项调查发现，71%的人担心黑客会入侵智能电子产品。

修补漏洞不容易。原因之一是计算机和计算机软件很复杂。例如，福特最畅销的F150皮卡车据估计有约1.5亿行代码。一般规则是，在认真监督下工作的优秀程序员平均每写2000行代码约发生一个漏洞。这意味着几乎任何计算机化的设备都将充满缺陷。

另一个问题是，制造联网电子产品的公司对网络安全都没有多少经验，也没什么动力去认真对待它。良好的安全性要花钱，而安全性越好，它带来的好处就越不为终端用户所看见。对于像Mirai这样的攻击，付出代价的并不是电子产品的制造商或所有者，而是无关的第三方，这让事情变得更加混乱。其结果就是最基本的预防措施通常也都被忽略。斯坦福大学于6月发表的一篇论文分析了8300万台联网设备的遥测数据，发现数百万人使用了不安全的旧通信协议或弱密码。

一种选择是向他人学习。今年2月，专注于物联网工业部署的行业组织“工业互联网联盟”（Industrial Internet Consortium）发布了由富士、卡巴斯基实验室和微软等资深公司的专家撰写的安全指南。另一个是将问题外包给更适合处理它的人。安谋给芯片设计加上了内置的安全特性，全球最大的芯片制造商英特尔也是如此。

大型信息技术公司正在试图将安全性变成一个卖点。微软将物联网视为其云计算业务的重要市场。它以Azure Sphere品牌推出了一种专注于安全性的低功耗微控制器（它比微处理器更小、更便宜，功能也较弱），旨在成为各种物联网设备的大脑。这些微控制器运行一个专注于安全性的Linux操作系统版本，并通过Azure的云服务器进行通信，而Azure服务器本身提供额外的安全特性。Azure的首席技术官马克·拉西诺维奇（Mark Russinovich）说，许多安全特性的灵感都来自于该公司Xbox电子游戏部门的经验教训，这个部门具有设计抗入侵计算机方面的丰富经验。咖啡连锁店星巴克是Azure Sphere的早期客户，其联网咖啡机可以下载新的咖啡配方。

政府也在参与其中。2017年，美国食品和药品监督管理局（FDA）在发现某些无线起搏器容易受到黑客攻击后，发布了首个与网络安全相关的产品召回。次年，加州成为美国第一个对物联网产品设定最低安全标准的州，其中包括禁止使用默认密码。英国政府正在拟订类似的法律，要求制造商为漏洞发现者提供联系方式，并说明产品预计可以在多长时间内获得安全更新。

但是，尽管小电器制造商可以从计算巨头那里学到很多东西，后者也将必须反过来遵从前者的某些经验。计算产业发展迅速，比如智能手机就很少会得到五年以上的安全更新。帕尔默说，这种喜好新奇的风气不适用于汽车或工厂机器人等产品，因为它们的使用寿命要长得多。他说，要雇用程序员来为数十种型号提供长达几十年的支持，将是一项昂贵的提议。

专门服务科技领域的美国律师安吉拉·沃尔奇（Angela Walch）说，一片笼罩一切的阴云是法律责任的问题。软件行业使用许可协议来试图让自己免于像生产伪劣产品的公司那样负上责任。她说，这种豁免实际上是一项巨大的补贴。

到目前为止，法院（至少在美国）普遍乐于执行此类免责声明。沃尔奇说，任何改变这一点的尝试都会遭到软件行业的抵抗，它们长期以来都声称，让软件公司为灾祸担责会扼杀创新。但是，随着软件传播到历史上从未获得过此类法律豁免的实物商品中，这一点将愈发难以捍卫。“我们在说什么？”她问，“如果有缺陷或被感染的软件杀了人，你将无法索赔？”

美国安全专家布鲁斯·施耐尔（Bruce Schneier）认为，从长远来看，安全性差的后果可能意味着企业和消费者将达到“联网峰值”，并开始质疑让日常物品联网是否明智。他用核能做类比。核能支持者曾经认为它将为从汽车到宠物活动门的一切提供动力。如今，“我们仍然有核能，”他写道，“但对于何时建造核电站以及何时使用某种替代形式的能源，我们有了更多的考虑。有一天，计算机化也将如此。”■



Bartleby

Juggling act

There is no magic formula for management success

AIRPORT BOOKSHOPS team with guides that promise to teach executives the secrets of success. Read this tome, follow this philosophy, change your habits and you, too, can be a management titan. As a moment's reflection on business history demonstrates, there is no sure-fire route to glory. Instead, running a company is a permanent exercise in juggling trade-offs. What is the right course of action may vary at different times, and in different industries.

Take, for example, the pace of expansion. The fashion is for “upscale”—creating a business model that can dominate its niche within a few years. This model’s turbocharged version, “blitzscaling”, is beloved of venture capitalists who dream of recreating the “network effects” that fuelled the rise of Google and Facebook. That is, in part, because most venture investments fail and a few big successes are needed to make up for all the duds.

From the point of view of the entrepreneur, however, upscale may well be a mistake. For a start, not all businesses are subject to network effects. Second, by expanding too fast, companies risk losing control of product quality and messing up their management structure. Building a business is like running a marathon, and few people win a long-distance race by setting off like Usain Bolt. The first Walmart store was opened in 1962 and it took another six years before the retail chain expanded outside its home state of Arkansas.

The fashion for upscale means that companies are encouraged to get their

product to market as quickly as possible. The theory is that customers get a rough-and-ready prototype at the start, which is improved over time. This may work for smartphone apps, which are easy to update, but not for most other products, where a reputation for shoddiness may be impossible to shake off.

In his book on financial frauds, “Lying for Money”, Dan Davies, a former financial regulator, explains how companies must balance the goals of cost, quality and customer satisfaction. Focus too narrowly on cost and the quality of goods may suffer; concentrate on quality and costs will rise. Try to ensure both and the business may become so obsessed with its own production processes that it ignores customer needs.

Another trade-off is between centralisation and delegation. Early Victorian businesses resembled the army: generals (executives) handing down instructions to non-commissioned officers (foremen and overseers) who in turn directed the foot soldiers (workers). This hierarchical structure was devised for a world in which employees were required to follow a clear set of instructions.

As businesses became more sophisticated in the 20th century, organisations became much more elaborate. Companies were split into divisions by geography and product type. Middle managers took charge of functions such as marketing and finance. Eventually, though, businesses started to view these structures as expensive and overly bureaucratic.

In the past 20 years or so management layers have been stripped away. A flat structure, with delegated decision-making, seemed more appropriate for a service-based economy. The idea of “agile” management, in which workers are frequently reassigned to multidisciplinary teams, is all the rage.

But this trend can likewise go too far. When power is dispersed, the result

can be a confused mess. Some firms may conclude they are better off under centralised command.

The last trade-off is between focus and diversification. The relegation of General Electric from the Dow Jones industrial average last year seemed like another nail in the coffin of the industrial conglomerate. Institutional investors can diversify their portfolios by investing in a range of sectors; they do not need a conglomerate to do it for them. Yet cash-rich tech giants are similarly buying promising startups, often with no obvious relation to their core business (think of Google's purchase of Nest, which makes thermostats).

At some point the growth prospects of even the best products falter. For businesses to survive, they must find new things or services to sell. Choosing the right time to expand and diversify, and the right organisational structure to do it, is a matter of judgment. That judgment, and the flexibility to change plans, is what makes a good manager. It cannot be reduced to an in-flight read. ■



巴托比

杂要

成功的管理没有神奇公式

机场书店里到处是号称能向高管们传授成功秘诀的指南。看看这本大部头，听听那套管理哲学，改变你的习惯，你也可以成为一名管理大师。但对商业史稍加反思就能知道，世上并无必胜之道。相反，经营企业是一场永无休止的权衡利弊的把戏。时间不同、行业不同，成功之道可能也各不相同。

以扩张速度为例。现在流行“快速”扩张，即创造一种可在几年内称霸所在利基市场的商业模式。这一模式还有加强版——“闪电扩张”，风险资本家对此尤为钟情，他们梦想再现当年造就谷歌和Facebook的“网络效应”。某种程度上，这是因为风险投资大多数都是失败的，需要少数大获成功的项目来弥补所有失败的损失。

然而，从企业家的角度看，快速扩张很可能是个错误决策。首先，并非所有企业都能得益于“网络效应”。其次，扩张太快，产品质量可能失控，管理结构也会乱作一团。经营企业就像跑马拉松，长跑比赛的赢家是不会像博尔特那样起跑的。第一家沃尔玛在1962年开业，六年后这家连锁零售商才从老家阿肯色州扩张到其他州。

快速扩张的风潮促使公司尽快将产品推向市场。其理念是先给客户不完善但可用的原型产品，之后再逐步改进。对智能手机应用而言这可能行得通，毕竟这些应用很容易更新，但其他大多数产品却不是这样，因为一旦背上粗制滥造的名声，可能就无法洗脱了。

曾任金融监管官员的丹·戴维斯（Dan Davies）在他撰写的有关金融诈骗的《说谎骗钱》（Lying for Money）一书中解析了公司如何必须在成本、质量和客户满意度等目标之间做好权衡。过度关注成本，商品质量可能会下降；只专注质量，成本可能会上升。尽量兼顾这两者，企业又可能一味执

着于自己的生产流程，以致忽视了顾客的需求。

另一项权衡是集权还是放权。维多利亚时代的早期企业很像军队：将军（高管）向士官（工头和一线管理人员）发出指令，再由后者指示步兵（员工）行动。这种等级架构是应当时员工须按明确指示来工作的大环境而生的。

到了20世纪，企业变得越来越复杂，组织方式也变得精细得多。公司按地域和产品类型划分为不同部门。中层管理人员负责营销和财务等职能。然而，最终，企业开始觉得这些架构太过昂贵和繁冗。

过去大约20年的时间里，管理层级被削减。决策权下放的扁平结构似乎更适用于服务型经济。频繁让员工在不同的跨领域团队里轮岗的“敏捷”管理理念大行其道。

但这种趋势同样会矫枉过正。权力被分散，结果可能是没有头绪、一片混乱。有些公司可能会得出结论，认为集权管理更有利。

最后还有在专一与多元化之间的权衡。去年通用电气被剔除出道琼斯工业平均指数，似乎是给这家工业集团的棺材板上又钉了一根钉子。机构投资者可以通过投资多个行业来实现投资组合多样化，而不需要一家企业集团来代劳。然而，财大气粗的科技巨头还是这样到处收购前景光明的创业公司，而后者往往与前者的核心业务没有明显关联，例如谷歌收购恒温器制造商Nest。

即便是最好的产品，到了某个节点，增长前景也会不稳。企业要生存就必须推出新产品或新服务。在合适的时机扩张及推进多元化，并选择与之相配的组织架构，这需要判断力。这种判断力及灵活变通正是优秀的管理人员所必备的。这一切可没办法浓缩到一本飞机读物中。■



Cuba and China

Double happiness

Autocracy cannot overcome bureaucracy, a new restaurant shows

A PHOTO OF Fidel Castro, the late Cuban dictator, shaking hands with Xi Jinping, China's living one, hangs in the entrance to the newly opened "Beijing" restaurant in Havana. Around it are snapshots of Chinese and Cuban bigwigs past and present. One from 1961 shows a smiling Mao Zedong and Osvaldo Dorticós Torrado, then Cuba's president, on a balcony. On a flight in 2014 from Havana to Santiago de Cuba, the birthplace of Cuba's revolution, Mr Xi promised Raúl Castro, then its president, a fine Chinese restaurant. That visit, too, is memorialised in the vestibule.

It took five years, and millions of dollars in rent and renovation, before the Beijing was ready to serve its first *dandan* noodles. It opened in August at last, two years later than planned. Even when the Chinese and Cuban autocrats bless the enterprise, doing business in Cuba is hard.

The restaurant, which was the first firm in Cuba to be wholly owned by a foreign one (state-owned Beijing Enterprises Group, or BEG), has long mystified *habaneros*. They watched as Chinese builders refurbished the structure, which was built in the 1930s. Fussy building inspectors and slow clearance of equipment and ingredients through customs held up its opening.

Now Chinese executives, ferried to the portico in German cars, enter through circular front doors painted with a huge red *shuang xi*, which means double happiness. The phrase is often emblazoned on cash-stuffed red envelopes given as wedding presents. Small fans display table numbers. (There is no table four, an inauspicious number in China.) Cuban waitresses

dressed in red *qipao*—high-necked dresses—take orders on tablets made by Huawei, a controversial Chinese maker of telecoms kit.

Cuban complications intrude. Unlike eateries in China, where diners can pay by reading a barcode on the table with their mobile phones, the Beijing accepts only cash. It aims for authenticity, but must buy most ingredients through Cimex, the state-run export-import company. Ducks for Peking duck come from Canada. Their skin is thicker than that of Chinese ducks, and so does not become as crispy, explains Li Sha, who helps run the restaurant. The sweet-and-sour fish is Cuban *pargo* (red snapper), not mandarin fish. Though tasty, it is a clumpier meat that resembles fried cauliflower. Egg and tomato stir fry is off the menu because the chefs cannot buy enough eggs and tomatoes. Although BEG owns Yanjing, a Chinese brand of beer, do not assume you can order it to wash down your spicy cumin lamb. Crates of it await clearance through the ports.

Despite gastronomic glitches, BEG plans investments in Cuban hotels, condominiums and a golf course. The Trump administration's hostility towards Cuba and economic chaos in Venezuela, Cuba's main foreign backer, are strengthening its relationship with China. The country is Cuba's largest creditor. A fleet of Chinese-made trains—the first Cuba has bought in 45 years—arrived in May. A \$150m loan from China helped pay for them. Most of the vehicles joining elderly classic American cars on Cuba's roads are made by Geely, Yutong and other Chinese brands. The machinery that is gradually replacing cow-drawn ploughs, still the usual method of tilling Cuban fields, is made in China. Huawei routers provide the outdoor hotspots that make it possible for Cubans to go online.

So far, China has profited little from its friendliness. From 2000 to 2018 it forgave \$6bn of Cuban debt, about 60% of the total foreign debt that it wrote off during that period, according to Development Reimagined, a consultancy, and the student-run Oxford China Africa Consultancy. The two

communist states may be in for a period of double disappointment. ■



古巴和中国

双喜

一家新开的餐馆显示专制统治无法克服官僚作风

在哈瓦那新开业的“北京餐厅”的入口处，挂着一张古巴已故独裁者菲德尔·卡斯特罗和中国现任主席习近平握手的照片。周围挂着中古两国过去和现在的各色大人物的照片。其中一张拍摄于1961年，毛泽东正微笑着和时任古巴总统奥斯瓦尔多·托拉多站在阳台上。2014年，在从哈瓦那飞往古巴革命的发源地古巴圣地亚哥的飞机上，习近平向时任古巴总统劳尔·卡斯特罗承诺要开一家上好的中餐馆。前厅里也留下了那次访问的印记。

北京餐厅花了五年时间，投入数百万美元的租金和装修费，才准备好供应第一份担担面。餐厅总算在8月开业了，比计划的时间晚了两年。即便中巴两国的专制领导人都祝福这家企业，但在古巴做生意还是太难了。

这家餐厅是古巴第一家由外国企业全资拥有的公司，这家企业是国有的北京控股集团（简称北控）。一直以来，这家餐厅都让哈瓦那人困惑不已。他们一路看着中国建筑商翻新这座建于上世纪30年代的建筑。挑剔的建筑验收、缓慢的设备和原料清关让它迟迟无法开业。

现在，中国的高管们坐着德国车来到餐厅的门廊，穿过画着巨大的红双喜的月亮门走进餐厅。这个图案经常被醒目地印在作为结婚贺礼的红包上。小扇子上标着桌号（这儿没有四号桌，因为“四”在中文里是个不吉利的数字）。穿着红色旗袍的古巴女服务员拿着备受争议的中国电信设备制造商华为生产的平板电脑给客人点菜。

古巴的复杂纷乱也加入进来。在中国的餐厅里，食客用手机扫描餐桌上的条码就可以付款，而北京餐厅不一样，这里只接受现金。它想做正宗中餐，但必须通过古巴国有进出口公司Cimex购买大部分原料。做北京烤鸭用的鸭子来自加拿大。协助经营这家餐厅的李莎（Li Sha，音译）解释说，加拿大鸭子的皮比中国鸭子的皮厚，所以烤出来就没那么脆。糖醋鱼

用的是古巴红鲷鱼，而不是桂鱼。虽然也很好吃，但鱼肉是一块一块的，像是油炸过的花菜。菜单上没有番茄炒蛋，因为厨师买不到足够的鸡蛋和番茄。虽然北控拥有中国啤酒品牌燕京啤酒，但别指望能点到它来解解孜然羊肉的辣。成箱的啤酒还在港口等着清关。

尽管在餐饮生意上存在一些小问题，但北控还计划在古巴投资酒店、公寓和一座高尔夫球场。特朗普政府对古巴的敌意，加上古巴最主要的外国后盾委内瑞拉经济混乱，增进了古巴和中国的关系。中国是古巴最大的债权国。5月，中国制造的一批铁路列车运抵古巴，这是古巴45年来进口的第一批列车。中国提供的1.5亿美元贷款帮助支付了这笔费用。在古巴的大街上，和老式美国车一起上路的车辆大多是吉利、宇通等中国品牌。中国制造的机器正逐渐取代目前古巴农业中仍然常用的牛拉犁。华为路由器提供了户外热点，让古巴人可以上网。

到目前为止，中国从与古巴的友好关系中获益甚微。根据咨询公司 Development Reimagined 和学生运营的牛津中非咨询公司（Oxford China Africa Consultancy）的数据，从2000年到2018年，中国免除了60亿美元的古巴债务，约占它在此期间注销的外债总额的60%。两大社会主义国家或许正处在一段“双失望”期。 ■



Planning for rising sea levels

In deep trouble

Climate change is forcing low-lying Asian cities to rethink their flood defences

IN NORTH JAKARTA, not far from a quayside where workers unload frozen mackerel, a derelict building stands a metre deep in murky water. The warehouse was flooded in 2007, after torrential rains and a tidal surge submerged half the city under nearly four metres of water, displacing half a million people and causing \$550m in damage. The building has remained inundated and abandoned ever since—barring the hardy soul who seems to be camping on the first floor, aided by a rowing boat.

Floods have always plagued Jakarta, but in recent years they have become more severe. Many other cities in Asia are menaced by the same phenomenon. As the planet heats up, sea levels are rising. Heavy rainstorms are also becoming more frequent and tropical cyclones more intense. And Asia's coastal cities are growing, even as the risk of flooding increases. The number of people living in flood plains in Asia is expected to more than double between 2000 and 2060, according to the Asian Development Bank (ADB). As cities grow, they exacerbate flood-risk by covering ground that would once have absorbed water with concrete and asphalt. The amount and value of the property at risk also grows. Thirteen of the 20 cities projected to have the biggest increases in annual losses caused by flooding between 2005 and 2050 are in Asia.

Jakarta exemplifies the typical response to rising tides and swelling rains. Though Akuarium, a neighbourhood of shanties, is on the coast, it is impossible to see the sea from its dirt streets. A three-metre-tall sea wall stands in the way. For centuries Jakarta's authorities have dispatched engineers to hold back the rising waters. In the 18th century they built

flood canals; in the 19th century, retention ponds. After the floods of 2007 they raised the existing 30km-long sea wall, widened and dredged the canal system and dug more retention ponds. The idea that the water would recede if only nature could be tamed still motivates Indonesia's planners. After another disastrous flood in 2013, the president of the day instructed his ministers to be bolder. The result was the National Capital Integrated Coastal Development (NCICD), a \$40bn mega-project consisting of a 25km outer sea wall and 17 artificial islands which would seal off Jakarta Bay.

The plan was controversial because of its huge cost, the damage it would do to the maritime ecosystem in the enclosed bay and the fact that it did not deal with a significant cause of flooding in Jakarta: subsidence. Though the sea is rising by 0.8cm a year, parts of northern, coastal Jakarta are sinking by 25cm a year, according to Heri Andreas, a geologist at the Bandung Institute of Technology. At least 40% of residents tap into aquifers, either because they are not connected to mains water or, if they are, because their supply is unreliable and dirty. As they drain the water from under their feet, the soil is compressed. Forty percent of Jakarta is now below sea level. This means that water in the drainage system that would otherwise empty into the bay remains trapped in the city. And as Jakarta sinks, it is dragging its dykes down with it.

Building the plants and pipes to supply treated water is expensive and time-consuming, however, and the result is hidden out of sight. The NCICD plan, in contrast, would have sculpted 1,000 hectares of reclaimed land into a new waterfront city in the shape of a garuda, a mythical bird that is the symbol of Indonesia. "By developing North Jakarta, the project promises to [fulfil] the world-class city aspirations of Indonesia's political elites," writes Emma Colven of the University of Oklahoma. "People want to see visible infrastructure," says Srinivasan Ancha of the ADB.

In August the government signalled a change of tack. It announced plans

to clean Jakarta's public water supply and connect the entire city to it in an effort to stop groundwater extraction. The NCICD plan has also been revised. The sea wall will no longer enclose the bay, and the artificial islands have been scrapped, although 2,000 hectares of land will still be reclaimed for development. The cost has fallen by half.

Jakarta is not the only Asian city to get cold feet about big engineering schemes in recent years, and to embrace cheaper flood-control measures. The most notable convert is Singapore, which is no stranger to monumental waterworks. It recently completed a vast underground retention pond at a cost of S\$227m (\$164m), a cathedral of concrete buttresses fed and drained by pipes you could drive a car through. The city is so proud of Marina Barrage, a system of huge pumps and nine 27-metre-long hydraulic gates to stop the business district flooding, that it has turned the S\$226m facility into a tourist attraction. Over the past decade it has spent a total of S\$2.4bn on drains. Yet as the tiny city-state runs out of space for colossal new structures, and as ever more torrential storms threaten to overwhelm even the new, improved drainage network, Singapore has had to rethink the way it manages storm water.

In 2006 Singapore launched a scheme to increase the city's absorption capacity by natural means, by converting canals and reservoirs into streams and lakes and by creating wetlands and other spaces designed to flood. Swamps, after all, can absorb potentially ruinous floods, while mangrove forests can protect cities near the coast from storm surges. Maintaining them is much cheaper than building dykes. Singapore completed 75 projects to mimic such natural flood defences between 2010 and 2018. The scheme, which also helps to harvest rainwater, is the first of its kind in the tropics. But the rest of Asia, with far less to spend on colossal flood defences, will surely follow suit. ■



规划应对海平面上升

水深火热

气候变化迫使亚洲低洼城市反思防洪措施

在北雅加达，距离工人卸载冷冻鲭鱼的码头区不远处，有一座废弃建筑泡在一米深的脏水中。这是一个仓库，2007年被洪水淹没。当时暴雨如注，潮水上涨，半个城市都淹在四米深的水里，50万人流离失所，损失达5.5亿美元。之后这个仓库就一直浸泡在水中，废弃至今——除了有一位猛人划船出入，似乎是在二楼宿营。

雅加达向来备受洪水困扰，但近些年情况愈加严峻。亚洲其他许多城市也受到同一现象的威胁。随着地球变暖，海平面不断上升。暴雨也愈加频繁，热带气旋变得更猛烈。就在洪水风险升高之际，亚洲的沿海城市数量却有增无减。据亚洲开发银行（ADB）的数据，从2000年到2060年，生活在亚洲冲积平原上的人口预计将增加一倍多。随着城市的发展，以往可以吸纳水分的土地逐渐被混凝土和沥青覆盖，加剧了水淹风险。受威胁财产的数量和价值也在上升。2005年到2050年，预计因洪灾造成的年度损失增幅最大的20个城市中，有13个位于亚洲。

雅加达的做法体现了应对暴雨洪潮的典型思路。尽管棚户区阿库拉利恩（Akarium）位于海边，但站在那里的土路上，你却看不见大海。一堵三米高的海堤挡住了视线。几个世纪以来，雅加达政府一直在派工程师设法阻挡上涨的海水。他们在18世纪修筑了防洪渠，在19世纪修建了滞洪池。2007年的洪水过后，他们加高了原来30公里长的海堤，加宽并疏通了沟渠系统，挖掘了更多的滞洪池。印尼的规划者依然相信，驯服自然，就能击退洪水。在2013年雅加达再一次遭受灾难性洪水后，当时的印尼总统指示政府部长们要更加果敢。结果是他们推出了耗资400亿美元、名为“首都沿海综合开发”（NCICD）的大型项目，计划兴建一道全长25公里的外海堤和17个人工岛，把雅加达湾围起来。

这项计划引发了争议，因为除成本高昂外，它还会损害被围起来的海湾的海洋生态系统，而且也没有解决雅加达遭水淹的一个重要原因——地面沉降。万隆理工学院（Bandung Institute of Technology）的地质学家赫里·安德里亚斯（Heri Andreas）表示，尽管海平面仅以每年0.8厘米的速度上升，但雅加达北部沿海部分地区的地面却以每年25厘米的速度不断下沉。当地至少有40%的居民使用地下水，因为他们所在的区域没接上自来水，或者供水不稳定、水质差。抽取地下水时，地下土壤会被压缩。雅加达目前有40%的地面低于海平面。这意味着排水系统中原本将排到雅加达湾的水会困在城市内。而随着城市的沉降，堤坝也在跟着下沉。

然而，建造供应净化自来水的工厂和管道费钱费时，而且成果不容易体现。相比之下，NCICD计划填海造地1000公顷，打造出一个形状如神鹰（一种神鸟，是印尼的象征）的滨水新城。“通过开发北雅加达，该项目有望实现印尼政治精英阶层打造世界级城市的愿望。”俄克拉荷马大学的艾玛·科文（Emma Colven）写道。“人们想要的是能看得见的基础设施。”亚洲开发银行的斯里尼瓦桑·安恰（Srinivasan Ancha）指出。

八月，印尼政府发出了转换思路的信号。它宣布推出雅加达公共供水净化计划，并将全城各区全面接入自来水，以停止抽取地下水。政府还对NCICD计划做了修订。虽然仍将填海造地2000公顷进行开发，但海堤将不再围住海湾，人工岛也被取消。成本随之下降一半。

近年来，放弃大型工程、转而采取造价更低的防洪措施的亚洲城市不止雅加达。其中最具代表性的就是不乏宏大防洪工程的新加坡。新加坡最近建成了一座耗资2.27亿新元（1.64亿美元）的巨型地下滞洪池，犹如混凝土墩撑起的“大教堂”，内部的供排水管道宽敞到可以行驶汽车。新加坡滨海堤坝（Marina Barrage）是整个城市引以为豪的防洪系统，包含巨型水泵和九个27米长、用于商业区防洪的液压闸门，这个耗资2.26亿新元的防洪系统现在已经成了新加坡的一大旅游景点。过去十年，新加坡在防洪设施上共投入了24亿新元。然而，这个小小的城市国家已没有太多土地来兴建新的巨型防洪工程，而且随着越来越多暴风雨来袭，连升级改造后的新排水体系也将招架不住，迫使新加坡反思自己的防洪方式。

新加坡在2006年推出了一项计划，以自然手段提高城市排洪能力——将水渠和水库改造成溪流和湖泊，并打造湿地和其他空间用于泄洪。毕竟，沼泽能吸收可能极具破坏性的洪水，红树林可以保护沿海城市免受风暴潮的侵袭。维护这些系统比修建堤坝便宜得多。2010年至2018年间，新加坡完成了75个模仿这类自然防洪机制的项目。这项计划（还有助于收集雨水）是热带地区首例，但亚洲其他地区能花在大型防洪工程上的钱还要少得多，所以势必会效仿。 ■



Information technology

The digital assembly line

Technology firms vie for billions in corporate data-analytics contracts

SOMEBODY LESS driven than Tom Siebel would have long since thrown in the towel. In 2006 the entrepreneur, then 53 years old, sold his first firm, Siebel Systems, which made computer programs to track customer relations, to Oracle, a giant of business software. That left him a billionaire—but a restless one. In 2009, a few months after Mr Siebel had launched a new startup, he was trampled by an elephant while on safari in Tanzania. When, a dozen surgeries later, he could work again, the enterprise almost went bankrupt. Undeterred, he rebooted it.

Mr Siebel's fortitude has paid off. The firm, now called C3.ai, raised \$100m in venture capital last year, valuing it at \$2.1bn. It was an early bet on data analytics, which converts raw data (from a machine's sensors or a warehouse) into useful predictions (when equipment will fail or what the optimal stocking levels are) with the help of clever algorithms. Many investors see fortunes to be made from this new breed of enterprise software, which is spreading from Big Tech's computer labs to corporations everywhere.

Worldwide, 35 companies that dabble in data analytics feature on a list of startups valued at \$1bn or more, maintained by CB Insights, a research firm. Collectively, these unicorns—some of which brand themselves as purveyors of artificial intelligence (AI)—enjoy a heady valuation of \$73bn. According to PitchBook, another research company, the six biggest alone are worth \$45bn (see chart 1). Many venture capitalists who back them are hoping to emulate the successful initial public offerings this year of less exalted business-services startups like CrowdStrike, which provides cybersecurity,

or Zoom, a video-conferencing company. And then some.

As is often the case in Silicon Valley, hype springs eternal, fuelled by big numbers from consultancies. IDC reckons that spending on big-data and business-analytics software will reach \$67bn this year. But it will, boosters say, at last allow businesses to see the computer age in their productivity statistics, freeing them from the shadow of Robert Solow, a Nobel-prizewinning economist, who in 1987 observed that investment in information technology appeared to do little to make companies more efficient. Just as electricity enabled the assembly line in the 19th century, since machines no longer had to be grouped around a central steam engine, data-analytics companies promise to usher in the assembly lines of the digital economy, distributing data-crunching capacity where it is needed. They may also, as George Gilbert, a veteran business-IT analyst, observes, help all kinds of firm create the same network effects behind the rise of the tech giants: the better they serve their customers, the more data they collect, which in turn improves their services, and so on.

Consultants at Gartner recently calculated that in 2021 “AI augmentation” will create \$2.9trn of “business value” and save 6.2bn man-hours globally. A survey by McKinsey last year estimated that AI analytics could add around \$13trn, or 16%, to annual global GDP by 2030. Retail and logistics stand to gain most (see chart 2).

Data analytics have a long way to go before they live up to these expectations. Extracting and analysing data from countless sources and connected devices—the “Internet of Things”—is difficult and costly. Although most firms boast of having conjured up AI “platforms”, few of these meet the usual definition of that term, typically reserved for things like Apple’s and Google’s smartphone operating systems, which allow

developers to build compatible apps easily.

An AI platform would automatically translate raw data into an algorithm-friendly format and offer a set of software-design tools that even people with limited coding skills could use. Many companies, including Palantir, the biggest unicorn in the data-analytics herd, sell high-end customised services—equivalent to building an operating system from scratch for every client. Cloud-computing giants such as Amazon Web Services, Microsoft Azure and Google Cloud offer standardised products for their corporate customers but, as Jim Hare of Gartner explains, these are considerably less sophisticated and lock users into their networks.

Enter C3.ai, founded to help utilities manage electric grids, a complex problem that involves collecting and processing data from many sources. After its near-bankruptcy, advances in machine learning, sensors and data connectivity gave it a new lease of life—and allowed it to repackage its products for a range of industries. Crucially for corporate clients, C3's approach grew out of Mr Siebel's experience with enterprise software. He wanted to make data analytics hassle-free for corporate clients, without sacrificing sophistication.

3M, an American conglomerate, employs C3 software to pick out potentially contentious invoices to pre-empt complaints. The United States Air Force uses it to work out which parts of an aircraft are likely to fail soon. C3 is helping Baker Hughes to develop analytics tools for the oil-and-gas industry (General Electric, the oil-services firm's parent company, has struggled to perfect an analytics platform of its own, called Predix).

C3's chief rival in building a bona fide AI platform is not Big Tech or the very biggest data-analytics unicorns. It is a company called Databricks. It was founded in 2013 by computer wizards who developed Apache Spark, an open-source program which can handle reams of data from sensors and

other connected devices in real time. Databricks expanded Spark to handle more data types. It sells its services chiefly to startups (such as Hotels.com, a travel site) and media companies (Viacom). It says it will generate \$200m in revenue this year and was valued at \$2.8bn when it last raised capital in February.

Though C3's and Databricks' niches do not overlap much at the moment, they may do in the future. Their approaches differ, too, reflecting their roots. Databricks, born of abstruse computer science, helps clients deploy open-source tools effectively. Like most enterprise-software firms, C3 sells proprietary applications.

It is unclear which one will prevail; at the moment the two firms are neck-and-neck. In the near term, the market is big enough for both—and more. In the longer run, someone will come up with AI-assisted data analytics that are no more taxing than using a spreadsheet. It could be C3 or Databricks, or smaller rivals like Dataiku from New York or Domino Data Lab in San Francisco, which are also busily erecting AI platforms. The field's other unicorns are unlikely to give up trying. And incumbent tech titans like Amazon, Google and Microsoft want to dominate all sorts of software, including advanced data analytics.

Mr Siebel would be the first to admit that this scramble is likely to claim victims. But it certainly bodes well for buyers of data-analytics software, which is likely to become as familiar to corporate IT departments in the 2020s as customer-relations programs are today. ■



信息技术

数字流水线

技术公司争夺价值数十亿美元的企业数据分析合同

换做是不如汤姆·西贝尔（Tom Siebel）那般奋发图强的人，早就认栽了。2006年，这位时年53岁的企业家将自己的第一家公司西贝尔系统（Siebel Systems，开发用于追踪客户关系的计算机程序）出售给了商业软件巨头甲骨文（Oracle）。这让他成了亿万富翁，但他还是闲不住。2009年，他又创立一家新的创业公司，几个月后他去坦桑尼亚游猎，期间遭一头大象踩踏。等他接受了十几次手术，能够重新工作时，公司也差不多要破产了。他没有灰心丧气，重启了它。

西贝尔的坚韧得到了回报。这家现在名叫C3.ai的公司去年募得了一亿美元的风险投资，估值达21亿美元。它早早地就在数据分析上押注了。借助聪明的算法，数据分析将原始数据（来自机器的传感器或仓库）转换成有用的预测（设备何时会出故障，或库存设置在何种水平为最佳）。这种新型企业软件正从大型科技公司的计算机实验室走入各地的企业，许多投资者都期待靠它大赚一笔。

研究公司CB Insights追踪市值在10亿美元或以上的创业公司，全球有35家涉足数据分析的公司位列其中。这些独角兽的总市值高达730亿美元，其中有一些自我描述为人工智能（AI）供应商。根据另一家研究公司PitchBook的数据，仅最大的六家就价值450亿美元（见图表1）。支持这些公司的许多风险资本家希望它们能在IPO上大获成功，就像一些地位不那么崇高的企业服务类创业公司在今年做到的那样——比如提供网络安全的CrowdStrike、支持视频会议的Zoom，等等。

正如在硅谷常见的那样，在咨询公司预测的庞大数字的推波助澜下，炒作永不止息。IDC估计，今年在大数据和商业分析软件上的支出将达到670亿美元。但拥护者说，数据分析最终将引领企业在生产率数字上看到计算机

时代的到来，摆脱诺贝尔奖得主罗伯特·索洛（Robert Solow）留下的阴影。据这位经济学家在1987年的观察，投资于信息技术对提高公司效率作用有限。电力在19世纪使装配线成为可能，因为机器不再需要聚集在一台中央蒸汽机的周围，与之类似地，数据分析公司承诺引入数字经济的装配线，将数据处理能力分散到有需要的地方。正如资深商业IT分析师乔治·吉尔伯特（George Gilbert）所指出的，它们也许还可以帮助各类企业创造出科技巨头们赖以崛起的那种网络效应：公司为客户提供的服务越好，收集到的数据就越多，这进而又会改进它们的服务，如此循环推进。

据高德纳（Gartner）的咨询师近期计算，到2021年，“AI增强”将创造2.9万亿美元的“商业价值”，并在全球范围内节省62亿个工时。麦肯锡去年的一项调查估计，到2030年，AI分析可能会使全球年度GDP增长约13万亿美元，即增长16%。零售和物流将获益最多（见图表2）。

数据分析若要达成这些期望，还有很长的路要走。从无数的源头和联网设备（即“物联网”）中提取并分析数据既困难又昂贵。尽管大多数公司都吹嘘自己炮制出了AI“平台”，但当中没有几个符合这个术语通常的定义。能称得上AI平台的通常是苹果和谷歌的智能手机操作系统之类，开发人员可以借助它们轻松打造兼容的应用。

AI平台会自动将原始数据转换为适宜算法处理的格式，并提供一套软件设计工具，即使编程技能有限的人也能使用。包括数据分析公司中最大的独角兽Palantir在内的许多公司销售高端定制服务——相当于为每个客户从零开始构建一个操作系统。亚马逊网络服务（AWS）、微软的Azure和谷歌云等云计算巨头为其企业客户提供标准化产品，但正如高德纳的吉姆·黑尔（Jim Hare）所解释的那样，这些产品的复杂程度要低得多，且将用户锁定在它们的网络中。

C3.ai闪亮登场。它成立的初衷是帮助公用事业公司管理电网——一个涉及收集并处理来自众多来源的数据的复杂问题。它一度处于破产的边缘，但依靠机器学习、传感器和数据连接方面的进步赢得了新的生机。它还凭借

这些进步重新包装产品，面向诸多行业。对企业客户而言至关重要的是，C3的方法源于西贝尔本人在企业软件方面的经验。他想为企业客户提供省心省力的数据分析，同时又不牺牲复杂精妙。

美国企业集团3M运用C3的软件找出可能存在争议的发货单，预先防范投诉。美国空军用它来确定飞机的哪些部件可能很快会出故障。C3正在帮助贝克休斯公司（Baker Hughes）为石油和天然气行业开发分析工具（这家石油服务公司的母公司通用电气试着完善自己的分析平台Predix，但困难重重）。

在建立真正的AI平台方面，C3的主要竞争对手不是大型科技公司，也不是最大的那几个数据分析独角兽，而是一家名为Databricks的公司。它于2013年由一些计算机奇才创建，在那之前他们开发了开源程序Apache Spark，可以实时处理来自传感器和其他联网设备的大量数据。为处理更多类型的数据，Databricks扩展了Spark。它主要向创业公司（如旅游网站Hotels.com）和媒体公司（Viacom）销售服务。它表示今年将产生2亿美元的收入，上次于2月融资时市值为28亿美元。

尽管C3和Databricks的利基业务目前并没有太多重叠，但未来不好说。它们出身不同，所采用的方法也有所不同。Databricks源自深奥的计算机科学，帮助客户有效地部署开源工具。而C3像大多数企业软件公司一样，销售专用应用程序。

目前还看不出哪家会占上风，眼下它们还是并驾齐驱。在短期内，市场还足够同时容纳两者，甚至更多方。从长期来看，会有一家公司研发出由AI辅助的数据分析，使用难度跟电子表格差不多。它可能会是C3或Databricks，也可能是来自纽约的Dataiku或旧金山的Domino Data Lab等较小的竞争对手——它们也在忙着架设AI平台。数据分析领域的其他独角兽也不大可能放弃尝试。而亚马逊、谷歌和微软等现有技术巨头希望在各种软件方面都占据主导，包括先进的数据分析。

西贝尔想必会第一个承认这场混战会有牺牲品。但这对数据分析软件的买

家来说无疑是个好兆头。在接下来的十年里，企业IT部门可能会对这类软件习以为常，就像如今它们很熟悉客户关系管理程序一样。■



Chaguan

Trucker culture, China-style

Hitching a ride with China's unsung army of 30m long-distance drivers

AROUND FIVE in the morning is the most lethal time on China's motorways, says a transport-industry veteran. The peril comes from long-distance lorry drivers, whose vehicles may have been rolling for days, pausing only for fuel and the rest stops required by law: 20 minutes every four hours, with no daily limit on driving. As dawn breaks, a long-haul trucker may be munching sunflower seeds and sipping cold tea to stay awake, while a driving partner dozes on a bunk bed. To help that partner sleep, the windows may be closed. The only sound may be the tinny tones of a satellite-navigation device. Such drivers "are like ticking bombs, you don't know if they are awake or asleep," says the veteran, adding that as a result wise travellers avoid highways until after seven.

If that makes drivers sound a bit unloved, the reality is sadder. Many Chinese do not think about long-haul lorries enough to be scared of them. China's 30m lorry drivers are vital but invisible. Their toil helped the country become a manufacturing juggernaut. It is now feeding a consumer-spending boom, as middle-class Chinese order anything from a sofa to a selfie-stick with a tap on a smartphone, for express delivery at cut-price rates. This explosion in mobility, involving the creation of a vast highway network and a high-tech logistics industry in less than a generation, has brought Chinese truckers neither fame nor respect. When America and western Europe experienced similar transport booms in the 20th century, popular culture made folk heroes of long-distance drivers—brawny, taciturn types who prefer to brave blizzards than obey a foreman on a factory floor. Hollywood made films about wisecracking, heartbreaking truckers outsmarting policemen and other authority figures. Country singers

recorded tributes like the hit of 1975, “Convoy” (“Ain’t nothin’ gonna get in our way”). Soon after becoming president Donald Trump invited truckers to the White House, climbed into a big rig and blasted its air horn, burnishing his blue-collar rebel credentials.

In contrast, China’s rulers are wary of authority-flouting loners. Greeting scooter-riding delivery workers in Beijing before the Chinese new year, President Xi Jinping offered them a thoroughly collective compliment, beaming that they were “busy as bees”.

Chaguan recently cadged a ride from Liu Chengbing, a 43-year-old lorry driver, as he began a run from Beijing to a chemicals plant in the coastal city of Jiaxing. Back in the 1990s drivers had a pretty high status, Mr Liu recalled. They earned good salaries, though most had only a middle-school education. They could make a still better living if they bought their own lorry and then touted for jobs, perhaps by handing out cards at factories. Self-employment is harder today. Margins are shrinking and repeat deliveries go to logistics firms. In June 2018 caravans of drivers used social media to organise nationwide protests about fuel prices, low incomes and the market dominance of a few, Uber-like load-finding apps.

Mr Liu sometimes takes his wife along in the cab to help with navigation, parking, food and accounts—a common practice. Like so many migrant workers, Mr Liu lives in the east, near Hangzhou, leaving his sons, 16 and 12, with their grandparents in rural Sichuan. Mr Liu can earn over 10,000 yuan (\$1,400) a month. At least as a specialist driver of dangerous goods his hours are limited, and night-driving banned. Asked why lorry drivers are not heroes in Chinese films, he snorts, adjusting the brace that he wears for a painful back. “When I load stuff at the factory, the security guard sort of orders me around. That shows you our status,” he says. Near Cangzhou, south of Beijing, a traffic jam allows Mr Liu time for a swift roadside pee, a cigarette and a spot of kung-fu style high-kicking. He does not chat with

nearby drivers. Truckers are not especially sociable, Mr Liu explains, back in the cab. One exception is on social media such as WeChat, where drivers share tips about bad traffic, good food and clean guesthouses. Some lorry drivers, including some of the roughly one in 25 who are women, have built followings on Kuaishou, a video-sharing app. Mr Liu does not fear self-driving lorries taking jobs. “Maybe for smaller cars,” he muses. But for big lorries like his, hauling a tank of sulphuric acid plastered with warning signs, “you’re going to need a guy.”

A nationwide survey of the industry, published by the Social Sciences Academic Press in 2018, found that more than 71% of drivers own their vehicles, often after borrowing heavily. A big majority are from rural areas and are married with children. On average, drivers see their families once every 20 days. Asked if they would like their children to drive lorries, nearly 96% said no.

Mats Harborn, a Beijing-based executive at Scania, a Swedish lorry-maker, has devoted years to promoting a Western-style “truck culture” in China, including driving contests that hail truckers as “heroes”. In part, this is to sell expensive imported lorries with fuel efficiency that makes them good value in the long run, but only if they are well driven. In part, Mr Harborn sees a broader need to help China develop a safe, sophisticated transport sector, rather than a “Wild East” industry plagued by overcapacity.

Imported lorries are mostly bought by big logistics firms, and give drivers bragging rights among their peers, says Harry Huang of Volvo Trucks, another Swedish firm. Their comfort and safety—including gadgets that brake automatically if they detect a sleepy driver—may help deal with the industry’s chronic recruitment problems, he suggests, standing on the sidelines of a Volvo driving contest in the southern province of Guangdong. One contestant, Shao Panpan, drives the same route all year, connecting Suzhou with Harbin, more than 2,300km to the north. Each leg involves four

days of non-stop driving, shared with a partner. He likes the job, and does not mind sharing a cab for days on end. "The partner thing is like a marriage, you need to get along and compromise," Mr Shao says. Still, round-the-clock driving is hard. "Our bodies wear out faster than other people's." He can expect little thanks. ■



茶馆

中国式卡车司机文化

中国3000万长途司机默默无闻，少人称颂。来搭一次便车看看

在中国的高速公路上，早上五点左右是最致命的时刻，一位运输业资深人士表示。危险来自长途货运司机。他们的车可能已经跑了几天，只在加油时停一停，此外就是按法律规定，每跑四小时休息20分钟（但一天驾驶的时长不限）。黎明时分，一名长途货运司机为了提神，也许正在嗑瓜子，喝冷掉的茶。而和他搭伴跑车的人正在驾驶室内的卧铺上打瞌睡。为了让同伴睡个安稳觉，车窗可能是关着的。唯一的声音也许就是卫星导航设备发出的微弱音调。这些司机“就跟定时炸弹差不多，你不知道他们是醒着还是睡着了。”这位资深人士说。所以，他补充说，明智的旅行者在早上七点前会避开高速公路。

如果你听了这些觉得司机们有点不受待见，那么现实就更让人难过了。在中国，许多人对长途货车关注不多，所以也不害怕它们。中国3000万卡车司机至关重要，但他们却是隐形人。他们的苦干帮助中国成为了一个制造业强国。如今中国正在推动一轮消费繁荣——中产阶级点一点智能手机就能下单购买从沙发到自拍杆的任何商品，而快递费用十分低廉。在不到一代人的时间里，一个巨大的高速公路网络和一个高科技物流业便建立起来。然而中国的卡车司机既没有从这种爆炸式的出行增长中收获名声，也没得到敬重。上世纪美国和西欧在经历类似的交通量大增时，流行文化将长途司机塑造成了民间英雄：健壮，沉默寡言，比起在工厂车间里听从工头的调遣，宁愿去直面暴风雪。好莱坞制作了以卡车司机为主角的电影，他们满嘴俏皮话又令人心碎，比警察和其他权威人物智高一筹。乡村歌手灌录了向他们致敬的歌曲，例如1975年的大热歌曲《车队（没有什么能够阻挡我们）》。特朗普当选总统不久后便邀请卡车司机作客白宫，还钻进一辆大卡车里大按喇叭，好好立了一把不羁的蓝领人设。

相比之下，中国的统治者对藐视权威的独行侠态度警觉。今年快过年的时

候，国家主席习近平在北京问候了骑着电瓶车的快递小哥，将他们完全作为一个群体给予夸赞，眉开眼笑地将他们比作“勤劳的小蜜蜂”。

近期，43岁的卡车司机刘成兵（Liu Chengbing，音译）从北京发车，前往沿海城市嘉兴的一家化工厂，本专栏作者请他载了自己一程。他回忆说，上世纪90年代，司机的地位相当高。虽然他们大多数人只受过中学教育，但工资很不错。如果他们自己买一辆卡车再去拉生意，比如在工厂发名片，日子可能还更好过。现在干个体户变难了。利润在萎缩，回头生意都流向了物流公司。2018年6月，长途货运司机群体利用社交媒体组织了全国性的抗议活动，表达对油价、低收入，以及类似优步的少数配货应用主导了市场的不满。

刘成兵有时会带上妻子一起出车，让她帮忙导航、停车、张罗吃饭和算账。这种安排很常见。和许多农民工一样，刘成兵住在中国东部，离杭州不远，他16岁和12岁的儿子跟祖父母一起住在四川的农村。他一个月可以赚一万多块。因为他专门运送危险品，所以至少工作时长是受限的，夜间驾驶更是被禁止。当被问到为什么货车司机在中国电影里当不上主人公时，他哼了一声，调整了下穿在身上缓解背痛的护具说，“我在厂子里装货的时候，保安对我简直是呼来喝去。你说我们是啥地位。”快到北京以南的沧州时遇到了交通堵塞，刘成兵总算有时间到路边快速小解，再抽根烟，找一小块儿空地像耍功夫一般踢踢腿。他没和附近的司机聊天。回到驾驶室后他解释说，卡车司机都不是特别善于交际。不过在微信等社交媒体上例外，司机们在上面分享哪里堵车、哪里东西好吃、哪里旅店干净等信息。包括部分女司机（每25名长途货运司机中大概有一名女性）在内的一些货运司机已在视频分享应用快手上收获了粉丝。刘成兵不担心无人驾驶卡车来抢饭碗。“开小型车的也许会担心。”他沉思道。但如果是他开的这种拉着一罐硫酸、贴满了警示标志的大卡车，“那还是需要一个大活人。”

社会科学文献出版社去年发布了对该行业的一项全国性调查结果，显示超过71%的司机拥有自己的卡车，通常是通过大量举债购置的。绝大多数人来自农村地区，已婚并育有子女。平均而言，司机们每20天见一次家人。

当被问是否希望自己的孩子也去开卡车时，近96%的人回答“不”。

瑞典卡车制造商斯堪尼亚（Scania）驻北京的高管何墨池（Mats Harborn）多年来一直致力于在中国推广西方式的“卡车文化”，其中包括将卡车司机誉为“英雄”的驾驶竞赛。这在一方面是为了促进销售昂贵的进口卡车——它们燃油效率高，从长远来看相当划算，但要合理驾驶才行。而在另一方面，何墨池看到了一个更广泛的需求：帮助中国发展出一个安全、先进的运输业，而不是一个受产能过剩困扰的“狂野东部”产业。

另一家瑞典公司沃尔沃卡车的黄强表示，进口卡车的买家多是大型物流公司，这让它们的司机在同行中有了炫耀的资本。他认为，进口卡车的舒适性和安全性（比如装载了小设备，能察觉驾驶员昏昏欲睡并自动刹车）也许有助于解决这个行业里长期存在的招不到人的问题。说这番话时，他正站在广东一场沃尔沃驾驶比赛的赛场边。参加这场比赛的选手邵攀攀（Shao Panpan，音译）全年都行驶在连接苏州和哈尔滨的同一条路线上，从南到北距离超过2300公里。单次车程耗时四天，他和一个搭档轮着开车，途中无休。他喜欢这份工作，不介意一连几天与人共用一辆车。“搭伙跑车就像结婚，得好好相处，还得做出妥协。”他说。尽管如此，夜以继日地开车仍然很艰辛。“我们的身体损耗得比别人都快。”这并不会换来别人多少感谢。 ■



AI and war

Battle algorithm

Artificial intelligence is transforming every aspect of warfare

AS THE NAVY plane swooped low over the jungle, it dropped a bundle of devices into the canopy below. Some were microphones, listening for guerrilla footsteps or truck ignitions. Others were seismic detectors, attuned to minute vibrations in the ground. Strangest of all were the olfactory sensors, sniffing out ammonia in human urine. Tens of thousands of these electronic organs beamed their data to drones and on to computers. In minutes, warplanes would be on their way to carpet-bomb the algorithmically-ordained grid square. Operation Igloo White was the future of war—in 1970.

America's effort to cut the Ho Chi Minh trail running from Laos into Vietnam was not a success. It cost around \$1bn a year (about \$7.3bn in today's dollars)—\$100,000 (\$730,000 today) for every truck destroyed—and did not stop infiltration. But the allure of semi-automated war never faded. The idea of collecting data from sensors, processing them with algorithms fuelled by ever-more processing power and acting on the output more quickly than the enemy lies at the heart of military thinking across the world's biggest powers. And today that is being supercharged by new developments in artificial intelligence (AI).

AI is “poised to change the character of the future battlefield”, declared America's Department of Defence in its first AI strategy document, in February. A Joint Artificial Intelligence Centre (JAIC) was launched in the Pentagon in summer 2018, and a National Security Commission on Artificial Intelligence met for the first time in March. The Pentagon's budget for 2020 has lavished almost \$1bn on AI and over four times as much on unmanned

and autonomous capabilities that rely on it.

A similar flurry of activity is under way in China, which wants to lead the world in AI by 2030 (by what measure is unclear), and in Russia, where President Vladimir Putin famously predicted that “whoever becomes the leader in this sphere will become the ruler of the world”. But the paradox is that AI might at once penetrate and thicken the fog of war, allowing it to be waged with a speed and complexity that renders it essentially opaque to humans.

AI is a broad and blurry term, covering a range of techniques from rule-following systems, pioneered in the 1950s, to modern probability-based machine learning, in which computers teach themselves to carry out tasks. Deep learning—a particularly fashionable and potent approach to machine learning, involving many layers of brain-inspired neural networks—has proved highly adept at tasks as diverse as translation, object recognition and game playing (see chart). Michael Horowitz of the University of Pennsylvania compares AI to the internal combustion engine or electricity—an enabling technology with myriad applications. He divides its military applications into three sorts. One is to allow machines to act without human supervision. Another is to process and interpret large volumes of data. A third is aiding, or even conducting, the command and control of war.

Start on the battlefield. The appeal of autonomy is obvious—robots are cheaper, harder and more expendable than humans. But a machine capable of wandering the battlefield, let alone spilling blood on it, must be intelligent enough to carry that burden—an unintelligent drone will not survive for long in a battle; worse still, an unintelligent gun-toting robot is a war crime waiting to happen. So AI is required to endow machines with the requisite skills. Those include simple ones, like perception and navigation,

and higher-order skills, like co-ordination with other agents.

Intelligent machines that combine these abilities can do things that individual humans cannot. “Already, an AI system can outperform an experienced military pilot in simulated air-to-air combat,” notes Kenneth Payne of King’s College London. In February, the Defence Advanced Research Projects Agency (DARPA), the Pentagon’s blue-sky-thinking branch, conducted the latest test of a six-strong drone swarm capable of collaborating in a “high-threat” environment, even when cut off from human contact.

For all that, most such systems embody intelligence that is narrow and brittle—good at one task in a well-defined environment, but liable to fail badly in unfamiliar settings. So existing autonomous weapons are comprised of either loitering missiles that smash into radars or quick-firing guns that defend ships and bases. Useful, but not revolutionary—and neither requires the fancy machine-learning techniques pioneered in recent years.

It would be a mistake to think that AI is useful only for battlefield drudgery. Robots, killer or otherwise, must act on what they see. But for many military platforms, like spy planes and satellites, the point is to beam back raw data that might be turned into useful intelligence. There is now more of that than ever before—in 2011 alone, the most recent year for which there are data, America’s 11,000-or-so drones sent back over 327,000 hours (37 years) of footage.

Most of that has lain unwatched. Luckily, the second major application for AI in the armed forces will be in processing data. In lab-based tests, algorithms surpassed human performance in image classification by 2015 and nearly doubled their performance in a tougher task, object segmentation, which involves picking out multiple objects from single

images, between 2015 and 2018, according to Stanford University's annual index of AI progress. Computer vision is far from perfect and can be exploited in ways that would not fool a human observer. In one study, altering 0.04% of the pixels in an image of a panda—imperceptible to humans—caused the system to see a gibbon instead.

Those weaknesses notwithstanding, by February 2017 the Pentagon itself concluded that deep-learning algorithms “can perform at near-human levels”. So it established the “Algorithmic Warfare” team, known as Project Maven, which uses deep learning and other techniques to identify objects and suspicious actions, initially in footage from the war against Islamic State and now more widely. The aim is to produce “actionable” intelligence—the sort that often ends with bombs falling or special forces kicking in doors.

An insider with knowledge of Project Maven says that the benefits to analysts—in terms of time savings and new insights—remain marginal for now. Wide-angle cameras that can see across entire cities throw up large numbers of false positives, for instance. “But the nature of these systems is highly iterative,” he says. Progress is rapid and Project Maven is just the tip of the iceberg.

Earth-i, a British company, can apply machine-learning algorithms from a range of satellites to identify different variants of military aircraft across dozens of bases with over 98% accuracy (see main picture), according to Sean Corbett, a retired air vice-marshall in the Royal Air Force (RAF) who now works for the firm. “The clever bit”, he says, “is then developing methods to automatically identify what is normal and what is not normal.” By watching bases over time, the software can distinguish routine deployments from irregular movements, alerting analysts to significant changes.

Algorithms, of course, are omnivorous and can be fed any sort of data, not

just images. “Bulk data combined with modern analytics make the modern world transparent,” noted Sir Alex Younger, the head of MI6, Britain’s spy agency, in December. In 2012 leaked documents from the NSA, America’s signals-intelligence agency, described a programme (reassuringly called Skynet), which applied machine learning to Pakistani mobile-phone data in order to pick out individuals who might be couriers for terrorist groups. Who, for instance, had travelled from Lahore to the border town of Peshawar in the past month—and turned off or swapped their handset more often than usual? “It’s beginning to shift intelligence from the old world, where commanders asked a question and intelligence agencies used collection assets to find the answer, to a world where answers are in...the cloud,” says Sir Richard Barrons, a retired general who commanded Britain’s joint forces until 2016.

Indeed, the data in question need not always come from an enemy. JAIC’s first project was neither a weapon nor a spying tool, but a collaboration with special forces to predict engine failures in their Black Hawk helicopters. The first version of the algorithm was delivered in April. Air-force tests on command-and-control planes and transporters showed that such predictive maintenance could reduce unscheduled work by almost a third, which might allow big cuts in the \$78bn that the Pentagon currently spends on maintenance.

The point of processing information, of course, is to act on it. And the third way AI will change warfare is by seeping into military decision-making from the lowly platoon to national headquarters. Northern Arrow, a tool built by UNIQAI, an Israeli AI firm, is one of many products on the market that helps commanders plan missions by crunching large volumes of data on variables such as enemy positions, weapon ranges, terrain and weather—a process that would normally take 12 to 24 hours for soldiers the old-fashioned way by poring over maps and charts. It is fed with data from books and manuals—say, on tank speeds at different elevations—and also from

interviews with experienced commanders. The algorithm then serves up options to harried decision-makers, along with an explanation of why each was chosen.

These “expert system” platforms, such as Northern Arrow and America’s similar CADET software, can work far quicker than human minds—two minutes for CADET compared with 16 person-hours for humans, in one test—but they tend to employ rule-following techniques that are algorithmically straightforward. By historical standards this would be considered AI, but most use deterministic methods, which means that the same inputs will always produce the same outputs. This would be familiar to the soldiers who used the outputs of ENIAC, the world’s first electronic general-purpose computer, which generated artillery firing tables in 1945.

In the real world, randomness often gets in the way of making precise predictions, so many modern AI systems combine rule-following with added randomness as a stepping stone to more complex planning. DARPA’s Real-time Adversarial Intelligence and Decision-making (RAID) software aims to predict the goals, movements and even the possible emotions of enemy forces five hours into the future. The system relies on a type of game theory that shrinks down problems into smaller games, reducing the computational power required to solve them.

In early tests between 2004 and 2008, RAID performed with greater accuracy and speed than human planners. In simulated two-hour battles in Baghdad, human teams were pitted against either RAID or other humans; they could tell them apart less than half the time. The retired colonels drafted to simulate Iraqi insurgents “got so scared” of the software, notes Boris Stilman, one of its designers, that “they stopped talking to each other and used hand signals instead”. RAID is now being developed for army use.

The latest deep-learning systems can be the most enigmatic of all. In March

2016, AlphaGo, a deep-learning algorithm built by DeepMind, beat one of the world's best players in Go, an ancient Chinese strategy game. In the process it played several highly creative moves that confounded experts. The very next month, China's Academy of Military Science held a workshop on the implications of the match. "For Chinese military strategists, among the lessons learned from AlphaGo's victories was the fact that an AI could create tactics and stratagems superior to those of a human player in a game that can be compared to a war-game," wrote Elsa Kania, an expert on Chinese military innovation.

In December 2018 another of DeepMind's programs, AlphaStar, trounced one of the world's strongest players in StarCraft II, a video game played in real-time, rather than turn-by-turn, with information hidden from players and with many more degrees of freedom (potential moves) than Go. Many officers hope that such game-playing aptitude might eventually translate into a flair for inventive and artful manoeuvres of the sort celebrated in military history. Michael Brown, director of the Defence Innovation Unit, a Pentagon body tasked with tapping commercial technology, says that AI-enabled "strategic reasoning" is one of his organisation's priorities.

But if algorithms that surpass human creativity also elude human understanding, they raise problems of law, ethics and trust. The laws of war require a series of judgments about concepts such as proportionality (between civilian harm and military advantage) and necessity. Software that cannot explain why a target was chosen probably cannot abide by those laws. Even if it can, humans might mistrust a decision aid that could outwardly resemble a Magic 8-Ball.

"What do we do when AI is applied to military strategy and has calculated the probabilistic inferences of multiple interactions many moves beyond that which we can consider," asks wing-commander Keith Dear, an RAF

intelligence officer, “and recommends a course of action that we don’t understand?” He gives the example of an AI that might propose funding an opera in Baku in response to a Russian military incursion in Moldova—a surreal manoeuvre liable to baffle one’s own forces, let alone the enemy. Yet it might result from the AI grasping a political chain of events that would not be immediately perceptible to commanders.

Even so, he predicts that humans will accept the trade-off between inscrutability and efficiency. “Even with the limitations of today’s technology, an AI might support, if not take over, decision-making in real-world warfighting” by using a “massive near-real-time simulation”.

That is not as far-fetched as it sounds. Sir Richard Barons points out that Britain’s defence ministry is already purchasing a technology demonstrator for a cloud-based virtual replication of a complex operating environment—known as a single synthetic environment—essentially a military version of the software that powers large-scale online video games such as “Fortnite”. It is built by Improbable, a gaming company, and CAE, known for its flight simulators, using open standards, so everything from secret intelligence to real-time weather data can be plugged in. “It will revolutionise how command and control is done,” says Sir Richard, as long as there are plentiful data, networks to move it and cloud computing to process it. That would allow a “single synthetic command tool from the national security council down to the tactical commander”.

Western governments insist that humans will be “on the loop”, supervising things. But even many of their own officers are not convinced. “It seems likely humans will be increasingly both out of the loop and off the team in decision-making from tactical to strategic,” says Commander Dear. The expectation that combat will speed up “beyond the capabilities of human cognition” recurs in Chinese writing, too, says Ms Kania. The result would not only be autonomous weapons, but an automated battlefield. At the

outset of a war, interconnected AI systems would pick out targets, from missile launchers to aircraft-carriers, and choreograph rapid and precise strikes to destroy them in the most efficient order.

The wider consequences of that remain unclear. The prospect of accurate and rapid strikes “could erode stability by increasing the perceived risk of surprise attack”, writes Zachary Davis in a recent paper for the Lawrence Livermore National Laboratory. But AI might equally help defenders parry such blows, by identifying the telltale signs of an impending strike. Or, like America’s sensor-scattering spree in the Vietnamese jungle in the 1960s, such schemes could wind up as expensive and ill-conceived failures. Yet no power wants to risk falling behind its rivals. And here, politics, not just technology, may have an impact.

The Pentagon’s spending on AI is a fraction of the \$20bn-30bn that was spent by large technology firms in 2016. Although many American companies are happy to take defence dollars—Amazon and Microsoft are nearing a \$10bn cloud-computing contract with the Pentagon—others are more skittish. In June 2018 Google said it would allow its \$9m contract for work on Project Maven to lapse this year, after 4,000 employees protested the company’s involvement in “warfare technology”.

In China, on the other hand, firms can be easily pressed into the service of the state and privacy laws are a minor encumbrance. “If data is the fuel of AI, then China may have a structural advantage over the rest of the world,” warned Robert Work, a former US deputy secretary of defence, in June. Whether civilian data can fuel military algorithms is not clear, but the question plays on the minds of military leaders. JAIC director General Jack Shanahan expressed his concerns on August 30th: “What I don’t want to see is a future where our potential adversaries have a fully AI-enabled force and we do not.” ■



人工智能与战争

作战算法

人工智能正在改变战争的方方面面

海军的飞机俯冲到丛林上方，向下面的树冠投放了一捆装置。其中有侦听游击队脚步声或卡车点火声的拾音器，还有探测地面微小振动的地震探测器，而最奇怪的当属能嗅出人体尿液中的氨气的嗅觉传感器。几万个此类电子装置将收集到的数据发送给无人机和计算机。几分钟之内，战机就会按照算法标定的坐标网格展开地毯式轰炸。这个名为Igloo White的行动展示了未来战争的形态——不过这是在1970年。

美国试图通过这项行动切断从老挝进入越南的胡志明小道，不过以失败告终。它每年耗资约10亿美元（相当于现在的73亿美元）——其中每摧毁一辆卡车就要花费10万美元（相当于现在的73万美元），却仍未能切断这条支援路线。但半自动化战争的诱惑却从未消退。利用传感器收集数据，由不断增强的处理能力支持算法分析数据，并根据处理结果先发制人，这种想法是世界列强的核心军事思想。如今，人工智能（AI）的新发展为它提供了强大的驱动力。

美国国防部2月在首次发布的AI战略文件中宣布，AI“已准备好改变未来战场的特征”。去年夏天，联合人工智能中心（以下简称JAIC）在五角大楼成立。今年3月，国家人工智能安全委员会（National Security Commission on Artificial Intelligence）首次召开会议。五角大楼2020年在AI上的预算高达近10亿美元，此外还有四倍于此的预算用于依赖AI的无人驾驶和自主控制能力。

中国也在进行一系列相似的行动，它希望在2030年之前能在AI领域引领世界（按什么标准来衡量就不得而知了）。俄罗斯总统普京有一句著名的预言：“谁成为这个领域的统帅，谁就将成为世界的主宰。”但矛盾的是，AI可能会在穿透战争迷雾的同时让战争更加迷雾重重，它将极大地提升战争

的速度和复杂性，让人类难以看透。

AI是一个宽泛而模糊的术语，涵盖了一系列技术，从上世纪50年代开创的遵循规则的系统，到现代基于概率的机器学习（计算机自学如何执行任务），不一而足。深度学习是一种特别时兴和有效的机器学习方法，涉及受人类大脑启发而来的多层神经网络，已在翻译、目标识别和游戏等不同类型的任务中展现出很强的能力（见图表）。宾夕法尼亚大学的迈克尔·霍洛维兹（Michael Horowitz）认为AI和内燃机或电力一样，是可以支持无数应用的使能技术（enabling technology）。他将AI在军事领域的应用分为三类，一是让机器在无人监督的情况下行动，二是处理和解释大量数据，三是协助甚至直接指挥和控制战争。

先从战场说起。能自主行动的机器显然很吸引人——机器人比人类士兵成本低、更大胆强悍，也更不怕被牺牲掉。但一台能在战场上驰骋甚至杀戮的机器必须足够聪明才能承担这种重任。低智力的无人机在战斗中存活不了多久。更糟糕的是，低智能的武装机器人随时可能犯下战争罪行。因此AI需要赋予机器必要的技能，包括感知和导航等简单技能，以及与其他战争主体协调行动等高阶技能。

综合了这些技能的智能机器可以做到人类个体无法完成的事情。伦敦国王学院的肯尼斯·佩恩（Kenneth Payne）指出：“AI系统在模拟空战中的表现已经优于经验丰富的空军飞行员。”今年2月，五角大楼的创新部门国防部高级研究计划局（DARPA）对六架无人机组成的机群进行了最新测试。这个机群在切断了与人类的联系后仍能在“高威胁”环境中协同作战。

尽管如此，大多数此类系统所展现的智能都是狭隘和脆弱的——能在明确定义的环境中完成某项任务，但在不熟悉的环境中容易一败涂地。因此，现有的自主武器要么是打击雷达的巡航导弹，要么是用于护卫船只和基地的速射炮。有用，但并非革命性的——近年来开创的复杂花哨的机器学习技术对它们来说也非必需。

如果认为AI仅能运用于战场上的苦差事就错了。不管是否要杀戮，机器人

必须见机行事。但对于许多侦察机和卫星之类的军事平台而言，关键在于发回可能转化为有用情报的原始数据。现在这类数据比以往任何时候都多——仅在2011年，也就是有此类数据的最近年份，美国约1.1万架无人机就发回了超过32.7万小时（37年）的视频。

这些视频大部分都闲置着没人看。幸好，AI在军队里的第二项主要应用将是处理数据。根据斯坦福大学每年发布的AI进展指数，在实验室测试中，算法在图像分类方面的表现在2015年超越了人类；在更困难的对象分割（从单张图像中挑选出多个对象）任务方面，从2015年到2018年，算法的表现几乎提高了一倍。计算机视觉远未完善，可以用愚弄不了人类观察者的方式干扰它们。在一项研究中，仅改变了熊猫图像中0.04%的像素——是人类觉察不到的变化——就让系统把图像认成了长臂猿。

尽管存在这些不足，2017年2月，五角大楼自己得出的结论是深度学习算法“可以以接近人类的水平完成任务”。因此，它成立了被称作“行家项目”（Project Maven）的“算法战争”团队，利用深度学习等技术来识别对象和可疑行为。最初分析的是对伊斯兰国组织（Islamic State）作战的视频，现在的分析范围更广泛。其目的是产生“可执行的”情报，往往会促使发动轰炸或派特种部队突袭行动。

一位了解该项目的内部人士表示，目前情报分析师在节省时间和获得新洞见方面得到的帮助仍然微不足道。例如，监控整个城市的广角摄像头会产生大量误报。“但这些系统本质上是高度迭代的。”他说。进展很快，而行家项目只是冰山一角。

英国公司Earth-i可以在一系列卫星上应用机器学习算法，以超过98%的准确度识别数十个军事基地中不同型号的军用飞机（见主图），目前在该公司任职的英国皇家空军退役少将肖恩·科比特（Sean Corbett）表示。“高明的部分就是接下来正在开发的能自动识别正常情况和非正常情况的方法。”他说。观察基地一段时间后，软件可以区分常规部署和非常规调动，提醒分析师注意重大变化。

当然，算法不挑食，任何类型的数据都可以输入，而不限于图像。英国间谍机构军情六处的负责人亚历克斯·扬格（Alex Younger）去年12月表示：“大量数据加上现代分析，会让现代世界变得透明。”2012年，美国信号情报机构国家安全局（NSA）泄露的文件描述了一项计划（它有一个令人安心的名字——“天网”[Skynet]），该计划用机器学习分析巴基斯坦的移动电话数据，以找出可能是恐怖组织信使的人。举例来说，过去一个月谁曾从拉合尔（Lahore）去过边境城镇白沙瓦（Peshawar），而且比往常更频繁地关闭或更换手机？2016年前任英国联合部队司令的退役将军理查德·巴伦（Richard Barrons）说：“情报工作的面貌已经开始转变。从前，指挥官提出问题，情报机构通过情报人员来找答案，现在，答案都在……云上。”

实际上，所涉数据并不总是来自敌人。JAIC的第一个项目既非武器也非间谍工具，而是与特种部队合作预测黑鹰直升机的发动机何时发生故障。其算法的第一个版本于4月交付。空军针对指挥控制型飞机和运输机的测试表明，这种预见性维护可以减少近三分之一的计划外工作量，这也许能大幅减少五角大楼目前780亿美元的维护支出。

处理信息当然是为了据此采取行动。AI将改变战争的第三种方式就是参与从基层连队到国家总部的军事决策。以色列AI公司UNIQAI打造的工具Northern Arrow是市场上的众多产品之一，通过处理大量有关敌方阵地、武器射程、地形和天气等变量的数据来协助指挥官制定任务计划。这一过程如果换做士兵研究地图和图表的老办法，通常耗时12至24小时。

Northern Arrow的数据来源是书籍和手册（例如坦克在不同海拔的速度）以及对经验丰富的指挥官的访谈。然后，算法为焦头烂额的决策者提供不同的方案选项，并解释每个方案背后的逻辑。

Northern Arrow和美国类似的CADET软件等“专家系统”平台的效率比人脑高得多——在一次测试中，CADET在两分钟内完成了人类需要16个工时的工作。不过这些平台一般采用在算法上直截了当的遵循规则的技术。从历史标准来看这可以算作AI，但大多用的是确定性方法，也就是说相同的输入将始终产生相同的输出。当年使用“埃尼阿克”（ENIAC，电子数字积分

计算机）的输出数据的士兵对此并不陌生。埃尼阿克是世界上第一台通用计算机，在1945年生成了炮弹弹道射表。

在现实世界中，随机性经常会妨碍精确预测，因此许多现代AI系统将遵循规则与额外随机性结合起来，以辅助更复杂的规划。DARPA的“实时对抗智能与决策”（RAID）软件力争预测未来五小时内敌人的目标、动向、甚至可能的情绪状态。这个系统依赖的是一种博弈理论，把问题缩小为更小的博弈，降低了解决问题所需的计算能力。

在2004年至2008年的早期测试中，RAID的准确度和速度都高于人类作战计划人员。在模拟的两小时巴格达战斗中，人类团队与RAID或其他人类展开对抗。人类只在不到一半的时间里分辨出了对手是人还是计算机。征召来模拟伊拉克叛乱分子的退役上校们“很怕”这个软件，RAID的设计师之一鲍里斯·斯蒂尔曼（Boris Stilman）说，“他们不再用言语交谈，而是改用手势”。研发人员正在开发RAID供军队使用。

最新的深度学习系统可能是最神秘的。2016年3月，由DeepMind构建的深度学习算法AlphaGo击败了一位世界顶尖围棋手。在对局中，它走的几乎棋极具创意，让一众高手困惑不已。一个月之后，中国军事科学院就此次人机大赛的影响举办了一场研讨会。研究中国军事创新的专家埃尔莎·卡尼亚（Elsa Kania）写道：“中国的军事战略家从AlphaGo的胜利中汲取的经验教训之一是，AI可以在堪比作战游戏的棋盘游戏中创造出优于人类玩家的战术和策略。”

去年12月，DeepMind的另一个程序AlphaStar击败了《星际争霸II》的全球最强玩家之一。《星际争霸II》是一款即时电子游戏，而不是一步接一步地进行，信息对玩家隐藏，比围棋的自由度更高（潜在的招数也就更多）。许多军官希望这种玩游戏的能力最终可以转化为军事历史上推崇的那种创新而巧妙的操纵才能。五角大楼负责利用商业技术的国防创新部门（Defence Innovation Unit）的主管迈克尔·布朗（Michael Brown）表示，AI辅助的“战略推理”是其部门的工作重点之一。

但是，如果超越人类创造力的算法同时也超出了人类的理解力，就会引发法律、伦理和信任的问题。战争法要求就比例原则（平民遭受的伤害和军事优势之间的权衡）和必要性等概念做出一系列判断。如果软件无法解释为何选择某个目标，可能就无法遵守这些法律。即使它可以解释，人类可能也不信任一个看起来好像“魔力八号球”那般随机的决策辅助工具。

“AI应用于军事战略后，如果计算出了多重交互的概率推论，大大超出了人类可以考虑的范围，并推荐了一个我们无法理解的行动方案，这时我们该怎么做？”英国皇家空军情报官凯斯·迪尔（Keith Dear）中校问道。他举了个例子：为了回应俄罗斯对摩尔多瓦（Moldova）的军事入侵，AI可能会提议在巴库（Baku）资助一部歌剧——敌人自不必说，自己人可能也会为这种离奇的策略挠头。然而，AI提出这样的建议，可能是因为它掌握了指挥官无法立即察觉到的一系列政治事件动向。

即便如此，他预测人类也将接受在难以理解和决策效率之间做取舍。通过“大规模近实时模拟”，“即使现在仍有技术局限，AI也可能支持甚至接手实战决策”。

这并不像听上去那么难以置信。理查德·巴伦指出，英国国防部已经购买了一款技术演示软件，用于对复杂行动环境（称为单一综合环境）进行基于云的虚拟复制，实质上是驱动《堡垒之夜》（Fortnite）等大型在线游戏的软件的军用版。它由游戏公司Improbable和以飞行模拟器而闻名的加拿大航空电子设备公司（CAE）设计，使用开放标准，因此可以接入从秘密情报到实时天气数据的所有信息。只要有丰富的数据、传输数据的网络和处理数据的云计算能力，“它将彻底改变指挥和控制的方式。”理查德说。这样，“上至国家安全委员会，下至战术指挥官，都可以使用单一的综合指挥工具”。

西方政府坚持要求人在“回路上”，负责监督。但即使是很西方国家的军官对此都没有信心。“从战术决策到战略决策，人类似乎将越来越多地被挤出回路之外，排除出决策团队。”迪尔中校说。卡尼亚说，在中国人的

著述中，战斗速度将“超越人类认知能力”的预期屡屡出现。结果就是不仅武器将变得自主，战场也会变得自动化。战争开始时，互联的AI系统将挑选目标，可能是导弹发射器，也可能是航空母舰，并设计快速和精准的打击方案，以最高效的顺序摧毁目标。

更大范围内的影响仍不得而知。扎克里·戴维斯（Zachary Davis）在最近为劳伦斯·利弗莫尔国家实验室（Lawrence Livermore National Laboratory）撰写的一篇报告中写道，可以实施快速精准的打击“可能会破坏局势稳定，因为可以想见的是，突袭的风险将增加”。但通过识别即将遭受打击的迹象，AI可能同样可以帮助防御方抵御这样的打击。AI方案也可能代价高昂但计划不周，最后沦为败笔，就像上世纪60年代美国在越南丛林中大量投放传感器的做法那样。然而，没有任何国家愿意冒险落后于竞争对手。而在这一方面，可能会产生影响的不仅仅是技术，还有政治。

大型科技公司2016年在AI上的支出为200亿至300亿美元，相比之下，五角大楼在这方面的投入是小巫见大巫。虽然许多美国公司乐于发军火财——亚马逊和微软即将与五角大楼达成100亿美元的云计算合同，但其他公司的态度要更加游移不定。2018年6月，谷歌表示其与行家项目的900万美元合同在当年到期后将不再续约，在此之前有4000名谷歌员工抗议公司参与发展“战争技术”。

而在中国，企业很容易受到压力而为政府服务，隐私法规也只是个小障碍。美国前国防部副部长罗伯特·沃克（Robert Work）在6月警告说：“如果说数据驱动了AI，那么中国可能比世界其余地区都具有结构性优势。”民用数据能否驱动军事还很难说，但这个问题盘旋在各国军事领导人的头脑中。JAIC的负责人杰克·沙纳汉（Jack Shanahan）中将在8月30日表达了他的担忧：“我不希望看到未来我们的潜在对手拥有全AI赋能的军队，我们却没有。”■



The altered Arctic

Ice would suffice

The consequences of a rapidly warming Arctic will be felt far afield

AROUND 320BC, a Greek merchant called Pytheas set off for a long journey north. He brought back reports of a land called Thule, six days north of Scotland, “where... there are no nights during the [summer] solstice...and also no days during the winter solstice”. It is unclear if Pytheas made it there himself, or merely heard tales. But for this and his account of a “congealed sea”, he is said to have been one of the first Arctic explorers. Were he to return today, he would find a very different landscape.

Temperatures in the Arctic are warming twice as fast as the global average. One driver is the melting of floating sea ice. When it vanishes, it exposes deep blue waters, which absorb more solar energy than white ice does. In turn, this speeds up melting: a classic positive-feedback loop. The ice recedes to an annual minimum extent every September. The record low was set in 2012; 2007 and 2016 are joint second. This year is expected to be level with them.

The best-known consequence of Arctic heating is rising sea levels. Melting sea ice does not raise the water level, for the same reason that melting ice cubes do not make a cup overflow. However, water trapped on land in Greenland’s ice cap does increase the sea level when it melts into the ocean.

Greenland has 2.85m cubic kilometres of ice, enough to lift sea levels seven metres. For now, it is melting slowly. Sea levels are rising by an average of 3.3mm per year; owing to an unusually hot summer in 2019, Greenland will contribute about 1mm.

Another feedback loop involves frozen soil. Normal garden soil consists

of 5% carbon; soil in Arctic permafrost regions, rich in organic matter, contains 20-50%. It is thought to hold a total of 1.1-1.5trn tonnes of carbon, more than the atmosphere and ten times as much as the Amazon.

As the Arctic warms, bacteria in the soil consume organic matter faster, releasing more carbon dioxide and methane. These gases can then speed up the greenhouse effect—heating the permafrost further and causing more emissions. This July the Siberian tundra warmed and dried enough to catch fire for weeks, a very unusual event.

The third threat posed by Arctic warming is less scientifically certain but more immediate. Higher Arctic temperatures are thought to affect weather patterns in the northern mid-latitudes, where weather systems form as a result of the temperature gap between the hot tropics and cool pole. The jet stream pushes them west to east.

Some evidence suggests that as the temperature difference shrinks, the jet stream weakens and its wavy pattern deepens. This allows “tongues” of frigid air to reach south, and warm pockets to approach the Arctic Circle. It may also cause both storms and clear skies to stay in place for longer, leading to extended floods and dry spells.

Climate-change sceptics point to cold snaps in North America as evidence that concern about global warming is overheated. In fact such days, caused by chilly air escaping polar latitudes, may be a consequence of Arctic warming. ■



变样的北极

靠冰就够了

北极迅速变暖，影响将波及远方

大约公元前320年，一个名叫皮西亚斯（Pytheas）的希腊商人出发北上，展开了一段漫长的旅程。他回来后讲述说，有一片极北之地（Thule），从苏格兰往北走六天到达，“那里……夏至无黑夜……冬至无白昼”。无从知晓这是皮西亚斯的亲身经历还是他道听途说得来，但因为这些说法还有他对“冻海”的描述，皮西亚斯被说成是最早的北极探险家之一。假如他现在重返北极，会发现那里的地貌景观已经截然不同。

北极变暖的速度是全球平均水平的两倍。原因之一是海面浮冰融化。浮冰消失，露出深蓝的海水，而海水比白色冰块更能吸收太阳的热能。这又加快了冰面融化的速度——典型的正反馈循环。每年9月，北极的冰量会降到年度最低水平。最低纪录是在2012年，2007年和2016年并列第二低。预计今年的情况会和这几年差不多。

北极变暖最为人所知的后果是海平面上升。海冰融化不会导致海平面升高，跟冰块融化不会让水溢出杯子是一个道理。但是，格陵兰岛陆地上冰盖中封存的水融化流入海洋会令海平面上升。

格陵兰岛有285万立方千米的冰，足以令海平面升高七米。就目前而言，这些冰融化的速度还很缓慢。海平面平均每年上升3.3毫米，而由于今年夏季异常炎热，单是格陵兰岛的融冰就将让海平面上升约1毫米。

另一个反馈循环和冻土有关。普通的花园土壤含有5%的碳，而北极永冻土区的土壤富含有机质，碳含量达20%至50%。据推算，北极含碳总量为1.1到1.5万亿吨，比大气中的总含量还多，是亚马孙地区含量的十倍。

随着北极变暖，土壤中的细菌消耗有机物的速度加快，释放出更多二氧化碳和甲烷。这些气体又会加快温室效应：令永冻土进一步变暖，导致排放

加剧。今年7月，西伯利亚苔原干燥暖热，导致起火数周，是个非同寻常的现象。

北极变暖的第三个威胁在科学上尚无定论，但影响更为直接。北极气温上升被认为会影响北部中纬度地区（其天气系统是热带地区和寒冷极地之间温度差的产物）的天气模式。高空急流自西向东影响天气变化。

一些证据表明，随着温度差缩小，高空急流减弱，路线波动加剧。这让寒冷的空气“舌”到达南方，也让温暖的空气团进入北极圈，还可能导致暴风雨或晴天持续更久，导致洪水泛滥或干旱。

质疑气候变化的人以北美遭受的寒流为证，认为全球变暖是过分担忧。但事实上，由于寒冷空气逸出极地而导致的寒流可能正是北极变暖的结果。





The Economist film

How could veganism change the world?

The environmental impacts of the food system are daunting, it's responsible for about a quarter of all green-house gas emissions and uses about 70% of all fresh-water resources.



经济学人视频

素食主义如何改变世界？

食物生产对环境的影响令人生畏，它约占温室气体排放总量的四分之一，并耗费了约70%的淡水资源。



Climate-change targets

From smog to slog

China has upheld its pledges on greenhouse-gas emissions. It must do a lot more

AFTER DONALD TRUMP became America's president in 2017 and thumbed his nose at international efforts to curb global warming, China emerged as a hero in the campaign. Other Western leaders were relieved that it did not take the opportunity to back away as well—after all, it had once condemned climate-change talk as Western fearmongering aimed at undermining China's economic growth. The country's president, Xi Jinping, won widespread applause for insisting that emissions goals agreed at the UN's climate meeting in Paris in 2015 must be upheld.

Now environmentalists wonder whether China will lead the charge in a new round of climate diplomacy. One aim of the climate summit at the UN's headquarters on September 23rd is to remind countries that they will need more ambitious targets if the world is to keep global warming below 2°C. Work is getting under way on drawing up China's next five-year economic plan, which will take effect in 2021. It will be a test of China's willingness to raise its game. Early signs are not promising.

China certainly looks well on track to fulfil the pledges it made at the Paris conference: that carbon-dioxide emissions would reach a final peak "around 2030", and that by then one-fifth of its energy would come from non-fossil sources, up from one-sixth currently. In 2015 its carbon emissions, having surged in many of the preceding years, fell slightly for the first time this century (see chart). This was because China was no longer flooding its economy with money in order to combat the effects of the global financial crisis of 2008. It was also the result of vast green projects launched by the government to assuage public anger over toxic air and other

environmental damage. The smog choking China's cities was being caused, not least, by the burning of coal which was also responsible for much of the country's greenhouse-gas emissions. The air in Beijing (pictured), though still often awful, appears cleaner than it was a few years ago.

The proportion of China's energy that is produced from coal, the most polluting of fossil fuels, is still high. But it has decreased by more than ten percentage points over the past decade, to below 60%. A third of the world's electricity-generating capacity from wind is now in China, as are a quarter of the world's solar panels in use. The country is building 11 more nuclear reactors, to add to its existing 47. From next year China will start requiring fossil-fuelled power firms to buy and sell credits in a national carbon-trading scheme—though it may be years before the system results in big cuts in emissions.

But the pledges made in Paris by China and the world's other main emitters of global-warming gasses are far from enough. Fulfilling them may still allow temperatures to rise by 3-3.5°C, which would be catastrophic. The UN wants countries to propose tougher targets by the middle of next year and agree on these at another climate conference at the end of 2020.

China does not encourage public debate about this. Even as the country's leaders have been basking in the glow of global gratitude for their climate-change efforts, they have been tightening controls on NGOs. The state-run media rarely question the government's policies. But some Chinese experts have been calling on it to step up to the plate. In June an influential Chinese think-tank, the China Council for International Co-operation on Environment and Development, said the country should pledge that its emissions will peak by 2025 rather than 2030, and that by then non-fossil fuels should contribute at least one-quarter of the energy it consumes.

China has real incentives to keep up the pace. It wants to reduce the economy's dependence on labour-intensive manufacturing and boost the role of high technology and services. It worries about dependence on imported fossil fuels: last year 72% of its oil was imported and 43% of its gas. The attacks on Saudi Arabia's oilfields on September 14th were scary for China: the country had been by far the biggest source of China's imported oil.

But some analysts doubt whether China is ready yet to commit to tougher emissions targets. The main reason is that the economy is slowing faster than officials would like. This year the aim is to expand it by between 6% and 6.5%. That would be in line with China's long-term aim of achieving more sustainable, less frothy, growth. But China's prime minister, Li Keqiang, said last month that even 6% has not been easy to achieve, citing a global slowdown and the "rise of protectionism and unilateralism"—a veiled reference to the trade war with America.

In August a senior Chinese climate official warned that economic uncertainty caused by the trade conflict, among other factors, was making it less likely that China would reduce its emissions any more swiftly than promised. China's leaders can hardly be keen to put aside money for stiffer green policies while the economy is going through such a bumpy patch.

To keep the economy growing within the target range, officials have allowed more credit to flow to some high-emitting industries such as steel and cement, and cranked up coal-fired plants to meet the resulting increase in power demand (and it is building them apace abroad as part of its Belt and Road Initiative, a global infrastructure-building scheme). After falling in 2015 and 2016, China's carbon emissions began creeping upwards again. Greenpeace estimates that carbon-dioxide emissions grew 4% in the first half of this year.

Large state-owned companies with vested interests in fossil fuels sense an opportunity. In March power firms proposed that the government allow another 300-500 coal-fired power stations to be built by 2030, a 30% increase in capacity. Officials must resist the temptation. If not, the planet is damned. ■



气候变化目标

冲破重重雾霾

中国坚称将履行在温室气体排放上做出的承诺，但这远远不够

特朗普于2017年成为美国总统后，对国际社会为遏制全球变暖所做的努力嗤之以鼻，中国遂成为这场运动的英雄。中国没有借机跟着撤退，这让西方的其他领导人松了一口气，毕竟中国曾指斥西方国家有关气候变化的言论是危言耸听，目的是破坏中国经济增长。中国国家主席习近平坚称必须维护2015年在巴黎的联合国气候大会上达成的排放目标，由此赢得了广泛的赞誉。

现在，环保主义者猜想中国是否会成为新一轮气候外交的领导者。9月23日，气候行动峰会在联合国总部召开，会议的目的之一是提醒各国，如果要将全球变暖幅度保持在2°C以下，它们还需要树立更远大的目标。中国正在制订将于2021年生效的下一个五年经济计划，这将考验中国是否有意愿再加把劲。而早期的迹象并不乐观。

中国当然有望兑现它在巴黎气候会议上做出的承诺：将在“2030年左右”达到二氧化碳排放的最终峰值，届时非化石能源的比重也将从现在的六分之一升至五分之一。中国的碳排放量经历了多年的猛增后，在2015年出现了本世纪以来的首次小幅下降（见图表）。这是因为中国已不再向其经济注入大量资金以应对2008年全球金融危机的影响。此外，这也是其大规模绿色项目所取得的成果。政府发起这些绿色项目是为了平息公众对有毒空气和其他环境危害的愤怒。造成各地雾霾压城首当其冲的原因就是燃烧煤炭，而燃煤是中国大部分温室气体排放的源头。北京的空气（见图）虽然时常还是很糟糕，但看起来已比几年前干净。

用煤炭这种污染最严重的化石燃料发电在中国能源中的占比仍然很高，但在过去十年中已下降了十多个百分点，跌至60%以下。现在，全世界三分之一的风电装机容量都在中国，在使用中的太阳能电池板有四分之一在中

国。中国现有47座核反应堆，另有11座在建。从明年起，中国将开始要求采用化石燃料的电力公司在一个国家碳交易计划中买卖碳排放额度——尽管这个体系可能还要等好几年才能大幅减少排放。

但是，中国和其他全球变暖气体的主要排放国在巴黎所做的承诺还远远不够。即使它们兑现了这些承诺，全球气温仍可能升高3到3.5℃，而这将是灾难性的。联合国希望各国在明年轻年中之前提出更严格的目标，并在2020年底的另一次气候会议上就这些目标达成共识。

中国不鼓励这方面的公共辩论。即便其领导人为应对气候变化所做的努力赢得了全球的感谢，他们同时一直在收紧对非政府组织的控制。国家媒体很少质疑政府的政策。但一些中国专家一直在呼吁政府担起重任。6月，中国颇有影响力的智库中国国际环境与发展合作委员会表示，中国应保证其排放量将在2025年而不是2030年达到峰值，还应保证届时非化石燃料至少将占到所消耗能源的四分之一。

中国确实也有动力升级目标。它希望本国经济减轻对劳动密集型制造业的依赖，让高科技和服务业发挥更大作用。它还担心自身对进口化石燃料的依赖：去年它进口了72%的石油和43%的天然气。9月14日沙特阿拉伯油田遭袭令中国骇然，因为沙特是迄今中国进口石油的最大来源。

但一些分析人士怀疑中国是否准备好了实施更严格的排放目标。原因主要是其经济放缓的速度已快过官员们乐意接受的程度。今年中国的经济增长目标是6%至6.5%。这符合中国的长期目标：实现更可持续、更少泡沫的经济增长。但国家总理李克强上月表示，即使要保住6%的增速也非易事，原因是全球经济放缓以及“贸易保护主义和单边主义抬头”——暗指与美国的贸易战。

八月，中国一位高级气候官员警告称，除其他因素外，贸易冲突造成的经济不确定也使中国不太可能以比之前的承诺更快的速度减排。中国的经济发展正经历艰难时期，其领导人几乎没有意愿留出资金用于制订和执行更严格的环保政策。

为使经济增长保持在目标区间内，官员们已允许更多的碳排放额度流向某些高排放行业，如钢铁和水泥，并增加了煤电发电量以满足由此产生的电力需求增长（中国还加紧在国外建设煤电厂，作为其全球基础设施建设计划“一带一路”倡议的一部分）。中国的碳排放量在2015年和2016年出现下降，之后再度开始攀升。绿色和平组织估计，今年上半年其二氧化碳排放量增长了4%。

作为化石燃料产业的既得利益者，一些大型国有企业嗅到了机遇。3月，电力公司提议政府批准到2030年前再建300到500座煤电厂，装机容量增加30%。官员们必须扛住这种诱惑。不然我们这颗行星就完蛋了。 ■



Climate capitalists

The not-so-dirty dozen

Some tycoons are putting serious money into climate-friendly investments—and expect serious returns

BETS ON CLEAN technologies have ballooned this decade. Over \$2.6trn has flowed into low-carbon energy alone since 2010, according to BloombergNEF, a research firm (see chart 1). Now that some ventures have soured, after green subsidies grew stingier around the world, many investors are thinking again.

Many, but not all. A clutch of industrialists and entrepreneurs are doubling down. *The Economist's* unscientific survey has identified 12 with notably climate-friendly dispositions, and a combined net worth of \$200bn (see chart 2). Some, like Elon Musk, Bill Gates and Michael Bloomberg, are household names. Others are little-known outside their industry. Their wagers cover mature technologies (electric cars, wind turbines), fast-maturing ones (high-voltage grids, meatless burgers) and out-there ideas (turning carbon from the air into useful stuff). All want to do good by the planet. Most expect to do well for themselves.

The world's most prominent green mogul is Mr Musk. Having made a killing with PayPal, an online-payments firm, he ploughed some of his fortune into Tesla. The carmaker is in trouble; last year it lost roughly \$1bn. But it has turned electric vehicles from an unsightly curiosity (think G-Wiz) first into an object of desire, then, with its mass-market Model 3, into something reassuringly ordinary. Production of the Model 3 has hit snags. But no big car firm can today go without its own EVs.

Mr Musk has also put billions into batteries, for Teslas and to balance the electric grid. The minerals inside them are the preserve of our second tycoon, Robert Friedland. His brash style and early mining investments earned him the nickname “toxic Bob” from the press. But his investments in battery metals, made through holdings like Ivanhoe Mines, make him look greener today. He is digging up cobalt and nickel in Australia, and developing what could be the world’s second-biggest copper mine in Africa. His joint-venture with Chinese investors is working on metal sulphates for lithium-ion cells.

Wang Chuanfu is the closest China has to Mr Musk. BYD, the company he founded in 1995, started out making rechargeable batteries. Today its sprawling campus in Shenzhen shows off solar cells, electric cars, heavy machinery, mobile-phone components and much else besides that needs energy storage. In 2008 Warren Buffett’s Berkshire Hathaway invested \$232m in BYD. The stake is now worth over \$1.5bn. BYD’s sales surpassed \$18bn last year, putting it among the biggest makers of batteries and electric cars.

Like Messrs Musk, Friedland and Wang, others from our list joined the ranks of tycoons by seeing their ideas mature. Mr Wang’s compatriot, Zhang Yue, runs Broad Group, a huge manufacturer of chillers that recycle waste heat. Brazil has Rubens Ometto, the man behind the world’s biggest bioenergy firm and its first ethanol billionaire. His company, Cosan, produces sugar and, through a joint-venture with Royal Dutch Shell, an Anglo-Dutch energy giant, sugar-cane ethanol. In Germany Aloys Wobben, who built his first wind turbine at university and later developed a pioneering variable-speed model, turned Enercon, which he created in 1984, into a leading producer of such equipment.

A second group of moguls funnels money made elsewhere into climatically noble projects seeking scale. Consider Philip Anschutz, whose empire

stretches from oil to entertainment (and whom the *New Yorker* described as the “man who owns LA”). He has spent a decade promoting a \$3bn high-voltage electric grid, TransWest Express, to send 3GW of wind power (which he is backing separately) from blustery Wyoming to electricity-hungry California. It should start construction in 2020.

Or take Bill Joy, who co-founded Sun Microsystems. As befits a self-assured Silicon Valley software pioneer, he reckons his climate bets could tackle half of all annual greenhouse-gas emissions. In 2011 he backed Beyond Meat, a maker of plant-based alternatives to burgers; meat production accounts for 14.5% of global emissions. The company’s share price is up six-fold since it went public in May. To clean up cement-making (6% of emissions), in 2014 Mr Joy invested in Solidia Technologies, which has found a way to cut the industry’s carbon footprint by 70%. LafargeHolcim, a Franco-Swiss cement colossus, is helping commercialise it.

Besides imminently scalable ventures, Mr Joy has supported speculative ones like Ionic Materials, a firm that has come up with an energy-storage technology that uses solid polymers (*Wired*, a magazine popular among geeks, called it the “Jesus battery”). When it comes to moonshots, though, it is hard to beat Mr Gates. Last month the co-founder of Microsoft told the *Financial Times* that those who want to change the world should stop wasting time urging investors to dump fossil-fuel stocks and put their money and energy behind disruptive technologies.

Mr Gates is putting a part of his \$105bn fortune where his mouth is: into blue-sky projects. Literally, in the case of Carbon Engineering, a company working to turn CO₂ in the air to fuel. Because its carbon is being taken from the atmosphere, it has no net-effect on the atmospheric stock when burned. He co-founded TerraPower, which has developed a new type of nuclear reactor. And in 2016 he launched Breakthrough Energy Ventures, a \$1bn pot of “patient, risk-tolerant capital” to bankroll technologies that

radically cut annual emissions. Only those with the potential to shave 500m tonnes (1% or so) or more off today's global total need apply. Investments include Boston Metal (which aims to decarbonise steelmaking) and Commonwealth Fusion Systems (which is pursuing nuclear fusion). Fellow plutocrats have been enlisted into the fund: Mr Bloomberg, Amazon's Jeff Bezos, Alibaba's Jack Ma, Masayoshi Son of SoftBank and Mukesh Ambani of Reliance, an Indian conglomerate.

The last kind of climate tycoon does not seek returns, at least directly. Jeremy Grantham of GMO, a \$70bn investment fund, is giving away most of his \$1bn fortune to climate politics and research. It isn't really philanthropy, he says. "It's sensible defensive investing in the broadest sense." Mr Bloomberg has poured \$500m into Beyond Carbon, an initiative to kill off coal plants in America by financing green lobbyists and politicians at state and local level.

Our twelfth apostle of climate action is not himself deep-pocketed. But Pope Francis, the greenest pontiff to date, has ultimate control over the Vatican Bank's \$3bn-worth of assets—and a bully pulpit to exercise moral suasion over much more. In June he rounded up oil bosses from BP, ExxonMobil, Shell and Total, and strong-armed them to support "economically meaningful" carbon prices and disclose risks posed by climate change to their companies.

Our list is necessarily incomplete. Other fat cats back clean investments. So do firms, even historically carbon-cuddling ones like GM, whose carmaking prowess may do more to popularise EVs than Tesla, or McDermott, which builds oil rigs but whose subsidiary has put money in NET Power, a builder of power plants in which carbon dioxide released by burning natural gas in pure oxygen is heated and then used instead of steam to turn a turbine (with any excess captured).

Many clean bets continue to rely on tax breaks, subsidies or the prospect of high carbon prices. Plenty will fail in the marketplace. But some may succeed. Without creative destruction powered by climate capitalists, including profit-seeking ones, safeguarding the planet would be considerably more daunting than it already is. ■



气候资本家

环保十二金刚

一些大亨大笔投资于气候友好项目，也期望切实的回报

近十年来，押注清洁技术的投资激增。根据研究公司彭博新能源财经（BloombergNEF）的数据，自2010年以来，单是投入到低碳能源的投资就超过2.6万亿美元（见图表1）。现在，随着全球各地收紧绿色补贴政策，一些项目状况恶化，许多投资者变得犹豫起来。

许多投资者是这样，但也不是全部。一小部分实业家和企业家反而在加倍投资。本刊一项不那么科学的调查发现了12位这样的气候友好型投资者，他们的净资产总和达2000亿美元（见图表2）。有些名字家喻户晓，如伊隆·马斯克、比尔·盖茨和迈克尔·布隆伯格。其他人在自己行业外不大为人所知。他们投资的领域涵盖了成熟技术（电动汽车、风力发电机）、快速发展的技术（高压电网、素肉汉堡包）和新奇创意（将空气中的碳转化为有用的东西）。他们都想造福地球，大多数也期望给自己带来利益。

全球最出名的“绿色大亨”当数马斯克。通过在线支付公司PayPal大赚一笔后，他将部分财富投入到特斯拉。这家汽车制造商目前陷入了困境，去年约亏损了10亿美元。但特斯拉把电动汽车从难看的稀罕物（如G-Wiz）变成了人们渴求的东西，又用一款面向大众市场的Model 3把它变成了人们能放心使用的日常用品。Model 3的生产遇到了困难。但在今天，电动汽车已成为大型汽车公司不可或缺的产品。

马斯克还投资数十亿美元开发电池技术，这既是为特斯拉的发展，也为平衡电网负载。电池内含的矿物则是我们的第二位大亨罗伯特·弗里德兰（Robert Friedland）的专属领域。由于他自以为是的风格及早期的矿业投资，媒体给他起了个绰号：“有毒的鲍勃”（toxic Bob）。但如今他通过艾芬豪矿业（Ivanhoe Mines）等控股公司投资于电池金属，让自己看起来

更加环保了。他目前在澳大利亚开采钴和镍，又在非洲开发可能成为全球第二大铜矿的项目。他与中国投资者合资的公司正在生产锂离子电池用的金属硫酸盐。

王传福是最像马斯克的中国大亨。他于1995年成立比亚迪公司，最开始生产的是可充电电池。如今，该公司在深圳的庞大工业园展示着太阳能电池、电动汽车、重型机械、手机部件，此外还有其他许多不需要储能的产品。2008年，巴菲特的伯克希尔·哈撒韦公司向比亚迪投资2.32亿美元。现在这些股份价值超过15亿美元。比亚迪去年销售额超过180亿美元，跃居电池和电动汽车的最大制造商之列。

跟马斯克、弗里德兰和王传福一样，我们名单上其他一些人也是随着自己的创意日臻成熟而跻身大亨行列的。王传福的同胞张跃是远大科技集团的董事长，这家大型制造商主要生产循环利用余热的制冷机组。巴西有鲁本斯·奥梅托（Rubens Ometto），他是全球最大的生物能源公司的老板，也是全球首个靠乙醇生意登上亿万富翁榜的人。他的科桑公司（Cosan）生产糖，并与英荷能源巨头荷兰皇家壳牌创办合资企业，生产甘蔗乙醇。德国阿洛伊斯·沃本（Aloys Wobben）。他在读大学时就制造出了自己的首台风力发电机，之后又开发出一款创先河的变速风机。他在1984年创建爱纳康（Enercon），现在已发展为全球领先的风机生产企业。

第二类大亨则是把自己从别处赚来的钱投向气候友好技术的规模化发展。例如菲利普·安舒茨（Philip Anschutz），他的帝国横跨石油业和娱乐圈（《纽约客》杂志称他是“拥有洛杉矶的男人”）。他花了十年时间推动30亿美元的高压电网“跨西部快速电力传输”（TransWest Express）将3吉瓦的风电（他另外投资）从疾风劲吹的怀俄明州输送到用电大户加州。项目预计在2020年开工。

还有一位是比尔·乔伊（Bill Joy），太阳微系统公司（Sun Microsystems）的联合创始人。他认为自己对气候项目的投资可解决温室气体年排放总量的一半——如此自信很符合他硅谷软件先驱的身份。2011年，他投资了“超越肉类”公司（Beyond Meat），这是一家生产植物肉汉堡的企业。全球排

放量的14.5%来自肉类生产。自5月上市以来，该公司的股价已涨至原来的六倍。为了减轻水泥生产造成的环境污染（占排放量的6%），乔伊在2014年投资了索力迪亚科技（Solidia Technologies）。该公司找到了一种可将水泥行业的碳足迹减少70%的技术。瑞法水泥巨头拉法基豪瑞（LafargeHolcim）正在协助将这项技术商业化。

除了很快便可扩大规模的项目外，乔伊还投资了美国创业公司Ionic Materials等冒险性项目。这家公司开发出了一种使用固体聚合物的储能技术（极客杂志《连线》称之为“耶稣电池”）。但说到投资前沿项目，最厉害的还是盖茨。微软的这位联合创始人上月向英国《金融时报》表示，那些想改变世界的人们不要再浪费时间劝说投资者抛售化石燃料股票，而是应该用自己的金钱和精力支持颠覆性技术。

盖茨说到做到，已把自己1050亿美元财富中的一部分投向多个异想天开的所谓“蓝天”项目。其中的碳工程公司（Carbon Engineering）可谓名副其实的“蓝天”项目，致力于将空气中的二氧化碳转化为燃料。由于所用的碳是从大气中获取，因此燃烧时对大气中的碳含量没有净影响。另外，他还联合创办了泰拉能源（TerraPower），这家公司开发了一种新型核反应堆。2016年，他又创立了突破能源基金（Breakthrough Energy Ventures）——一只10亿美元的基金，为那些能明显减少年排放量的技术提供“耐心且能容纳风险的资本”。只可能将全球温室气体减少至少五亿吨（约占总量的1%）的项目才可申请资助。该基金已经投资了波士顿金属（Boston Metal，目标是无碳炼钢）和联邦聚变系统（Commonwealth Fusion Systems，正在研发核聚变技术）。已加入该基金的富豪还有布隆伯格、亚马逊的贝佐斯、阿里巴巴的马云、软银的孙正义和印度信实工业集团（Reliance Industries）的穆克什·安巴尼（Mukesh Ambani）。

最后一类投资气候项目的大亨并不追求回报，至少不直接追求。资产管理规模达700亿美元的美国投资管理机构GMO的创始人杰里米·格兰瑟姆（Jeremy Grantham）捐出其10亿美元身家的大部分，用于资助气候政治和科研。他说，这并非真正意义上的慈善，“从最广义上说，这是明智的防御性投资。”布隆伯格已向“超越碳排放”（Beyond Carbon）项目投资五

亿美元，该项目为各州和地方的环保游说者和政客提供资金，以在美国关闭燃煤电厂。

我们的气候行动“第十二使徒”是教皇方济各（Pope Francis）。他本人没有雄厚财力，但是这位迄今最热心环保事业的教皇对梵蒂冈银行30亿美元的资产拥有最终控制权，而且他还能借自己的身份给予道德劝导来产生更大的影响。今年6月，他召集了英国石油公司、埃克森美孚、壳牌和道达尔等石油公司的老板，强力说服他们支持“具有经济意义的”碳价格，并披露气候变化给他们各自的公司带来的风险。

我们的名单肯定是不全的。其他富豪也在支持环保投资。企业也在行动，甚至包括通用汽车或钻井平台制造商麦克德莫特（McDermott）这种传统上碳排放严重的公司。相比特斯拉，通用的汽车制造能力也许更能推动电动汽车的普及。麦克德莫特的子公司投资了NET Power公司，这是一家发电设备建造商，能将天然气在纯氧中燃烧时释放出的二氧化碳加热，用于代替蒸汽推动涡轮机（多出的二氧化碳会被捕集）。

许多清洁项目投资仍依赖税收减免、补贴或者未来的碳价上调。很多项目会在市场中失败。但有一些也许会成功。如果没有气候资本家（包括寻求利润的那些）推动的创造性破坏，保卫地球的任务将比现在更艰巨得多。





The Panama Canal

Beyond seasonable drought

Changing rainfall patterns threaten an artery of global trade

TAKE IN THE view from atop Gatun dam and fathom what is missing. Container ships float idly on Lake Gatun, near the midpoint of the Panama Canal, awaiting passage to the Caribbean sea, their gateway to the Atlantic Ocean. What look like islands are hilltops poking up from a valley that American engineers flooded a century ago, creating what was then the world's largest artificial lake. All seems well. But a security guard from the Panama Canal Authority (ACP) points down to a problem: the water lapping against the dam is 1.8 metres (six feet) lower than it should be.

That water is Panama's lifeblood. Lake Gatun stores rain during the wet season, which usually runs from mid-April through to mid-December, for use in the dry one. It supplies drinking water to Panama city, the capital, as does man-made Lake Alajuela nearby. It is also two-fifths of the canal, a shortcut between oceans for 3% of the world's maritime trade, as well as for cruise ships and an occasional nuclear submarine. The ACP provides an eighth of the national government's revenue. "Water is money here," says Oscar McKay, an engineer at the dam site.

A normal rainy season fills Lake Gatun to 26.5 metres above sea level. By the end of the dry season that usually falls to 25.9 metres. Prolonged dry seasons have big consequences. If the water level falls below 24.4 metres, the ACP must limit the weight of big "NEOPANAMAX" container ships lest their hulls scrape on the lake bed. Below 24 metres smaller "PANAMAX" ships would risk bumping on the bottom of the locks reserved for them as they enter and leave the lake. This June, after Panama's most intense drought since independence in 1903, Lake Gatun fell nearly to that level. In 2016, during a

longer (but less severe) dry spell, it fell below that for the first time.

Panama city's rising population and the canal's growing traffic make such low water levels more likely. Each time a ship passes through the canal's locks, Lake Gatun releases 200m litres (52m American gallons) of water. In a dry month, outflows through the canal can reduce the lake's level by 80cm.

This year many ships had to transit the canal with less than their maximum load of cargo. That cost the ACP a few million dollars in revenue. The canal came "this close" to losing much more, says an executive, holding his thumb and forefinger together. It narrowly avoided having to impose draught restrictions on PANAMAX ships.

Rain since July has raised the water level to 24.7 metres but has not lowered apprehensions. Several severe droughts since 2014 may indicate that dry seasons are becoming longer. That would threaten not only Panama's water supply and government revenues but the canal's role as a hub of trade. "The whole global supply chain depends on consistency," says Onésimo Sánchez, a former manager at the ACP. If the canal falters, shipping firms will turn to competing routes, even if they cost more.

There is little doubt that climate change threatens Panama. Rising seas will submerge the low-lying Caribbean islands of San Blas, a tourist attraction and home to several thousand Guna, an indigenous group. Warmer temperatures will speed evaporation, and thus reduce water levels in Lake Gatun. But pinning blame for recent droughts on climate change is harder.

Panama's worst droughts have happened during extreme occurrences of El Niño, a natural phenomenon in which warm water moves eastwards across the equatorial Pacific Ocean. Longer cycles like the Pacific Decadal Oscillation, which alternates every 20-30 years between warm phases that make El Niños stronger and more frequent and cooler ones, make the role of

climate change harder to discern.

Residents of the capital do not doubt that changes are afoot. The rainy season once brought daily showers of three to four hours. Now the same amount of rain falls in an hour. Eight of the ten biggest storms in the city, measured by rainfall within 24 hours, have occurred since 2000. Despite those downpours, the canal area has had six straight years of below-average rainfall (see chart). The dry season is lengthening. This year it began a month earlier than usual and ended a month late. The current drought is the first severe one to occur in a mild El Niño year.

This unprecedented concurrence suggests that climate change is directly responsible, the ACP believes. “To be completely sure you’d have to wait a hundred years,” notes Carlos Vargas, the ACP’s vice-president for water and environment. And even if climate change is not the culprit now, it may strengthen future El Niños, which would lengthen droughts and increase their intensity. Some scientists think that if, as expected, the equatorial eastern Pacific warms faster than other regions, extreme El Niños will double in frequency to once a decade by 2100.

Water shortages imperil the canal’s expansion plans. In 2016 a new set of locks allowed the passage of NEOPANAMAX ships. The canal needs another upgrade to accommodate new “ultra-large” vessels. But work cannot start while water levels are so uncertain, ACP officials say.

If droughts become frequent, shipping firms may favour more reliable routes between the Atlantic and Pacific oceans, such as rail lines across the United States. Someday, climate change could open up for navigation the ice-clogged Northwest Passage through the Arctic. That would cut by about 4,000km (2,500 miles) the length of a journey from Shanghai to New York, which is 19,500km via Panama.

To secure the canal's future, the ACP has to plan now. "We cannot go back to what we had in the past," says Mr Vargas. Already the ACP has stopped producing hydroelectricity from the Gatun dam. It is studying ways to raise water levels, including by digging a third artificial lake to supply Panama city and piping water from the Indio river to Lake Gatun. "They're going to have to do all of them," says Merei Heras, a former environment minister, sipping a drink in a café as rain pelts down. Deepening Lake Gatun is not an option because the mountains nearby would collapse.

Drought-proofing the canal will be disruptive, forcing people to move and hurting habitats down-river from water-diversion projects. Panama's only answer to the global havoc caused by climate change, it seems, is to do local damage. ■



巴拿马运河

非季节性干旱

降雨模式的改变威胁全球贸易的一条动脉

从加通大坝的顶部俯瞰，看看到底哪里不对劲。集装箱船在靠近巴拿马运河中点的加通湖上静静地漂着，等待进入通向大西洋门户加勒比海的通道。在坝顶能看到许多小岛，其实是一个世纪前被美国工程师淹没的一个山谷中露出的小山山顶，当年这项工程创造出了当时世界上最大的人工湖。一切似乎都很正常。但是，来自巴拿马运河管理局（Panama Canal Authority，以下简称ACP）的一名保安指出了一个问题：拍打着堤坝的湖水比正常水位低了1.8米。

这些湖水是巴拿马的命脉。加通湖在雨季（通常从4月中旬持续至12月中旬）储存雨水，用于在旱季保持水位。它与附近的人工湖阿拉胡埃拉湖（Alajuela）一同向首都巴拿马城提供饮用水。它还占了巴拿马运河五分之二的长度。这条运河是大西洋和太平洋之间的捷径，货物运输量占全球海上贸易的3%，同时也供邮轮和偶尔经过的核潜艇通行。巴拿马政府年收入的八分之一来自ACP。“在这里，水就是金钱。”大坝工程师奥斯卡·麦凯（Oscar McKay）说。

正常的雨季会让加通湖的水位涨至海拔26.5米。到旱季结束时，水位通常会下降至25.9米。旱季延长会带来严重后果。如果水位下降到24.4米以下，ACP就必须限制大型“新巴拿马型”（NEOPANAMAX）集装箱船的载重量，以免船体剐蹭湖床。水位降至24米以下，更小一点的“巴拿马型”（PANAMAX）船进出加通湖时就有可能碰到专为它们保留的船闸的底部。今年6月，巴拿马经历了自1903年独立以来最严重的旱灾，加通湖的水位降至接近24米。2016年的旱灾时间更长（但没那么严重），其间水位第一次低于24米。

巴拿马城的人口和运河通航量不断增加，增加了出现这种低水位的可能

性。每当船只经过运河船闸，加通湖就会释放2亿升的水。在干旱的月份，向运河放水会让湖泊水位降低80厘米。

今年，许多船只通过运河时的实际载重量都必须低于最大载重量。这让ACP损失了几百万美元的收入。一位高管把拇指和食指捏在一起说，“就差这么一点”运河就会损失得更多。它差点就必须对巴拿马型船也实施载重限制。

七月以来的降雨让水位回升至24.7米，但并未减轻人们的忧虑。从2014年以来发生的几次严重干旱来看，旱季可能会越来越长。这不仅会威胁巴拿马运河的水供应和政府收入，还会威胁运河的贸易枢纽地位。ACP的前管理人员欧内斯莫·桑切斯（Onésimo Sánchez）说：“整个全球供应链依赖稳定性。”如果运河的状况不确定，船运公司就会转向竞争性路线，即便费用更高。

毫无疑问，气候变化威胁着巴拿马。海平面不断上升，加勒比海上低海拔的圣布拉斯群岛（San Blas）将被淹没，这里既是旅游胜地，也是数千名土著古纳人（Guna）的家园。气温升高将加速蒸发，进而降低加通湖的水位。但越来越难将近年的干旱归咎于气候变化。

巴拿马最严重的干旱都发生在极端厄尔尼诺现象期间，这是一种温暖海水流向赤道东太平洋的自然现象。周期更长的自然现象让气候变化的影响更难辨别。比如太平洋十年涛动，其暖相位和冷相位的变换周期为20至30年，涛动处于暖相位时厄尔尼诺现象会更强、更频繁。

巴拿马城的居民毫不怀疑即将发生的变化。过去，雨季每天有三到四个小时的降雨。现在，一小时内就有同等降雨量。巴拿马城24小时内降雨量最大的十次暴雨中有八次发生在2000年以后。尽管暴雨频发，但运河地区的降雨量已经连续六年低于平均水平（见图表）。旱季正在变长。今年的旱季提前了一个月到来，又晚了一个月结束。当前的干旱是首次在厄尔尼诺现象温和的年份里发生的严重干旱。

ACP认为，这种前所未有的并存现象表明气候变化是直接原因。ACP水与环境事务副总裁卡洛斯·瓦尔加斯（Carlos Vargas）指出：“要百分百确定这一点还得等一百年。”而即使现在气候变化还不是罪魁祸首，它也可能在未来加剧厄尔尼诺现象，让干旱延长并加重。一些科学家认为，如果如预期的那样，赤道东太平洋的升温速度快于其他地区，那么到2100年，极端厄尔尼诺现象出现的频率将翻倍，达到十年一次。

水资源短缺危及运河的扩建计划。2016年，一组新船闸建成，“新巴拿马型”船只得以通行。为了能让新的“超大型”船只通行，运河还需要再次升级。但ACP的官员表示，水位如此不确定，无法开启升级工作。

如果干旱频发，船运公司可能会选择大西洋和太平洋之间更可靠的路线，例如穿越美国的铁路。未来，经过北极冰封海域的西北航道可能会因气候变化变得适于通航。届时，从上海到纽约的航程将减少约4000公里，而经巴拿马运河需航行1.95万公里。

为了确保运河的未来，ACP必须立即制订计划。瓦尔加斯说：“我们没法再回到从前。”ACP已经停止了加通大坝的水力发电，现在正在研究提高水位的方法，包括挖掘第三个人工湖为巴拿马城供水，以及从印第奥河（Indio）向加通湖送水。“这些项目都得上。”前环境部长梅雷·赫拉斯（Merei Heras）在咖啡馆里啜着一杯饮料说，外面大雨如注。加深加通湖是行不通的，因为附近的山体会崩塌。

给运河做防旱工程将产生破坏性后果，迫使人们搬迁，损害引水工程下游的自然环境。看来，巴拿马运河应对气候变化造成的全球性破坏的唯一办法就是在当地搞破坏。■



Insurance and climate change

Blown cover

Why climate change could push insurance firms to the brink

THE PILOTS of the Port of London Authority are the cabbies of the Thames estuary. Based in Gravesend, 33km from the capital, they navigate some 10,000 ships into London terminals every year. Dispatched offshore on fast patrol boats, they use rope ladders to board ships as tall as buildings. Much like London's black-cab drivers, who know its 25,000 streets by heart, they must recall every sandbank and wind farm at the mouth of the river.

They are essential links in supply lines relied on by south-east England for everything from food to fuel. But when winds are too strong, pilots cannot board ships. If delays accumulate, terminals get clogged. The fiercer storms that could soon come to British shores could paralyse trade for days. Such a chain reaction is an example of the costs carbon emissions may bring.

Insurance companies are uniquely exposed to these sorts of changes. Tens of millions of businesses buy policies every year to protect themselves from risks. Last year the premiums paid for property and casualty insurance worldwide reached \$2.4trn, according to Swiss Re, one of the big reinsurance firms on to which consumer-facing insurers pass the risk of mega-losses. Extreme events becoming the norm could force insurers to fork out ever greater payouts to policyholders, and lower the value of the assets they hold. The best case is that insurers reinvent themselves, helping the world cope—managing risk is, after all, how they make their money. The worst is that some fail and that swathes of the global economy become uninsurable.

Already, insurers are seeing disasters of unprecedented scale. Earlier last

month Hurricane Dorian, one of the two largest storms ever known to have made landfall in the Atlantic, battered the Bahamas and then the Carolinas. In July Hurricane Barry brought the heaviest rainfall ever measured to Arkansas. The Indian Ocean basin has seen three huge cyclones so far this year. Last November California saw wildfires over the largest area ever recorded.

Very costly disasters are becoming more frequent. Between 1980 and 2015 America saw an average of five events each year causing over \$1bn in damage (in current prices). Between 2016 and 2018 the yearly average was 15. In the 20th century, according to AIR Worldwide, a climate-modelling firm, a hurricane on the scale of Harvey, America's costliest ever, would have been regarded as a one-in-2,000-year event. By 2017, when Harvey blew in, that frequency was estimated at once in 300 years. By 2100, says Peter Sousounis of AIR, it will be once a century, and tidal surges that used to be classed as once-a-millennium events will be expected every 30 years.

Catastrophes are also getting harder to predict. Though newer models are starting to take account of climate change, most still rely on data from the previous few decades, which are already obsolete. And insurers struggle to handle "compounding effects"—the mutually reinforcing impact on each other of events associated with global warming. Working out when droughts cause wildfires, for example, is tricky because lower rainfall not only makes vegetation drier and hence more flammable, but also slows its growth. Effects tend not to be linear. Above 100km per hour, a 10% increase in wind speed usually causes 50-60% more damage, says Pete Dailey of RMS, a modelling firm.

Adding to the losses is the growing number of properties being built on flood plains and coasts. Annual insured losses from catastrophic events have grown 20 times, adjusted for inflation, since the 1970s, to an average of \$65bn this decade. That excludes knock-on effects such as business

disruption. Last year the global figure totalled \$85bn, even though it was a year with no mega-disaster.

Climate losses can also come from the other side of insurers' balance-sheets: the investments they hold to cover payouts and park any spare funds. Insurers (including life and health as well as property and casualty) are the world's second-largest institutional investors, with \$25trn under management. They often place chunky bets on multinational firms, infrastructure and property—which are becoming riskier propositions as the climate changes. Moreover, structural changes in the economy, such as the move away from fossil fuels, could leave insurers' portfolios exposed.

In the face of these threats, insurers are seeking to future-proof their businesses. Part of this is about financial resilience. Most general policies are renewed annually, meaning firms can raise premiums promptly (within regulatory limits). Since a spate of mega-disasters caught them off-guard in the 1990s they have fortified their capital reserves. According to McKinsey, the policyholder surplus (crudely, the excess of assets over liabilities) available to pay claims in America's property and casualty sector doubled in real terms over the past 20 years. In 1992 Hurricane Andrew sent 11 insurers to the wall. All survived the record hurricane season of 2017-18.

Regulators are doing more to prod insurers to hold sufficient capital—typically the aim is to ensure they can withstand losses caused by the worst imaginable year in 200. But putting a figure on this is hard, because nobody has thousands of years of data. And the worst possible year is getting worse every year. The risks will keep rising long into the future, says Paul Fisher, a former supervisor at the Bank of England. A cataclysmic year could also hit markets, hurting insurers' investments just when they need them most. Some could be forced to sell assets to cover giant payouts, pushing asset prices down further.

Most probably, payouts will continue to rise without capsizing insurers. But that still creates a problem. To absorb bigger losses, they must charge higher premiums. According to Marsh, a broker, global commercial-insurance prices rose by 6% in the second quarter of this year, compared with the previous quarter. That was the largest increase since records began. In America property rates jumped 10%; in the Pacific region they soared by nearly 18%. The rise is to meet the demands of reinsurers. Average reinsurance rates are set to rise by 5% next year, according to S&P Global, a rating agency—and in California, after the huge recent wildfires, by 30-70%.

A few calm quarters could see some of those increases unwind. But there is no doubt about the trend. And it cannot continue for ever without some customers rethinking whether to buy insurance at all. Insurers may seek to keep rates lower by adding exclusion clauses or capping payouts. Or regulators may set maximum premiums—which could mean some insurers quitting altogether. Swathes of the economy are likely to become uninsurable, leaving a growing number of people, firms and states exposed to catastrophic losses.

The global gap between total losses and insured losses is already wide and growing. The research arm of Swiss Re estimates that it more than doubled in real terms between 2000 and 2018, to \$1.2trn. Half of last year's losses from natural disasters were uninsured. Nine out of ten American homeowners have no flood insurance despite half of the population living near water, says Erwann Michel-Kerjan of McKinsey.

Insurers are trying various ways to stop this “protection gap” growing. They are digitising their operations and automating claims to cut costs. They are deploying new technologies, for example tackling fraud by gathering data through sensors and sending drones to disaster areas, notes Seth Rachlin of Capgemini, a consultancy. Innovations such as parametric policies help with cost-cutting and fraud prevention. Rather than compensating reported

losses ex post, these pay a lump sum when an observable parameter, such as rainfall, passes an agreed threshold.

Where risks become uninsurable, states and firms may work hand-in-hand. In Britain, where a sixth of homes are at risk of flooding, government and insurers have set up Flood Re, a reinsurer that enables insurers to offer affordable premiums on 350,000 homes in flood plains.

Many insurers already offer discounted premiums when preventive measures are taken, such as building flood walls. They should consider lending to clients willing to undertake more substantial protective work, says David Bresch of the Swiss Federal Institute of Technology, for example reinforcing embankments. The short-term nature of most insurance contracts complicates matters: an insurer that invests in a project one year can lose its customer to someone offering lower premiums the next. But long-term policies could work for public infrastructure projects.

Developing countries are underinsured partly because the risks they face are poorly understood. More research would help, as would making models publicly accessible in order to allow officials and financiers to evaluate mitigation measures. Above all, insurers need to publicise the risks posed by climate change, and the need for cover. Often people do not take out insurance because they think the worst will not happen, says Alison Martin of Zurich Insurance. Talking of one-in-2,000-year events is not very helpful, “because many people would think we’re safe for another 1,999”. ■



保险和气候变化

自身难保

为什么气候变化会将保险公司推向绝境

伦敦港务局（Port of London Authority）的领航员就是泰晤士河口的“出租车司机”。他们的工作基地格雷夫森德（Gravesend）距离伦敦33公里，每年大约有一万艘船经他们导航驶入伦敦码头。他们乘坐巡逻快艇到近海上，使用绳梯登上楼房一般高的船只。他们很像对伦敦2.5万条街道烂熟于心的黑色出租车司机，必须记得泰晤士河口的每一个沙洲和风力发电场。

在英国东南部从食品到燃料的所有物资供应线上，他们是不可缺少的一环。但当风力太大时，领航员无法登船。如果受耽搁的船不断增多，码头就会堵塞。英国沿海区域也许在不久后将遭受更猛烈的风暴，贸易可能会因此瘫痪多日。这种连锁反应是碳排放可能带来的损失的一个例证。

这类变化给保险公司带来了独一无二的风险。每年有数千万企业购买保险以抵御风险。根据大型再保险公司瑞士再保险（Swiss Re）的数据，去年全世界财产与意外险的保费达到2.4万亿美元。直接与消费者打交道的保险公司会将巨额损失的风险转嫁给再保险公司。如果极端事件成为常态，保险公司就不得不给投保人更多赔付，它们持有资产的价值会降低。最好的情况是保险公司重塑自我，帮助世界应对风险——毕竟它们是靠管理风险赚钱的。最坏的情况是一些保险公司倒闭，导致全球经济的许多领域变得无法投保。

保险公司已经注意到了规模空前的灾难。上月早些时候，飓风“多利安”先后袭击了巴哈马群岛和美国南、北卡罗莱纳州。它是已知在大西洋形成进而登陆的两个最强风暴之一。7月，飓风“巴里”给阿肯色州带来了有记录以来的最大降雨量。今年到目前为止，印度洋海盆已经出现了三个巨型气旋。去年11月，加州发生了有记录以来过火面积最大的一次山火。

损失特别重大的灾难变得日益频繁。从1980年到2015年，美国平均每年发生五起损失超10亿美元（按当前价格计算）的事件，而在2016年到2018年间变成平均每年15起。“哈维”是史上给美国造成最惨重损失的飓风。根据气候模型公司AIR Worldwide的说法，在20世纪，一场规模堪比“哈维”的飓风会被视为两千年一遇的灾难。而在“哈维”来袭的2017年，人们估计这一频率为300年一遇。AIR的彼特·苏苏尼斯（Peter Sousounis）表示，到2100年，它将变成百年一遇。而过去被归为千年一遇的涌潮预计每30年就会发生一次。

灾难也变得越来越难以预测。虽然新的模型已开始计入气候变化，但大多数仍依赖来自过去几十年的、已然过时的数据。此外，保险公司也难以应对“复合效应”，即与全球变暖相关的各起事件会相互促进彼此的影响。比如，要预测干旱何时引发山火很难，因为降雨量减少不仅会让植被更干燥从而更易燃，也会减缓植被的生长。影响往往也不是线性的。气候模型公司RMS的皮特·戴利（Pete Dailey）表示，当风速超过每小时100公里时，每增加10%造成的损失通常会增加50%至60%。

建在冲积平原和海滨上的房屋越来越多，这也加大了损失。自上世纪70年代以来，灾难性事件每年造成的保险损失在经通胀因素调整后增长了20倍。最近十年平均每年损失达650亿美元，这还不包括业务中断之类的连锁反应。尽管去年没有发生特大灾害，全球年保险损失总额仍达850亿美元。

气候带来的损失也可能来自保险公司资产负债表的另一边，即保险公司用来支付赔偿金以及投放任何闲置资金的投资项目。保险公司（除了财产和意外险，还包括人寿和健康险）是全球第二大机构投资者，管理着25万亿美元的资金。它们经常在跨国公司、基础设施和房地产上押下重注。而随着气候变化，这样做的风险也在加大。此外，化石燃料用量减少等经济的结构性变化也可能令保险公司的投资组合遭受损失。

面对这些威胁，保险公司正力图让自己的业务能经受住未来的考验。这在

一定程度上和财务韧性有关。大多数常规保单每年更新一次，这意味着保险公司可以（在监管限度内）及时提高保费。上世纪90年代发生的一连串特大灾难让保险公司措手不及，之后它们加强了资本储备。根据麦肯锡的数据，按实际价值计算，过去20年来美国财产和意外险行业可用于支付索赔的保单持有人盈余（大致就是资产超过负债的部分）翻了一番。1992年飓风“安德鲁”导致11家保险公司破产。而在2017到2018年创纪录的飓风季节，所有保险公司都幸存了下来。

监管机构正采取更多措施来督促保险公司持有充足的资本——目标通常是确保保险公司能够承受200年一遇的最糟糕年份造成的损失。但要对此给出一个数字却很困难，因为没有谁拥有几千年的数据。而所谓“最糟糕的年景”却在一年年变得更糟。英国央行前监管官员保罗·费希尔（Paul Fisher）表示，未来很长一段时间，风险还将继续上升。灾难年份还可能对各个市场造成冲击，在保险公司最需要投资回报的时候损害它们的投资。一些保险公司可能被迫出售资产以支付巨额赔偿，从而进一步压低资产价格。

最有可能的是，赔付金额会继续攀升，尽管不至于让保险公司无力承担。但这仍会造成一个问题。为了能够承担更大的损失，保险公司必须收取更高的保费。根据经纪公司达信（Marsh）的数据，今年第二季度全球商业保险价格较第一季度上涨6%，创有记录以来的最大增幅。财产险价格在美国上涨了10%，在太平洋地区则飙升了近18%。这一上涨是为了满足再保险公司的要求。据评级机构标普全球（S&P Global）预测，明年再保险平均价格将上调5%；加州在经历了不久前的大规模山火后将上涨30%至70%。

尽管几个季度的风平浪静可能会使部分价格上涨放缓，但涨价是大势所趋。但是，这种情况不可能永远持续下去，总有一些客户会重新考虑究竟还买不买保险。保险公司可能会通过增加免责条款或限定赔付额来降低保费。或者，监管机构可能会设定最高保费，而这可能会让一些保险公司彻底退出。经济的许多领域可能会变得无法投保，这样一来，越来越多的个人、公司和国家就会遭受灾难性的损失。

全球总损失与已投保的损失之间的缺口已经很大了，而且还在不断扩大。瑞士再保险的研究部门估计，按实际价值计算，2000年至2018年间这一数字增长了一倍多，达到1.2万亿美元。去年自然灾害造成的损失有一半没有投保。麦肯锡的艾万·米歇尔克嘉（Erwann Michell-Kerjan）说，尽管美国有一半人口临水而居，但90%的房主都没有水灾保险。

保险公司正在尝试各种办法，不让这一“保险缺口”进一步扩大。它们正在将业务数字化并让理赔自动化，以求削减成本。咨询公司凯捷

（Capgemini）的赛斯·拉克林（Seth Rachlin）指出，保险公司正在部署新科技，比如通过传感器收集数据并向灾区派遣无人机等来对付欺诈问题。参数化保险等创新举措有助于削减成本和防止欺诈。当降雨量等可观测参数超过商定阈值时，保险公司就会一次性支付一笔赔偿金，而不是根据事后上报的损失来赔偿。

当风险变得无法投保时，政府和企业可以携手合作。在六分之一的房屋面临水灾风险的英国，政府和保险公司已经成立了再保险公司Flood Re，让保险公司能够为各个冲积平原上的35万套房屋提供负担得起的保费。

许多保险公司已经对采取了诸如修建防洪堤等防范措施的客户予以保费优惠。瑞士联邦理工学院的戴维·布雷施（David Bresch）表示，保险公司应该考虑向愿意实施更多防护工程（比如加固堤岸）的客户提供贷款。但由于保险合同大多是短期的，这让问题变得更加复杂。比如今年投资了某个项目的保险公司，明年就可能被其他保费更低的同行抢走客户。但长期保单可能适用于公共基础设施项目。

发展中国家投保不足，部分原因是它们对所面临的风险认识不足。加大研究力度将有助于改变这种状况；将模型公之于众也会有所帮助，这样官员和财务人员就能够评估减灾措施。最重要的是，保险公司需要宣传气候变化带来的风险以及投保的必要性。苏黎世保险（Zurich Insurance）的艾莉森·马丁（Alison Martin）指出，人们不投保通常是因为他们认为最坏的事情不会发生。只是讲讲两千年一遇的事件不怎么管用，“因为很多人会觉得自己在接下来的1999年里都是安全的”。 ■



Climate change

A warmer Russia

No bad thing, reckon some Russians, especially in frozen Siberia

FIRST CAME fires that turned the Siberian skies into a wall of solid smoke stretching for thousands of kilometres. Then came a drought that sucked the Lena river nearly dry, leaving boats marooned in the mud. It has been an arduous summer in Yakutia, an icy republic in Russia's far east. Add to that the fact that the regional capital, Yakutsk, stands upon thawing permafrost that warps roads and buildings, and climate inaction becomes hard to defend. "I've lived here my whole life, I remember what the winter used to be like, and what it's like now," says Sardana Avksenteva, Yakutsk's mayor. "I can confirm that global warming is a problem."

Some 1,000km (600 miles) to the north, on the republic's Arctic coast, the dying town of Tiksi would beg to differ. From its frozen vantage-point, warming has been a boon. Arctic sea ice is now receding at an alarming rate. In 1980 it covered 7.9m square kilometres (3m square miles) at its summer minimum, whereas last year it dipped to only 4.6m. So the Northern Sea Route (NSR) through once-impassable waters has emerged as a potential global shipping artery. The Russian government has pledged to direct some 735bn roubles (\$11bn) over the next six years towards its development. The route holds the promise of cutting delivery times between Asia and Europe by weeks, compared with going by the much longer Suez Canal route—with Russia poised to take a healthy cut for helping the cargo through. Tiksi has seen a new military base go up. It is in the running for a 2.5bn-rouble port project.

This tension between catastrophe and opportunity has shaped the contours of the climate-change debate in the world's fourth-largest carbon-emitter.

It is not only the world's second-largest producer of oil and gas combined, it also possesses ice-locked coasts and a vast, underpopulated hinterland which, some argue, could use the boost brought by a few degrees of warming. At an Arctic forum in 2017, Vladimir Putin called climate change "a factor that bolsters optimism", adding that it "provides more favourable conditions for economic activity in this region". He once quipped that climate change would enable Russians to spend less money on fur coats.

Yet the downsides are proving harder to ignore, as Mr Putin himself acknowledged at a G20 summit this summer. Russia is warming more than twice as rapidly as the world's average rate, and is experiencing a full range of climate-change-connected calamities for itself. The Ministry of Economic Development has accelerated climate policymaking. A national adaptation plan is in the works, and bills introducing carbon taxes and other mechanisms to regulate greenhouse-gas emissions have also been drafted. Earlier this year, Russia's main industrial lobby dropped its opposition to the Paris agreement. Russia's companies "understood that they lose more by remaining on the sidelines than by joining," says Mikhail Yulkin, head of the lobby's climate-and-environment committee. Russian Prime Minister Dmitry Medvedev signed a Cabinet resolution on ratifying the Paris agreement on September 23rd when the UN Climate Action Summit opened in New York.

Ratification, though, will have minimal practical impact. Russia's emissions-reduction pledge for the Paris agreement uses as a benchmark its levels in 1990—a year before the collapse of Soviet heavy industry. This means that cutting emissions by 25-30%, which Russia promised to do by 2030, requires virtually no reduction from today's less industrial levels (see chart).

There is little pressure from the citizenry to do more. Although 55% of the

Russian population believes that humans are causing climate change, the number has changed little over the past decade, and climate change is on the periphery of Russian discourse. The worsening state of the environment came in ninth place when Russians were asked to name their main concerns, whereas concerns about the economy and corruption dominated. Even Russia's embattled opposition has ignored the issue: the manifesto of Alexei Navalny, its leader, does not contain a single mention of climate change. Although young people have come out in their thousands to protest against corruption, Arshak Makichyan, a 22-year-old violinist who launched the Russian branch of Fridays for Future, an international group of students demanding action against climate change, reckons that the movement has just 50-100 active members in Russia.

Russia's leaders, in turn, see decarbonisation as a prospect too distant to care about. The government's in-house think-tank reckons that global carbon-dioxide emissions will not decline until after 2040, and that the world's appetite for Russia's hydrocarbons will last that long, too.

If Russia goes greener, it may not be in a way that Western environmentalists will like. It has a flourishing domestic nuclear industry, and a well-stocked foreign order book. Mr Putin recently raised eyebrows with an attack on wind turbines over the harm they do to birds and, he said, worms. "They shake, causing worms to come out of the soil," he said. "This is not a joke." Instead, warmer temperatures tantalise with the prospect of easier access to natural-resource wealth, an expanded farm belt, a reduced winter heating bill, and tolls from the Northern Sea Route.

Yet those benefits are hardly certain. The number of ships taking the NSR remains a fraction of those taking more established paths, such as the Suez Canal; tapping its potential will require big investment. Though land in the north may become arable, it will be farther from the agricultural know-how, infrastructure and logistical base of traditional farming regions. Those

established farmlands, meanwhile, will have to adjust the crops they plant and cope with ever more frequent droughts. “The bad will be there no matter what, while the good requires major efforts,” says Vladimir Kattsov, director of Russia’s Voeikov Geophysical Observatory.

Unstable weather patterns are already on the rise. In 2000 Russia’s weather service recorded 141 “severe weather phenomena”, which it defines as intense weather conditions—from heatwaves to heavy winds—that threaten human safety and can cause significant economic damage. Last year there were 580.

Frequent severe weather will trigger alarming consequences across Russia’s vast territory, its environment ministry warns. Modern-day infectious diseases will spread and ancient ones may return, as thawing permafrost exposes old burial sites. Arctic infrastructure will crumble as the ground becomes softer. In Yakutsk, locals have already taken to calling one tilting nine-storey apartment block built on the thawing ice their own leaning tower of Pisa. The floods that have devastated the Russian far east in recent years will become more common. So, too, will forest fires like the ones this summer that struck Siberia. “Nature is sending us little signals,” Ms Avksenteva says. Russia, and the world, would be wise to notice. ■



气候变化

更温暖的俄罗斯

有些俄罗斯人认为这不是坏事，尤其是在冰天雪地的西伯利亚

先是大火让西伯利亚的天空浓烟密布，数千公里遮天蔽日。接着干旱爆发，几乎吸干了勒拿河（Lena），船只都陷在淤泥之中。今年夏天，俄罗斯远东地区天气寒冷的共和国雅库特（Yakutia）很不好过。雪上加霜的是，其首都雅库茨克（Yakutsk）所在的永冻土带正在融化，道路和建筑物都随之变形。这一切使得人们很难继续在气候问题上无动于衷。“我一生都在这里生活，我记得过去冬天的样子，也知道现在的样子，”雅库茨克市长萨达娜·阿夫克先季耶娃（Sardana Avksenteva）说，“我可以肯定地说，全球变暖是个现实问题。”

在往北约1000公里的北极海岸，沉寂的季克西镇（Tiksi）却有不同看法。在这个常年冰封的小镇看来，变暖是一个福音。北极海冰正在以惊人的速度消退。1980年，夏季海冰覆盖最小面积为790万平方公里，而去年缩减至460万平方公里。因此，曾经难以通行的北海航线（NSR）可能成为一条全球航运大动脉。俄罗斯政府已承诺在未来六年内投入约7350亿卢布（110亿美元）发展这条航线。比起远航绕道苏伊士运河，这条航线有望将亚洲和欧洲之间的交货时间缩短数周，而俄罗斯也已准备好从发展这条航线中分一大杯羹。季克西已经新建了一个军事基地，还有望获批一个25亿卢布的港口项目。

是巨灾还是机遇？在全球第四大碳排放国，不同的认识勾画出了有关气候变化争论的轮廓。俄罗斯不仅是世界第二大油气生产国，还拥有冰封的海岸和人烟稀少的广阔腹地，有人认为升温几度可能推动这些地方的发展。在2017年的一次北极论坛上，普京称气候变化“是增强乐观情绪的一个因素”，并补充说气候变化“为该地区的经济活动提供了更有利的条件”。他曾经打趣说气候变化能让俄罗斯人在毛皮大衣上少花些钱。

但气候变化的不利影响越来越难以忽视，普京本人在今年夏天举行的G20峰会上也承认了这一点。俄罗斯变暖的速度是世界平均水平的两倍多，并且正在经历与气候变化有关的各种灾难。俄罗斯经济发展部已经在加快制订气候政策。一项全国性的气候适应计划正在拟定中，实施碳税等机制来管理温室气体排放的法案也已在起草。今年早些时候，俄罗斯主要的工业游说团体放弃了对《巴黎协定》的反对立场。该团体的气候与环境委员会负责人米哈伊尔·尤尔金（Mikhail Yulkin）说，俄罗斯的企业“明白了自己如果不参与应对气候变化的努力，而只是袖手旁观，损失会更大。”9月23日联合国气候行动峰会在纽约开幕之际，俄罗斯总理梅德韦杰夫签署了俄罗斯批准《巴黎协定》的法令。

但是，批准《巴黎协定》的实际影响很小。俄罗斯针对该协定做出的减排承诺是以其1990年的水平为基准，这是苏联重工业崩溃的前一年。也就是说，俄罗斯承诺到2030年将排放量减少25%至30%，而它现在的工业比重已经降低，所以实际上几乎不需要再减排（见图表）。

俄罗斯民众几乎没有施加任何压力要求政府做更多。尽管有55%的俄罗斯人认为人是导致气候变化的主因，但在过去十年中这一比例几无变化，而且在俄罗斯的公众讨论中气候变化问题处于边缘。让俄罗斯人列出他们担忧的主要问题时，环境恶化排在第九位，占据主导的还是对经济和腐败的担忧。就连俄罗斯严阵以待的反对派也无视这个问题：其领导人阿列克谢·纳瓦尼（Alexei Navalny）的政纲只字未提气候变化。尽管有成千上万的年轻人走上街头抗议腐败，但“星期五为将来”组织（Fridays for Futures，一个要求采取行动应对气候变化的国际学生团体）俄罗斯分会的发起人、22岁的小提琴手阿尔沙克·马克契延（Arshak Makichyan）估计，“星期五为将来”在俄罗斯只有50到100名活跃成员。

而俄罗斯领导人认为脱碳远非眼前就需要关注的问题。政府内部的智库认为，2040年之后全球二氧化碳的排放量才会减少，而全世界对俄罗斯的碳氢化合物的需求也将保持到那个时候。

就算俄罗斯加强绿色发展，可能也不会采用西方环保主义者喜欢的方式。俄罗斯国内有着蓬勃发展的核工业，国外订单充足。普京近期批评了风力涡轮机对鸟类——他说还有虫子——带来的伤害，让人大跌眼镜。他说：“这些机器产生的震动会把虫子从土里赶出来，”他说，“这可不是开玩笑。”而温度升高的前景很诱人，因为自然资源财富更易获得，农业区会扩大，冬季取暖费会降低，还能从北海航线收取通行费。

但这些好处都不是板上钉钉的。取道北海航线的船舶数量仍只相当于走苏伊士运河等更成熟航线的船只量的一小部分，挖掘该航线的潜力将需要大笔投资。尽管北部的土地可能会变得适于农耕，但那里相距传统农业区的农业技术、基础设施和物流基地都更远。而与此同时，那些传统农业区将不得不调整种植的作物，并应对越来越频繁发生的干旱。俄罗斯沃耶伊科夫地球物理观测台（Voeikov Geophysical Observatory）台长弗拉基米尔·卡特索夫（Vladimir Kattsov）表示：“无论如何，（气候变化的）坏处都将存在，而好处则需要付出巨大努力才能实现。”

不稳定的天气模式已经增多。2000年，俄罗斯的气象服务部门记录了141次“恶劣天气现象”，也就是从热浪到强风等威胁人类安全并可能造成重大经济损失的强烈天气状况。而去年共记录了580次。

俄罗斯环境部发出警告，频繁出现的恶劣天气将在俄罗斯的广袤领土上引发令人担忧的后果。现代传染病将蔓延，而随着永冻土融化，古代墓葬逐渐暴露出来，古老的传染病也可能卷土重来。随着地面变软，北极地区的基础设施将会坍塌。在雅库茨克，一栋九层公寓楼下的永冻土层正在融化，楼房已经发生倾斜，当地人已开始把它叫做本地的比萨斜塔。近年来给俄罗斯远东地区带来严重破坏的洪水灾害将变得更加常见，今年夏天在西伯利亚爆发的森林大火也会更频繁地发生。“大自然正在向我们一点点发出信号。”阿夫克先季耶娃说。俄罗斯，以及全世界，都应留意。■



Schumpeter

The Redmond doctrine

Lessons from Microsoft's corporate foreign policy

IS MICROSOFT A digital nation and does it have a secretary of state? The answer of Brad Smith, the software giant's top lawyer, is, well, diplomatic. Nation states are run by governments and firms need to be accountable to them, he says. But yes, he admits, he worries a lot about geopolitics these days.

Large companies have forever lobbied governments around the world—think Big Pharma or the oil majors. Sometimes the ties with their home countries' diplomacy are very close indeed: in 2017 the former boss of ExxonMobil, Rex Tillerson, became President Donald Trump's first secretary of state (albeit a short-lived one with a decidedly mixed record). And in a globalised world, multinationals can benefit from a “corporate foreign policy”, a term coined by Stephanie Hare and Timothy Fort in a paper from 2011, to align their values and priorities across markets.

Nowhere does this ring truer than in Big Tech. Digital giants loom larger than analogue ones (Facebook has 2.4bn monthly users—two-thirds more than China has people). They upend one industry after another and penetrate every nook and cranny of society. They lord it over cyberspace and set many of its rules. Recognising this, some countries are planning to upgrade their San Francisco consulates into de facto tech embassies. Denmark was the first to send an envoy to Silicon Valley, in 2017. The European Union is considering opening a mission in the capital of tech.

The tech firms, too, are adapting—none more so than Microsoft. Mr Smith presides over an operation as big as the foreign office of a medium-sized

country. Its 1,500 employees work in departments like “Law Enforcement and National Security” or “Digital Diplomacy Group”. It has outposts in 56 countries, sending regular cables to headquarters in Redmond, near Seattle. Mr Smith is as itinerant as a foreign minister. In one year he visited 22 countries and met representatives of 40 governments.

Microsoft, however, differs from much of Big Tech in its approach. Most firms are, like corporations before them, students of realpolitik. Apple censors apps in China when the Communist Party tells it to. Facebook dithered when the Burmese army used the social network to spread misinformation and fuel violence against the Rohingya. Google shelved a project to create a censored Chinese search engine after an outcry from employees, but is reopening an office in Egypt, a country run by a repressive junta.

Against this cynical backdrop Microsoft’s diplomatic efforts look refreshingly principled. Its worldwide antitrust fight at the turn of the century; Edward Snowden’s leaks which revealed widespread surveillance by America’s spooks; the rise in state-sponsored cyber-attacks—such “inflection points”, says Mr Smith, forced the company to mature geopolitically, long before its rivals in the case of antitrust. In “Tools and Weapons”, a new book co-written with Carol Ann Browne, a communications executive at Microsoft, he defends multilateralism—global problems caused by technology require global solutions, he says—and warns heads of state and foreign ministers (whom he meets by the dozen) that the tech cold war between America and China may split the world in two camps, leaving everyone worse off. He advocates involving non-governmental actors (including companies like his but also civil society) in decision-making, even if this “multistakeholder” process is slower than top-down government edicts.

It is not all idle talk, either. In 2013 Microsoft refused to hand over emails

that sat on a server in Ireland to America's feds in a drug-trafficking case, and successfully defended its decision in court—setting political wheels in motion that led America's Congress to adopt a law allowing tech firms to challenge such warrants if they fall foul of another country's rules. It implemented changes required by the EU's tough new privacy law globally, helping the rules become a worldwide standard for many companies—and indeed countries. In 2017 Mr Smith proposed a "Digital Geneva Convention", an international treaty to protect civilians against state-sponsored cyber-attacks in times of peace. Last May he helped launch the "Christchurch Call", a pledge by 17 countries and eight tech firms to "eliminate terrorist and violent extremist content online". Google and Facebook signed it. Apple (and America) did not.

Mr Smith says a coherent corporate foreign policy is simply good business: it creates trust, which attracts customers. His doctrine indeed sits well with Microsoft's business model, based on sales of services and software. It can afford to be more of a purist on privacy and the spread of disinformation, the most politically contentious tech issues of the day, than giants whose profits come from targeted advertising on social networks.

Microsoft is not squeaky-clean. Mr Smith says it refuses to put data centres for Azure, its global computing cloud, in countries with a sketchy human-rights record. Yet it has a few of them (operated by a local partner), plus a research centre, in China. And although Microsoft has proposed sensible rules for the use of facial-recognition technology, it has previously trained its algorithms on pictures of celebrities without their knowledge.

A dose of hypocrisy is perhaps inevitable in an organisation the size of Microsoft. Critics level a more fundamental charge against its foreign policy, however. Where, they ask, does it—and fellow tech giants—derive the legitimacy to be independent actors on the international stage? This is the wrong question to pose. As businesses, they have every right to defend

the interests of shareholders, employees and customers. As global ones, their priorities may differ from those of their home country's elected officials. And as entities which control much of the world's digital infrastructure, they should have a say in designing the international norms which govern it. At a time when many governments refuse to lead, why should the firms not be allowed to? Especially if, like Microsoft's, their efforts blend principles with pragmatism. ■



熊彼特

雷德蒙德原则

微软企业外交政策的经验

微软算是一个数字国家吗？它有国务卿吗？这家软件巨头的首席律师布拉德·史密斯（Brad Smith）给出的答案倒真的像出自外交官之口。他说，民族国家由政府管治，而企业对政府负责。不过，他承认，自己近来的确很担心地缘政治问题。

大公司从来都在游说各国政府——想想那些大型制药公司或石油巨头。有时候，它们与自己国家的外交政策确实关系紧密：2017年，埃克森美孚的前老板雷克斯·蒂勒森（Rex Tillerson）成了特朗普政府的第一任国务卿（尽管为时不久且政绩显然毁誉参半）。而在一个全球化的世界里，跨国公司能从“企业外交政策”中受益。这个术语来自斯蒂芬妮·哈尔（Stephanie Hare）和蒂莫西·福特（Timothy Fort）于2011年发表的一篇论文。这种政策可以让跨国公司在不同的市场协调价值和优先事务。

在大型科技企业中尤其如此。数字巨头比传统大公司的影响更大（Facebook的月度活跃用户达24亿，比中国人口还多三分之二）。它们颠覆了一个又一个行业，渗透到社会的每一个角落。它们主宰了网络空间并在其中定下许多规则。有鉴于此，一些国家正计划将自己在旧金山的领事馆升级为事实上的“科技大使馆”。2017年，丹麦成为首个向硅谷派遣大使的国家。欧盟正考虑在这一科技之都设立使馆。

科技公司也在调整适应，微软尤为积极。史密斯主管的部门规模与一个中型国家的外交部相当，其1500名员工分别在“执法和国家安全”或“数字外交团队”等单元工作。该部门在56个国家设有办事处，定期向位于西雅图附近的雷德蒙德（Redmond）的微软总部汇报。史密斯像一国外交部长那样频繁出访。他曾在一年里出访了22个国家，会见了40个政府的代表。

然而，微软的行事方式有别于其他许多大科技公司。大多数公司都和从前

的企业一样，屈从于政治现实。在中国，苹果公司按共产党的要求审查应用。Facebook面对缅甸军队利用自家的社交网络传播不实信息、煽动对罗兴亚人的暴力行动时，态度优柔寡断。谷歌原本计划为中国打造一个审查版的搜索引擎，因遭到员工强烈抗议而搁置，但它正在埃及这一军政府高压统治之下的国家重开办事处。

在一片见利忘义之举中，微软坚守原则的外交努力令人耳目一新。史密斯说，一些“拐点”事件迫使微软在地缘政治问题上成熟起来，比它在反垄断案中的竞争对手都要早得多。这些事件包括：微软在世纪之交展开全球反垄断抗争；斯诺登泄密事件揭露了美国情报机构的广泛监视行为；由政府策动的网络攻击不断增多。在与微软传媒总监卡罗·安·布朗（Carol Ann Browne）合著的新书《工具与武器》（Tools and Weapons）中，史密斯捍卫多边主义，称由技术引发的全球问题需要全球化的解决方案。同时他还警告国家元首和外交部长们（他曾与几十人会谈），中美之间的技术冷战可能导致世界分裂为两大阵营，最终人人受损。他主张让非政府主体（包括像微软这样的公司及民间团体）参与决策，即使这个“多边利益相关方”的实施流程要比自上而下的政府法令慢。

这并非全是空谈。2013年，在一宗贩毒案中，微软拒绝将存储在爱尔兰服务器上的电子邮件交给美国联邦政府，并在法庭上成功为此决定辩护。此事推动了政治车轮，促使美国国会通过法律，规定当政府的这类搜查令有违另一国法律时，科技公司可以抗命不从。微软遵从欧盟严厉的新隐私保护法，在全球范围内做出改变，推动这些法规成为许多公司乃至国家遵从的全球标准。2017年，史密斯提出了《数字日内瓦公约》（Digital Geneva Convention）——一项保护平民在和平时期免受国家支持的网络攻击的国际公约。去年5月，他协力推出《基督城呼吁》（Christchurch Call），这是由17个国家和八家科技公司发起的“消除网络恐怖主义和暴力极端主义内容”的承诺，谷歌和Facebook已签署，苹果和美国政府未签署。

史密斯表示，一以贯之的企业外交政策就是生财之道，它能造就信任，从而吸引到客户。他的理念的确非常契合微软基于服务和软件销售的商业模式。相比那些靠社交网络上的定向广告来盈利的科技巨头，微软更有余地

坚守原则，保护隐私，并应对当今科技业界最具政治争议的问题——虚假信息传播。

但微软也并非无可指摘。史密斯表示，公司拒绝在人权记录可疑的国家设立Azure（微软的全球云计算服务平台）数据中心。但它却在中国设立了多个这样的数据中心，由当地合作伙伴运营，还设立了一个研究中心。此外，尽管微软对于面部识别技术的使用提出了合理的规则，但它之前曾在当事人不知情的情况下使用名人照片训练算法。

在微软这般规模的组织里或许难免有虚伪之举。但批评者对其外交政策提出了更根本性的质询。他们质问，微软及其他科技巨头作为国际舞台独立参与者的合法性从何而来？这就问错了。作为企业，它们完全有权捍卫股东、员工和客户的权利。作为全球化的企业，它们的优先事务可能有别于母国的民选官员。而作为控制着世界大部分数字基础设施的实体，它们应该有权就设计管控这些基础设施的国际规范发言。如今许多政府不愿牵头行动，为什么不允许这些公司来做？尤其如果它们像微软那样把坚持原则与实用主义相结合的话。 ■



The future of the office

Work in progress

Beyond the fiasco at WeWork, white-collar workers are facing a two-tier office system

“FROM NINE till five, I have to spend my time at work,” warbled Martha and the Muffins back in 1980. “My job is very boring, I’m an office clerk.” Many of the hundreds of millions of people who trek into an office will feel as despondent at the prospect as Martha did. The office needs a revamp. But the crisis at WeWork, a trendy office-rental firm whose boss, Adam Neumann, stepped down this week after its attempt to float its shares turned into a debacle, shows that businesses are still struggling to come up with a new format.

The large office, like the factory, is an invention of the past two centuries. The factory arose because of powered machinery, which required workers to be gathered in one place. Big offices grew from the need to process lots of paperwork, and for managers to instruct clerks on what to do. But now the internet, personal computing and handheld devices mean that transactions can be dealt with on-screen and managers can instantly communicate with their workers, wherever they are. The need for staff to be in one place has been dramatically reduced.

A new model may take time to emerge—electric power was first harnessed in the 1880s but it was not until the 1920s that factories changed their layouts to make full use of it. The new model will have to balance three factors: the desire of many workers for a flexible schedule; the high cost for firms of maintaining office space; and the countervailing desire to gather skilled workers in one place, in the hope that this enhances collaboration.

People who work at home or in a Starbucks have no need for a stressful

commute and can adjust their hours to suit their way of life. In turn, that flexibility lets companies cut down on space. Our analysis of 75 large listed services firms in America and Britain shows that annual rental costs per employee have dropped by 15% over the past 15 years, to \$5,000. Many firms operate a hot-desking system where workers find a new seat every day. At the London offices of Deloitte, a consultancy, 12,500 people have access to the building but only 5,500 desks are available.

But hot-desking can be alienating. Every night, workers must erase all trace of their existence, hiding away their possessions. When crammed into desks sited close together, workers wear headphones to shut out noisy neighbours. Studies suggests this leads to more emails and less face-to-face communication. So much for collaboration and camaraderie.

High-skilled workers can be repelled by these conditions. So the hot-desking drive has been accompanied by a countervailing trend, in which this elite get better facilities. Those who need to concentrate have quiet spaces. Better lighting and air conditioning aim to keep employees healthy. Apple's new headquarters has parks, a meadow and a 1,000-person auditorium. The hope is that when workers mingle or relax, that will spark ideas.

All this looks like a shift towards an airline-style world of work, with economy seating for the drones and business-class luxury for skilled workers, who enjoy some of the benefits once reserved for senior executives. But this is a hard trade-off to get right. WeWork offers a "premium economy" service in which a wider range of workers can get a few perks. But fears that its rental income may be insufficient to offset its \$47bn of lease liabilities were one reason its IPO was delayed.

The office is bound to change further. Some firms may ask if it makes sense to have offices in city centres. In an era of remote collaboration, software

and documents sit in the cloud and offices could disperse to cheaper places. Mr Neumann's business plan is in tatters. But one of his insights is surely right: the office of the mid-21st century will be as different from today's as the high-tech factory is from the Victorian mill. ■



办公室的未来

正在改建

WeWork败退，白领面对双层式办公室制度

“朝九到晚五，上班没得跑，”乐队Martha and the Muffins在1980年唱道，“办公室文员，工作很无聊。”亿万上班族中的许多人在走进办公室时会感到歌词中的那种沮丧。办公室需要改造。但是，时髦的办公空间租赁公司WeWork的危机显示，企业在寻找新办公模式的路上仍然彷徨不定。近日，在WeWork上市的尝试大败后，公司首席执行官亚当·诺伊曼（Adam Neumann）宣布辞职。

大型办公室和工厂车间一样，是过去两个世纪里的发明。工厂兴起是因为使用动力机械设备从事生产需要把工人聚集在一起。大型办公室的出现则是为满足处理大量文书的需要，另外也是为方便管理者指导职员工作。但如今有了互联网、个人计算机和手持设备，人们可以在屏幕上处理各项业务，管理者也可以即时与手下沟通，无论他们身在何处。员工聚集在同一个地方工作的需要已大为减小。

新办公模式的出现可能需要时间——人们在19世纪80年代开始使用电力，但直到20世纪20年代工厂才改变布局以充分利用电力。新模式必须平衡三个因素：许多员工渴望灵活的工作时间安排；公司租用及维护办公室的高昂成本；但公司又希望高技能员工一起工作以加强协作。

在家中或星巴克工作的人无需承受通勤压力，还可以根据自己的生活方式调整工作时间。这种灵活性又让公司减少了租用的办公空间。我们对英美75家上市的大型服务企业的分析表明，在过去15年里，员工人均年租金成本下降了15%，降至5000美元。许多公司采用了办公桌轮用制，员工每一天都要找一个新位置办公。在咨询公司德勤的伦敦分公司，可进入办公楼的员工有12,500人，而办公桌只有5500张。

但共享办公桌可能反而导致疏离。员工每晚都必须清除自己的使用痕迹，

把个人物品收起来。挤在挨得很近的办公桌上工作时，员工会戴上耳机以屏蔽吵闹的“邻居”。研究表明，这导致员工更多使用电子邮件沟通，而减少了面对面交流。所谓加强协作和同事情谊不过如此。

高技能员工可能会排斥这类安排。因此，一股与共享办公桌风潮相反的趋势也同时兴起——让精英员工享受更好的办公条件。需要全神贯注工作的员工能获得安静的办公空间。有更好的照明和空调来保证员工的健康。苹果公司的新总部设有公园、草坪和可容纳1000人的会堂。公司希望员工在这些地方闲聚和放松时能激发他们的创意。

从这一切看，办公室似乎正变得像航空公司，为基层员工提供“经济舱”式的座位，为高技能员工提供“商务舱”式的豪华服务，让后者享受一些曾由高管专享的福利。但其中的尺度难以拿捏。WeWork提供“高端经济舱”服务，让更多员工能享受到一些特别待遇。但人们担心它的租金收入可能不足以抵消470亿美元的租金负担，这也是WeWork推迟IPO的原因之一。

办公室势必会一步变迁。一些公司可能会质疑是否还有必要把办公室设在市中心。在远程协作的时代，软件和文档存储在云端，办公室可以分散到租金更便宜的地方。尽管诺伊曼的商业计划已经崩盘，但他有一个见解无疑是正确的：21世纪中叶的办公室将与今天的大不相同，就像如今的高科技工厂与维多利亚时代的作坊迥然不同那样。 ■



Schumpeter

The entrepreneur's new clothes

Some venture capitalists are living in a world of make-believe. Thank goodness for stockmarkets

UNTIL RECENTLY the image of an entrepreneur was of a thrifty workaholic toiling away in a garage. Then came the “founder”, as epitomised by the flowing-haired Adam Neumann of WeWork, an office-subleasing firm dressed up as a tech giant. More emperor than entrepreneur, he wanted not merely to start a business but “elevate the world’s consciousness”. He sought limitless funds. He broke norms. And he generated losses as fast as he raised revenues.

He was not unique. Like other charismatic founders, such as Travis Kalanick, co-creator of Uber, a ride-hailing service, he tripped over his own billion-dollar ego. On September 24th Mr Neumann was ousted as chief executive of WeWork’s parent company, by his board, including his backers at SoftBank, the Japanese group, and its \$100bn Vision Fund, which together own 29% of its shares. Days earlier the company’s initial public offering (IPO) was postponed because of weak demand for its shares and the *Wall Street Journal* reported that he smoked pot on private jets. He will be replaced by two co-chief executives.

In such cases, attention invariably focuses on the founders’ hubris. Their rise and fall is the stuff of bestsellers. But it is the venture-capital industry that helps spin the invisible yarn that creates the legends. Some of its biggest names, such as SoftBank, have been peddling valuations of companies like WeWork that border on the absurd. In their competition to fund the biggest deals, they have been in thrall to founders’ excesses, rather than providing sober adult supervision. Good, then, that exposure

to the dowdy stockmarket is at last knocking sense into Silicon Valley's moneymen (for they are mostly male).

The folly begins with a sound idea. Startups need scale to become global champions. Thanks to the internet, ideas spread quickly. Because of network effects, the more people use a service, the better it gets. The fastest-growing firms, like WeWork and Uber, "blitzscale", meaning they attempt to disrupt a whole industry before anyone can stop them, raising fortunes to acquire users. The pioneers of this, such as Facebook in America and Tencent in China, have become so valuable that everyone wants to emulate their success. At its height this year, WeWork was valued at \$47bn, a staggering amount for a company which last year lost \$1.9bn on revenues of \$1.8bn. That is more than ten times the market capitalisation of IWG, a rival with bigger sales—and a profit to boot.

When venture capitalists jostle with each other to write cheques of \$100m or more on a daily basis, it goes to a founder's head. As is now common in Silicon Valley, Mr Neumann demanded more power for himself and his heirs via supervoting rights. He engaged in potential conflicts of interest, listed in the firm's IPO prospectus. The mountain of venture money available, including from mutual funds, enabled his firm to stay private for nine years, almost three times longer than the average tech startup in 2001. It entrenched bad habits.

When the firm tried to go ahead with an IPO, it ignored the implicit bargain of the stockmarket: that investors give companies capital in exchange for some influence. Mr Neumann sought to keep absolute control by having shares with ten times the voting rights of other shareholders. Rather than buying into a company run by a messianic overlord with an insatiable demand for cash, investors balked. A red-faced SoftBank lost faith in Mr Neumann. He will lose his majority control (but remain co-chairman).

The saga will have three ripple effects: on fundraising, governance and the wider economy. Startups with no recognisable route to profitability will find it harder to get cash. Even before WeWork's fiasco the taps were being tightened. In China the average volume of venture-capital deals has fallen from \$28bn a quarter last year to \$11bn a quarter this year, according to Prequin, a data provider. In America they fell from \$32bn in the second quarter to \$23bn in the third. Blitzscaling may become a dirty word. Cash-burning firms yet to join the rush to IPOs, such as micro-mobility ventures Bird and Lime, may find themselves stranded like their ubiquitous e-scooters. As regulators look increasingly askance at Big Tech, the very notion of blitzscaling raises competition and other concerns, which will make public investors yet more queasy. California's recent efforts to categorise drivers for gig-economy firms as employees rather than contractors has added to the post-IPO sell-off of Uber and its rival, Lyft.

Second, as money dries up, the balance of power may shift from the founders to investors, reducing the tolerance for supervoting shares and crony boards. It will be tough. Governance remains dull as ditchwater in Silicon Valley—until something goes wrong. No one wants to crush a creator's zeal.

Lastly, business at large will feel the impact. It may doom Softbank's efforts to raise a second \$100bn-plus Vision Fund to replicate its earlier one, which invested in companies like Uber and WeWork. Bulge-bracket banks like JPMorgan Chase and Goldman Sachs, which were to lead WeWork's abortive IPO, may end up looking gullible. Commercial-property markets may wobble as WeWork curbs its appetite for office space. For a while at least, there could be fewer of the breathtaking innovations such as ride-hailing that have transformed cities around the world.

That is not to say entrepreneurs or IPOs are gone for good. Shares of newly listed software firms that crank out at least some cash, such as Zoom Video

Communications and Datadog, have rocketed this year. Airbnb, a lodging site with positive EBITDA, still makes investors swoon. The salutary lesson is that the public markets are doing their job, rewarding firms that generate cash or profits, shunning those that do not. After years in which venture capitalists have cast themselves as infallible arbiters of value, it is good to see public investors shouting when an entrepreneur, for all his chutzpah, has no clothes. ■



熊彼特

企业家的新装

一些风险资本家活在一个虚构的世界里。好在还有股市

直到最近，企业家给人的印象还是在车库里埋头苦干的节俭的工作狂。之后“创始人”这一角色登上舞台，WeWork长发飘逸的亚当·诺伊曼（Adam Neumann）就是典型。WeWork是一家办公室转租公司，但以科技公司的面貌示人。诺伊曼比起企业家更像一个皇帝，不仅要创业，还想“提升全世界的意识”。他寻求无限的资金。他打破常规。他快速地创收，也同样快速地亏钱。

他并非独一无二。和其他魅力非凡的创始人（比如网约车公司优步的联合创始人特拉维斯·卡兰尼克[Travis Kalanick]）一样，诺伊曼因为10亿美元的身家膨胀了，栽了跟头。9月24日，董事会罢免了他在WeWork母公司的首席执行官一职。参与罢黜其职位的包括他在日本软银的支持者，以及软银旗下1000亿美元的愿景基金，两者合计持有29%的WeWork股份。此前几天，WeWork推迟了首次公开募股（IPO），原因是对其股票的需求疲软。此外，《华尔街日报》报道称诺伊曼在私人飞机上抽大麻。两名联席首席执行官会顶上他的位置。

在这类情况下，人们的注意力总是集中在创始人的傲慢自大上。他们的崛起和陨落是畅销书爱写的内容。但是，执起那支无形的笔，帮助写下这类传奇故事的其实是风险资本行业。软银等一些最大牌的风投公司一直在宣扬WeWork这类公司近乎荒谬的估值。在它们竞相为最大单交易提供资金的过程中，它们对创始人逾矩的行为却束手无策，未能提供严肃的“成人监督”。事到如今，好在有乏味老套的股市让硅谷的“金融巨子”们（因为他们基本都是男性）碰了一鼻子灰，总算给他们结结实实地上了一课。

愚蠢之举往往始于一个合理的创见。创业公司需要实现规模化才能成为全球领军企业。有了互联网，思想得以迅速传播。在网络效应的作用下，使

用某项服务的人越多，服务质量就越好。像WeWork和优步这样发展最快的公司采用的是“闪电式扩张”：它们试图赶在无人能阻挡自己之前颠覆整个行业，增加财富，获得用户。美国的Facebook和中国的腾讯等闪电式扩张的先行者如今已市值不菲，因而人人都想效仿它们的成功。WeWork在今年顶峰时的市值达470亿美元，对于一家去年营收18亿美元而亏损19亿美元的公司来说，这是个惊人的数字。反观WeWork的竞争对手IWG，销售额更高且已产生利润，市值却不及其十分之一。

每天都有风险资本家争抢着开出一亿美元或更大数额的支票，创始人就被冲昏了头脑。诺伊曼持有超级投票权，借此为自己和继承人争取更多权力，如今这在硅谷很常见。WeWork的IPO招股说明书中列出了他与公司间的潜在利益冲突。靠着已有的包括共同基金在内的大笔风投资金，WeWork的私营身份保持了九年，几乎是2001年一般科技创业公司保持私营状态时长的三倍。这让一些坏习惯变得根深蒂固。

这家公司在尝试推进IPO时，忽视了股市里隐含的一种交易：投资者给予公司资本，以换取对公司的些许影响力。诺伊曼持有的股票拥有十倍于其他股东的投票权，想以此保持自己的绝对控制权。面对这样一家由一个充满济世热情、对现金索求无度的大领主领导的公司，投资者犹豫了，没有买它的股份。软银丢了颜面，对诺伊曼失去了信心。他将失去多数控制权（但仍是联席董事长）。

这段传奇故事将在三个方面引发连锁反应：融资、公司治理和更广泛的经济。缺乏切实盈利途径的创业公司将更难获得资金。即使在WeWork惨败之前，资金来源就已收紧。数据供应商Prequin的数据显示，在中国，风险资本的平均交易额已从去年的每季度280亿美元降至今年的110亿美元。而美国第二季度的交易额为320亿美元，第三季度下降到了230亿美元。闪电式扩张也许成了一个犯忌的字眼。那些尚未追随IPO热潮的大举烧钱的公司，如“微出行”业务公司Bird和Lime，可能会和它们那些无处不在的电动滑板车一样突然遭遇热情降温。随着监管机构对大科技公司疑虑的加深，单是闪电式扩张这个概念就引发了有关竞争和其他方面的担忧，而这又会加剧公众投资者的不安。近期，加州将供职于零工经济公司的驾驶员

归为正式雇员而不是合同工，这加剧了投资者在优步及其竞争对手Lyft完成IPO后便抛售其股票的行动。

其次，随着资金的枯竭，权力的天平可能会从创始人向投资者倾斜，后者会越发不能容忍具有超级投票权的股份以及董事会任人唯亲的行为。这就难办了。在硅谷，人们始终觉得公司治理是件极度乏味的事——直到出现问题。没人想对一个充满热情的创始人泼冷水。

最后，这种影响还会波及整个商界。软银在筹集了投资于优步和WeWork等公司的基金后，本想再筹集一只类似的规模超过1000亿美元的愿景基金，但现在可能难以实现了。摩根大通和高盛（它们原本要领导WeWork这场流产了的IPO）这类大型银行到头来可能会给人以好骗的印象。随着WeWork抑制自己对办公空间的胃口，商业地产市场可能会出现波动。至少在一段时间内，像网约车这种变革了全球各地城市的令人惊叹的创新可能会减少。

这并不是说企业家或IPO的好光景自此一去不复返了。那些多多少少还是产生了些现金的软件公司在今年上市后股价就大涨了，比如Zoom视频通讯公司和Datadog。税息折旧及摊销前利润（EBITDA）为正值的借宿网站爱彼迎仍然令投资者心醉神迷。一个有益的教训是，股市正在尽自己的本分，公司若产生了现金或利润便会获得回报，反之则会被冷落。多年来，风险资本家一直以永不犯错的价值仲裁者自居。而今，一个企业家若厚着脸皮光着身子招摇过市，公众投资者会大声喊出他没穿衣服。这是件好事。 ■



Future of the workplace (1)

Redesigning the office

Examining three new offices in London that capture how the workplace is being reshaped

FOR CENTURIES businesses have settled inside the old walls of the City of London. Its geography is the same. But inside the Square Mile's temples of commerce the changes have been profound. At the start of the 20th century offices aimed to maximise efficiency by mimicking the factory layout with rows of supervised typists and clerks, as promoted by Frederick Taylor, an early American management consultant. In the 1960s less rigid *Bürolandschaft* ("office landscaping") made its way across the Channel from Germany. The 1980s ushered in "cubicle farms". Today open-plan offices and unassigned "hot desks" aim to flatten hierarchies and increase informality for many of the City's 400,000-odd whitecollar workers.

A tour of three new offices in London illustrates the latest trends. Around 7,000 investment bankers are moving into the eight-floor, purpose-built European headquarters of Goldman Sachs, which has taken 18 years and £1bn (\$1.25bn) to develop. Nearby, a branch of WeWork, a troubled startup, rents out co-working space in an old City pile to 2,300 "members", each of whom enjoys half the space that Goldman affords, and at a third of the price. Down Threadneedle Street the finishing touches are being put on 22 Bishopsgate, a 62-storey "vertical village" where 12,000 workers will soon reside.

What happens in buildings like these matters far beyond their walls. The corporate office is an engine of global growth. Across 40 developed countries some 200m people, one-third of the workforce, toil at a desk. Britain's desk-bound workers take home 55% of all earnings. Technology

and changing work habits are reshaping the life of desk-jockeys in the City and beyond—as well as that of their employers, who manage offices, and landlords, who own them.

Start with the landlords. Modern engineering allows developers to create better, more flexible spaces that tenants increasingly demand. Like everything else these days, buildings brim with technology. The Bishopsgate skyscraper will harvest 1m data points a day, to optimise use of resources such as air-conditioning, and offer glass that dims noise in open-plan offices. Now that lifts and toilets can be located on a building's periphery rather than its central shaft, entire unobstructed floors are being built. Architects are told to enable staff to mix on floors and between them to foster creative thinking; staircases are now places to meet, not just something you walk down in a fire drill.

This allows developers to offer flexible spaces that tenants can adapt over the course of a 15-year lease. Goldman's London home—which it developed and then sold and leased back for 25 years—is designed so that some outside walls can be removed and half the space sub-let should it reduce headcount in the event, say, of a chaotic Brexit. At 22 Bishopsgate tenants will have access to 100,000 square feet of flexible space run by Convène, a rival of WeWork.

All this means that landlords should expect to spend more keeping their buildings up to scratch, says Peter Papadakos of Green Street Advisors, a real-estate research firm. This may reduce the rental yield on offices from 5% today to perhaps 4%. More companies are fearful of being locked into new 10-15-year leases at a time when automation and the rise of temporary jobs make it hard to forecast future headcount. Some firms are opting for co-working spaces rather than leasing directly from traditional landlords. Co-working firms now account for about 5% of office space in London and New York. Most of their clients are small businesses. But HSBC, a big bank, will

occupy 1,100 desks in WeWork's new 6,300-desk London branch.

The landlords can still count on the co-working companies themselves to sign long-term leases. But they worry about the prospects for these leaseholders. Trouble at WeWork, which has lost over \$2bn since the start of 2018 and is struggling to show it has a viable business model, is adding to the uncertainty. Either way, observes Nick Wright of CBRE, a consultancy, the old landlord-tenant model is being shaken up.

Life is changing for corporate tenants, too. Typically, companies with tens of thousands of employees will own their headquarters and take out leases for branch offices. Over time these obligations are substantial. Among 75 big listed service-sector companies in America and Britain, lease commitments over the next decade or so amount to \$146bn. Annual rental costs amount to \$5,000 per employee. Absenteeism and the constant flow of people mean that just 40-50% of desks are actively used during working hours. This inefficiency constantly draws bosses to try to save office costs, especially in a downturn, although the reality is that office spending makes up only a tenth of property and headcount costs, with the rest going on workers' wages. Despina Katsikakis of Cushman & Wakefield, a property consultancy, warns that such stinting by firms can have an adverse effect on the wellbeing of their employees.

To optimise office use without killing morale, Goldman is therefore giving staff at its new London building options about where they work—at unassigned desks, private rooms and informal hangouts. Even the bank's 100 or so partners now occupy offices that transform into meeting rooms when they are away. Such manoeuvres, the company says, have increased desk occupancy by about 20%. Even in places without 22 Bishopsgate's anti-din technology, open-plan offices are easier to bear for distractible employees thanks to noise-cancelling headphones. As a result, companies need less space to accommodate the same number of workers.

According to the British Council for Offices, an industry body, space per desk in Britain has fallen by 10% over the past nine years, to ten square metres. “We don’t like the idea of animals in pens, but we’ve been happy to have people in them”, says Sir Stuart Lipton, the developer of 22 Bishopsgate. As companies reach the limits of densification, they must compensate cramped staff—the final group affected by the changing workplace—in other ways. WeWork, whose desks are a third smaller than a typical office worker’s, provides renters with ample space to drink nitro coffee, conduct impromptu meetings or play ping-pong. Offices have traditionally set aside just 3-4% of floor space for such fripperies. Occupiers now expect developers to provide at least double that amount of space. Staff in Bishopsgate have access to a climbing wall on the 25th floor (see picture). Goldman employs “workplace ambassadors” on each floor, who are responsible for staff welfare.

Office improvements are designed to make white-collar employees—and prospective recruits, many of whom expect to be coddled—feel fitter, happier and, employers hope, more productive. About 10% of a firm’s wage bill is lost to sick pay. A Harvard University study demonstrated that improving the quality of air, as Goldman and 22 Bishopsgate do, can boost occupants’ cognitive function. Access to natural light has also been shown to improve productivity. While a study by Andrew Oswald of the University of Warwick finds that productivity increases by 12% when people are happier. Unilever, a consumer-goods company, estimates that \$1 invested in its “wellness programmes” returns \$2.50 to the company. Goldman says that moving staff into new offices in other countries has improved their employees’ perception of their own productivity (it did not measure actual output).

There is work to be done. A recent worldwide survey of 600,000 office staff by Leesman, a data provider, found that 40% thought their office prevents them from working productively. Hot desks can be a curse. London’s three

new offices are not the last word in workplace management and architecture. But they offer a glimpse of the foreseeable future. ■



办公场所的未来

重新设计办公室

一探伦敦的三座新写字楼，了解办公室正如何被重构

几百年来，企业在伦敦金融城这片老城区安家落户。如今这里的布局还和过去一样，但“一平方英里”中一座座商业圣殿的内部已经发生了巨大的变化。20世纪初，在美国早期管理顾问弗雷德里克·泰勒（Frederick Taylor）的倡导下，办公室模仿工厂的布局，让打字员和文员们成排而坐，并监督他们工作，以求让效率最大化。20世纪60年代，一种不那么死板的“办公室景观”模式（Bürolandschaft）从德国跨越英吉利海峡而来。到了80年代，“小隔间办公”开始出现。如今，人们希望通过开放式办公室和无固定用户的“共享办公桌”为金融城的40多万白领中的大部分人消除等级差异，并增添一丝轻松惬意。

去伦敦三座新建的写字楼看一看，你能了解到最新的趋势。大约7000名投行员工正搬入高盛专门建造的八层欧洲总部大楼。这幢大楼历时18年建成，耗资10亿英镑（12.5亿美元）。不远处，陷入困境中的创业公司WeWork的一个分支将金融城一座大楼内的联合办公空间出租给2300名“会员”，每名会员享有的空间是高盛员工的一半，但价格是高盛的三分之一。在针线街（Threadneedle Street）的另一头，62层的“垂直村落”主教门22号大厦（22 Bishopsgate）正在做收尾工作，不久后将有1.2万名员工入驻。

这些变化虽是在这些大楼的内部发生，其影响却远远超越了它们的围墙。公司办公室是全球经济增长的引擎。在40个发达国家，约有2亿名员工在办公桌前辛勤工作，占劳动力总数的三分之一。在英国，办公室职员的收入占全体劳动者收入的55%。科技和不断变化的工作习惯正在改变人们的生活，受影响的不仅是金融城内外伏案工作的员工，还包括管理办公场所的雇主以及拥有这些场所的业主。

先从业主说起。现代工程技术让开发商能够创造更好、更灵活的空间，以满足租户在这方面日益增长的需求。如今科技无所不在，在建筑内部也不例外。主教门22号大厦每天将采集100万个数据点，以优化空调等资源的利用，并在开放式办公室里安装降噪玻璃。由于电梯和厕所可以设置在建筑物的外围，而不是在中心轴的位置，因此整层楼面就可以做到畅通无阻。业主要求建筑师的设计要方便员工在楼层内和楼层间互动交流，以激发创造性思维。现在楼梯间成了会面的地方，而不仅仅是消防演习时的下行通道。

如此一来，开发商就可以提供灵活的空间，供租户在15年的租期内调整改造。高盛伦敦总部（高盛在建成后将它出售，然后回租了25年）就设计了一些可拆除的外墙，如果发生像脱欧这种需要裁员的动荡事件，它就可以将一半的空间转租出去。在主教门22号，租户可以使用由WeWork的竞争对手机Convene运营的10万平方英尺的灵活空间。

这一切意味着，业主若要让自己的建筑始终能达到要求，应该对开销增加有所准备，房地产研究公司Green Street Advisors的彼得·帕帕达科斯（Peter Papadakos）表示。这可能会导致写字楼的租金收益率从目前的5%降至4%左右。自动化和临时性工作岗位的增加让未来的员工总数变得难以预测，在这种情况下，更多公司担心如果新签10至15年的租约，自己会被套牢。一些公司正在选择联合办公空间，而不是直接从传统业主那里租用场地。在伦敦和纽约，联合办公企业目前约占办公面积的5%。尽管它们的客户多是小企业，但大型银行汇丰将成为WeWork伦敦分部的客户，租用其新设置的6300张办公桌中的1100张。

业主仍可以指望与联合办公企业签订长期租约，但他们对这些租户的前途感到担心。WeWork遭遇的麻烦增加了这种不确定性。自2018年初以来，WeWork已亏损逾20亿美元，目前正在竭力证明自己的商业模式是可行的。咨询公司世邦魏理仕（CBRE）的尼克·赖特（Nick Wright）表示，不管怎样，旧有的租赁模式都在经历变革。

企业租户的境况也在发生变化。一般来说，有数万名员工的公司会拥有自

己的总部，而为分部租用办公室。久而久之，为此付出的租金数额巨大。在美国和英国的75家大型服务业上市公司中，未来10年左右的租金总共达到1460亿美元，平均摊到每个雇员身上的年租金达5000美元。由于缺勤和持续的人员流动，工作时间内仅有四五成的办公桌被经常性地利用。这种低效率让老板们总想要节约办公室成本，尤其是在经济低迷时期，虽然实际上办公室支出只占了资产和人员成本的十分之一，其余十分之九都用于支付工资了。房地产咨询公司高纬物业（Cushman & Wakefield）的德斯皮娜·卡西卡基斯（Despina Katsikakis）警告称，企业在这方面抠门可能会降低员工的幸福感。

为了在不扼杀员工士气的前提下充分利用办公室，高盛正在给其伦敦新大楼的员工提供在哪里办公的多种选择：非固定办公桌、私用房间，以及非正式聚会点。如今，就连高盛100名左右的合伙人不在的时候，他们的办公室也会被用作会议室。高盛表示，这样的灵活操作将办公桌的使用率提高了约20%。即使没有主教门22号的那种防噪音技术，但有了降噪耳机，开放式办公室对易于分心的员工来说也就没那么难以忍受了。如此一来，公司就可以用更少的空间容纳同样人数的员工。

行业机构英国办公室协会（British Council for Offices）的数据显示，过去九年里，英国每张办公桌占用的空间减少了10%，只有10平方米。主教门22号的开发商斯图尔特·利普顿（Stuart Lipton）说：“我们不喜欢把动物圈在围栏里，却一直乐于把人圈起来。”随着公司人员密度达到极限，企业必须以其他方式补偿工作环境狭促的员工——受工作场所变迁影响的最后一个群体。WeWork的办公桌比一般办公场所的办公桌小三分之一，但为租赁者提供宽敞的空间来喝杯氮气咖啡、开个临时会议或打场乒乓球。传统办公场所只会为这些“噱头”留出3%到4%的面积。而现在，租赁者希望开发商提供至少两倍于此的空间。主教门22号里的员工可以使用25楼的攀岩墙（见图）。高盛在每层楼都安排了负责员工福利的“办公室大使”。

改善办公条件是为了让白领员工和未来的新员工（他们中的许多人都希望受到公司宠爱）感觉更舒适、快乐，而雇主也希望他们会变得更有成效。一家公司大约有10%的薪酬支出是用于病假工资。哈佛大学的一项研究表

明，类似高盛和主教门22号那样改善空气质量的举措可以提高员工的认知能力。也有证据表明，接触到自然光可以提高工作效率。英国华威大学（University of Warwick）的安德鲁·奥斯瓦德（Andrew Oswald）的一项研究发现，当人们心情愉快时，工作效率会提高12%。消费品公司联合利华估计，它在“健康计划”上每投资1美元，便可为公司带来2.5美元的回报。高盛表示，将员工迁往别国新的办公场所后，员工自称工作效率提高了（高盛并未衡量实际产出）。

要做的事不少。数据供应商Leesman近期对全球60万名办公室职员的一项调查发现，40%的人认为自己目前的办公室让他们无法高效工作。共享办公桌可能是一种诅咒。伦敦这三处新写字楼在办公室管理和结构上未必代表最新、最高水平，却可以让我们一窥办公室可预见的未来。 ■



Quantum computers

Supreme achievement

A demonstration of quantum computing's power is a defining moment for a field prone to hype

“NATURE ISN’T classical, dammit, and if you want to make a simulation of nature you’d better make it quantum mechanical, and by golly, it’s a wonderful problem because it doesn’t look easy.” With those words, in 1981, Richard Feynman, an American physicist, introduced the idea that, by harnessing quantum mechanics, it might be possible to build a new kind of computer, capable of tackling problems that would cause a run-of-the-mill machine to choke. Feynman was right: it has not been easy. Over the past four decades quantum computers have slowly evolved from squiggles on theoreticians’ blackboards to small machines in university laboratories to research projects run by some of the world’s biggest companies.

Now one of those machines, built by researchers at Google, has at last shown what all the fuss is about. It appears to have performed, in just over three minutes, a task that, the researchers estimate, the world’s most powerful classical supercomputer would take around 10,000 years to complete. Google’s machine is a special-purpose device that was designed to solve a contrived problem with few practical uses. But this display of so-called “quantum supremacy” is nonetheless a milestone.

What might quantum computing actually be used for? That question is obscured by the piles of money and hyperbole that surround it. Along with 5G and AI, it is one of the technologies that presidents, of both countries and companies, love to cite. China and America have pledged to invest billions of dollars in it. There is excited talk of a race, and of the riches and power that await the first to seize the “Holy Grail of computing”.

Despite the breathlessness, quantum computers are not magical. A rich body of theoretical work proves that they will be potent, but limited. For all the talk of supremacy, quantum computers are not superior in every regard to their classical cousins. Indeed for many tasks they will offer little improvement. Yet for some problems—but only some—clever programmers or mathematicians can create algorithms that exploit the machines' quantum capabilities. In those special cases, quantum computers offer huge gains, crunching tasks that would otherwise take years or millennia down to minutes or seconds.

Several of these algorithms have been developed. They offer a glimpse of where quantum computers might excel. In encryption, for example, a quantum machine could quickly untangle the complex maths that underlies much of the scrambling that protects information online. A world with powerful quantum computers, in other words, is one in which much of today's cyber-security unravels. Tech firms and governments are investigating new foundations for encryption that are not known to be susceptible to quantum computers. But deploying them will be the work of decades.

As Feynman pointed out, classical computers struggle to simulate the quantum-mechanical processes that underpin physics and chemistry. Quantum computers could do so with aplomb, a useful trick for developing everything from pharmaceuticals to petrochemicals. Their ability to solve optimisation problems could help financial firms improve their trading algorithms. Artificial-intelligence researchers hope that quantum computers could offer a boost to their algorithms, too.

For now, though, all that lies in the future. Google's machine is best thought of as a Sputnik moment. By itself, Sputnik did nothing but orbit Earth while beeping. But it proved a concept, and grabbed the world's attention. Google's accomplishment is one in the eye for quantum-computing sceptics. It

strongly suggests the promise of quantum technology can be realised in practice as well as theory. And it will draw even more money and attention to a red-hot field. A great deal of engineering work remains before quantum computers can be used for real-world tasks. But that day has suddenly got closer. ■



量子计算机

至高成就

对于一个容易被炒作的领域，量子计算能力的展示是一个决定性时刻

“自然界并不像经典物理学描述的那样，真见鬼。要想模拟自然，最好用量子力学。天哪，这真是一道太精彩的题，因为一看就不容易。”1981年，美国物理学家理查德·费曼（Richard Feynman）在这番话中提出了这样一个想法：借助量子力学，也许能打造出一种新型计算机，解决普通计算机可能无力应对的问题。费曼说得对，这不容易。过去40年里，量子计算机慢慢从理论学家画在黑板上的潦草曲线发展到大学实验室里的小机器，再演变成世界上一些最大公司的研究项目。

现在，由谷歌的研究人员制造的其中一台机器终于让世人得见这件事到底有多了不起。研究人员估计，它在三分多钟的时间里完成的一项任务，若用世界上最强大的经典超级计算机来干大约耗时一万年。谷歌的这台机器是一种专用设备，旨在解决一项人为设计的问题，没有多少实际用途。但这种所谓“量子至尊”的展示仍然具有里程碑意义。

量子计算可能会有什么实际用途呢？这个问题被围绕在它周围的大量金钱和夸张的言论所掩盖。与5G和人工智能一样，量子计算也被国家首脑和企业大佬们挂在嘴边。中国和美国已经承诺在该领域投入数十亿美元。人们兴奋地谈论着一场竞赛，以及在此竞赛中第一个捧起“计算圣杯”的那一方将收获的财富和影响力。

尽管如此扣人心弦，但量子计算机并无魔力。大量理论研究证明，它们会非常强大，但仍有局限性。虽然人们都在谈论它的至高无上，但它们并非在所有方面都优于经典计算机。实际上，它们在许多任务上能带来的提升微乎其微。但在有些问题上——仅仅是有些——聪明的程序员或数学家能创造出算法来利用这些机器的量子能力。在这些特殊的案例中，量子计算机会带来巨大的收获，用几分钟或几秒钟处理完原本需要多年或几千年才

能完成的任务。

其中一些算法已经被开发出来，让人们得以一窥量子计算机的优势所在。例如在加密技术方面，量子机器可以迅速解开复杂的数学题，而这些数学题构成了保护网上信息的大部分加扰处理。换句话说，在一个拥有强大量子计算机的世界里，今天的大部分网络安全措施都会被攻破。科技公司和各国政府正在研究新的基础加密技术，希望能免受量子计算机的影响。但部署它们要耗费几十年。

正如费曼所指出的，经典计算机很难模拟作为物理和化学基础的量子力学过程。量子计算机可以轻松自如地做到这一点，这对于开发从药物到石油化工产品的各种物品都很有用。它们在解决优化问题上的能力能帮助金融公司改进交易算法。人工智能研究人员也希望量子计算机能改进他们的算法。

不过，现在一切都还未见分晓。谷歌的机器最适合被看作一个史泼尼克时刻。就“史泼尼克号”本身而言，它除了哔哔地叫着绕行地球外并没什么用处。但它证明了一个概念，并吸引了全世界的注意。谷歌的成果打击了量子计算的怀疑论者。它强有力地表明了量子技术的前景不仅在理论上成立，在实践中也能实现。而这将为这个炙手可热的领域吸引到更多的资金和关注。在用量子计算机解决现实世界的任务之前还有大量的工程建设要完成。但这一天突然离我们更近了。 ■



Schumpeter

The lessons of Stephen Schwarzman

How to build a legacy

AS A CHILD growing up in Philadelphia, Stephen Schwarzman had a part-time job selling handkerchiefs to old ladies at his father's shop, Schwarzman's Curtains and Linens. He hated it. His main consolation was imagining how the firm could expand across post-war America, like Sears. But his father was not interested. He was happy with a house, two cars and some money. He was no entrepreneur. The younger Mr Schwarzman, who went on to co-found Blackstone, the world's largest alternative-asset manager, and become an Olympian of modern-day capitalism worth \$18bn, recounts that story at the start of his memoir, "What It Takes". It is one of the few times a mere mortal appears in his account—only to be swiftly shunted aside.

Mr Schwarzman has little time in the book for the little guy. Other financiers wring their hands over the wealth gap between bosses and workers. Not him. He was a rare executive in America's Business Roundtable not to sign a charter last month calling for an end to the shareholder-led model of capitalism. His private life appears to be one of lavish parties and glamorous schmoozing. Acknowledgments in the book stretch to 14 pages and he name-drops five American presidents, four French ones and China's Xi Jinping.

Yet Mr Schwarzman avoids footling with life's foot-soldiers for a reason. The book has a higher purpose. Many will read it for insights on how to become a master of the universe. The subtext is how to build a legacy: a quest that at 72, he looks hellbent on. That means giving away chunks of his fortune so that the Schwarzman name is inscribed, Rockefeller-like, on

libraries, universities and scholarship programmes. It also means building a firm that outlasts him as J.P. Morgan has outlasted John Pierpont. Indeed, Mr Schwarzman's 25 "Rules for Work and Life" can be boiled down to one: how to create a corporate culture that persists.

Contrary to its barbarian image, the world of finance is not culture-free. Yes, employees at Lehman Brothers, where Mr Schwarzman once worked, famously had a reputation for not stabbing people in the back—but walking right up and stabbing them in the front. And Blackstone is sometimes similarly portrayed as a dealmaking war machine, with Mr Schwarzman as the merciless field-marshall; not for him hard-to-measure pieties about the purpose of business. But his company does have purpose, he feels: to generate healthy profits for investors, which include pension funds, while providing 500,000 jobs in the firms in which Blackstone invests.

Peer beneath Blackstone's armour and clear values emerge. The interplay between three in particular—ruthless ambition, unexpected humility and fierce loyalty—is the backbone of Mr Schwarzman's book. It also lies at the core of his company.

Start with ambition. Blackstone is steeped in unabashed elitism. Mr Schwarzman makes no bones about his own desire to be bigger than the rest. After he co-founded Blackstone with \$400,000 in 1985, he set out to raise more money from investors than any upstart fund before it. Now it has \$545bn under management—this year it has raised the world's biggest-ever private-equity and property funds. When he launched Blackstone's initial public offering in 2007, he wanted it to be the first private-equity IPO. Blackstone was pipped to the post by a smaller rival but it was still one of Wall Street's landmark listings. This year it scrapped its partnership structure to become a corporation, raising its market value above \$60bn—not far from that of BlackRock, which split from Blackstone in the mid-1990s to become a powerhouse in its own right, and with which Mr

Schwarzman has a respectful rivalry. When hiring, he aims to recruit only “tens”. As he puts it: “You have two options: either run a middling company going nowhere or clear out the mediocrity.” His philanthropy focuses on the elites of tomorrow—by sending American scholars to China, for instance.

This competitive streak is balanced by surprising humbleness. Blackstone readily learns from its mistakes. Mr Schwarzman owns up to several. The most painful came in 1989, when he backed a new employee’s gamble on a steel firm, Edgcomb, despite opposition from more experienced colleagues. It went spectacularly wrong. Since then, he ordained, investment decisions must always be made collectively. The meetings, robust affairs where participants compete to pick holes in each other’s ideas, reflect the premium Blackstone affords ambition. But focusing on downside risks rather than upside potential promotes prudence. When Blackstone bought Equity Office Properties, a real-estate trust, for \$39bn on the eve of the financial crisis in 2007, it recouped more than half what it had paid at a profit within a day in order to turn a huge risk into a manageable one.

The third value is loyalty. When Blackstone’s share price tumbled during the financial crisis, Mr Schwarzman listened to board members urging him to maintain its dividend, to spare the blushes of the Chinese sovereign-wealth fund, which had taken a huge punt on the IPO. As he told Jimmy Cayne, the boss of Bear Stearns, as the investment bank stared into the abyss: “There are times when you just have to stand up and write a cheque.” In other words, safeguard your reputation by making good those whose money you are responsible for. Mr Cayne did not listen.

The book has flaws, as does its author. He describes his early career in humorous detail: as a fresh-faced financier, “I must have been the biggest buyer of antiperspirant on the East Side of Manhattan.” By the end, he mainly brags. Blackstone is less prudent than he lets on. Buying Hilton, a hotel chain, for \$26bn amid the financial crisis turned a huge profit—but

was reckless in the extreme at the time. He glosses over the incestuous relationship between Wall Street and Washington. That said, his defence of capitalism at its red-blooded best is refreshing. If Blackstone's mix of dynamism and integrity lives up to this paragon, Mr Schwarzman's firm deserves to last. ■



熊彼特

苏世民的教训

如何让功业长存

在费城长大的苏世民曾经做过一份兼职，在他父亲的“施瓦茨曼窗帘和日用织品店”里卖手帕给老妇人。他讨厌这份活计。他当时最大的安慰是想象这家店能像西尔斯百货一样在战后的美国扩张。但他父亲对此没有兴趣——有栋房子、两辆车、一些钱，他就很满足了。他不是那种企业家。在回忆录《追求卓越的教训》(What It Takes)一书的开头，苏世民讲述了这番往事。后来他与人共同创立了全球最大的另类资产管理公司黑石(Blackstone)，成了现代资本主义的大神，身家180亿美元。在他的记述中少有凡夫俗子出场，父亲是其中一个——但也很快就翻篇了。

苏世民在书中没留多少笔墨给小人物。其他金融家为老板和工人之间的贫富差距忧心。他没有。上个月，在美国商业圆桌会议上，他是少有的没有签署声明呼吁终结股东主导的资本主义模式的高管。他的私人生活似乎总是充斥着奢华的派对和迷人的闲谈。书中的致谢部分长达14页，看似轻描淡写地提到了五位美国总统、四位法国总统和中国国家主席习近平。

不过苏世民避免在生活中的小兵上浪费时间是有原因的。这本书立志更高远。很多人读它是想知道如何成为“宇宙之王”。潜台词是如何让功业长存：这似乎是72岁的他拼了命也要完成的一项任务。这意味着他得捐出大部分财产，让苏世民的名字像洛克菲勒那样铭刻在图书馆、大学和奖学金项目上。这还意味着创立一家比他的生命更长久的公司，就像摩根大通比约翰·皮尔庞特(John Pierpont)更长久一样。其实苏世民的25条“工作和生活准则”可以归结为一条：如何创造一种经久不衰的企业文化。

与野蛮人的声名相反，金融界并非不讲究文化。是的，苏世民曾经工作过的雷曼兄弟的员工以不在人背后捅刀子闻名——他们会径直走上前去，从正面捅人。与此类似，黑石有时也被刻画成一个撮合交易的战争机器，苏

世民则是一位无情的元帅，而非对办企业的宗旨怀揣什么难以衡量的虔诚。但他觉得自己的公司确有其追求：为包括养老基金在内的投资者创造可观的利润，同时由黑石投资的一众公司提供50万个就业岗位。

透过黑石的盔甲，它的价值主张清晰可见。苏世民这本书的主线尤其是三种价值的相互作用：冷酷无情的野心、出人意料的谦逊、强烈的忠诚。这也是他的公司的核心。

先说野心。黑石浸淫在毫不掩饰的精英主义之中。苏世民毫不讳言自己想比其他人做得更大。1985年，他用40万美元与人共同创立了黑石后，开始努力从投资者那里筹集比在它之前任何一只新贵基金都大的数额。如今这家公司管理着5450亿美元的资产，今年还筹集到了全球有史以来最大的私募股权和房地产基金。当他在2007年启动黑石的IPO时，他希望它成为第一家上市的私募股权公司。尽管被一家规模较小的竞争对手以很小的优势抢了先，但黑石仍创下了华尔街里程碑式的上市记录之一。今年，它放弃了合伙制结构而转为公司制，令其市值升至六百多亿美元，与贝莱德（BlackRock）相差不远。上世纪90年代中期，贝莱德从黑石分拆出来，凭借自身实力成为一家巨擘，也是苏世民尊敬的对手。在招人时，他的目标只是“几十”。正如他所说，“你有两种选择：要么经营一家没有前途的中等企业，要么清除掉那些庸才。”他把慈善事业着重放在培养未来的精英身上，例如把美国学者派到中国。

这种力争上游的态度又被令人惊讶的谦逊所平衡。黑石很会从错误中吸取教训，有几次是苏世民自己犯下的。最痛苦的一次发生在1989年，当时他不顾更有经验的同事反对，支持一位新员工在钢铁公司Edgcomb上下注。结果大错特错。自那以后，他规定投资决策必须始终由集体做出。公司会议气氛活跃，与会者竞相在对方的点子上挑刺，反映出黑石对野心的珍视。但关注下行风险而非上行潜力让公司更加谨慎。2007年金融危机爆发前夕，黑石斥资390亿美元收购了房地产信托公司Equity Office Properties。为了使巨大的风险降为可控风险，它在一天之内溢价转手了一部分，收回了所付金额的一半多。

第三个价值观是忠诚。金融危机期间黑石股价暴跌时，苏世民听取了董事会成员敦促他维持股息的意见，以免让押重注于黑石IPO的中国主权财富基金难堪。就像在贝尔斯登（Bear Stearns）陷入困境时，他对该公司老板吉米·凯恩（Jimmy Cayne）所说的那样：“有些时候你就是得站出来，有所担当，开张支票。”换句话说，你得弥补那些把钱交付给你的人，以此维护你的声誉。凯恩没听进去。

这本书有缺憾，它的作者也一样。苏世民用诙谐的细节描述了自己早年的职业生涯：作为金融界的新手，“我一定是曼哈顿东区买止汗剂最多的人”。说到底，他主要还是在吹嘘。黑石并不像他说的那么谨慎。在金融危机期间，黑石以260亿美元收购连锁酒店希尔顿，虽然大赚了一笔，但在当时却是鲁莽至极。他掩饰了华尔街和华盛顿之间的勾连。尽管如此，他对资本主义充满活力的最佳状态的辩护令人耳目一新。如果黑石对活力和诚信的结合能够得上这样的典范，苏世民的公司就配得上长存。 ■



The Economist film

Battling wildfires

In one month, Brazil battled over 100000 wildfires. In America, humans are now responsible for 84% of all wildfires.



经济学人视频

对抗野火

一个月内，巴西就要抗击超过10万场野火。在美国，如今人类导致了84%的野火。



Chinese drugmakers

A rising star

China's pharmaceuticals industry is growing up

THE GLEAMING campus of BeiGene, a biotechnology company in Beijing, has all the trappings of a well-heeled research laboratory. They include screening machines to test the 500,000 compounds in BeiGene's library, its animal-testing quarters with 10,000 creatures—and Wu Xiaobin, who last year left a job as Pfizer's head for China to run the Chinese firm's domestic operations. Signs of expansion are all around—especially for research on cutting-edge treatments that include gene and cell therapies. The number of scientists working on such drugs has almost doubled since last year; more are being hired. Fresh lab space has replaced old offices.

BeiGene, founded in 2010, is emblematic of China's fast-changing pharmaceuticals industry—in more ways than one. On September 5th a New York asset manager alleged that it had inflated its sales figures—a sign of distrust of an industry with a historically well-earned reputation for shoddy quality and shady business practices. The company, which is listed on America's Nasdaq stock exchange, denies wrongdoing. Investors seem to believe it: its share price has recouped half of the 17% drop precipitated by the accusations.

Markets' optimism is doubtless fuelled by the huge promise of China's pharmaceutical industry. In 2016 the country became the world's second-biggest drug market. In 2018 sales reached \$137bn, doubling in just six years. They are projected to be worth half of America's by 2030, up from a quarter now. Much of this will come not from foreign drugmakers but domestic ones. At the same time, Chinese firms, which have historically produced copycat drugs for domestic use, will increasingly sell innovative treatments

for everyone, like those being developed by BeiGene.

The industry's makeover was set off by growing alignment of China's drug regulation with international standards. Speedier drug-approval processes rolled out in 2015 are modelled on America's. Regulatory oversight of clinical trials is converging with Western norms. About 3,000 applications for me-too drug approvals were withdrawn when the government announced the new rules, winnowing out many flaky firms. Starting in 2017 medicines have been able to get approved in China on the strength of clinical trials abroad.

At the same time, consolidation of drug procurement by state hospitals that began in 2015 squeezed the bloated prices of generic drugs. By one estimate, this freed up \$30bn a year for pricier medicines such as the newest cancer drugs. Some 400m Chinese now have health-insurance plans that cover these.

Chinese drug companies are pouring money into research—and researchers. China's legions of science graduates, including returnees from top foreign universities and Big Pharma labs, where they discern a glass ceiling, are sharpening its edge in medical innovation. Around 250,000 Chinese returnees who have come back since 2013 work in life sciences.

The booming domestic market for high-end drugs has created a similarly frothy one for their makers. Franck Le Deu of McKinsey, a consulting firm, calls it a "Cambrian explosion". In 2018 venture-capital and private-equity investments in China's biotechnology firms reached \$17bn, according to ChinaBio, a consultancy. Most of it came from local sources. The medical zone of Shanghai's Zhangjiang Hi-tech Park, one of China's biggest, houses more than 1,000 companies—about ten times the number a decade ago.

China's biotech sector is just 12% of its overall drug market, half the global

average of 25%. Most Chinese firms are young, and yet to turn a profit. But they are growing fast. Five of the world's ten biggest biotech initial public offerings in the first half of this year were of Chinese companies, which collectively raised \$1.6bn. To lure star startups away from New York and London listings, last year Hong Kong's stock exchange relaxed its rules to allow pre-revenue biotech firms to go public there.

Although they often started out licensing foreign drugs, either approved or in late-stage development, for the domestic market, Chinese firms soon set up their own drug-discovery programmes. These days they have global ambitions from the start, says Mr Le Deu—with eyes on the lucrative American market. Several are running late-stage clinical trials there and in Europe. In 2018 Chinese companies started 26 multiregional clinical trials, up from four in 2013. BeiGene is running over 60 international ones. China's first home-grown cancer drug, discovered by Chi-Med, is in clinical trials in America. In 2017 China overtook America in clinical trials of novel treatments that reprogramme patients' immune cells to fight cancer.

For now, most high-end drugs germinating in China are “me too” or “me better” ones that mimic existing therapies. Breakthroughs that yield drugs with a novel mechanism of action remain sporadic. Translating Chinese basic science into treatments at university research laboratories—the incubators for biotech start-ups in Western countries—is in its infancy, says Shan He from Sanford C. Bernstein, a research firm. But it is only a matter of time before China begins to rival America and Europe in this area. Chang Lee of Parexel, an American clinical-research contractor, reckons it could happen before 2030.

Chinese drug innovation may put pressure on the exorbitant prices of new medicines in the West. Some biotech firms sell advanced drugs for 70% less than Western equivalents. Marc Funk, chief executive of Lonza, a Swiss contract manufacturer of drugs which is opening a new facility in Shanghai,

insists this is happening “without compromising quality”.

President Xi Jinping wants the overhaul of Chinese pharma to proceed apace. It is part of his “Made in China 2025” strategy for global leadership. One drugs executive in China says that the government’s main motive for overhaul, as with many reforms, is to preserve social stability as more patients ask why highly effective drugs for their illnesses that are used in America are not available in China. Two weeks after the release last year of “Dying to Survive”, a hit movie inspired by the real-life story of a leukaemia patient, China’s prime minister, Li Keqiang, urged regulators to get cheaper cancer drugs on sale more quickly.

Progress may hit several obstacles. One worry is the sheer number of Chinese biotech firms that have piled into cancer treatments. A shakeout is imminent once they start releasing results from late-stage trials. Some drugs will flop once they start selling, as happens in a competitive market. The big worry is that Chinese investors may flee biotech altogether when things go awry for one or two firms. They still have a lot to learn about how the biotech business works, says Nisa Leung of Qiming Venture Partners, a big investor in Chinese healthcare. They overvalued some of the first biotech startups that went public in Hong Kong—only to see their share prices fall. Leading Chinese firms like Chi-Med and Zai Lab, as well as BeiGene, have listed their shares in New York or London, with their veteran biotech investors. But not all firms have that option.

The second big risk is China’s fragile drugmaking infrastructure. Although many clinical-trial sites are up to global standards, some are not. Immunotherapies are more difficult to make than the small-molecule compounds in traditional pills and injections, so the risk of faulty batches is greater. Political pressure like that from Mr Xi or Mr Li could make companies and regulators cut corners. Unlike in mature Western markets, a single quality scandal could shatter the credibility of the country’s entire

biotech industry, says Mr Le Deu.

Such teething pains are unavoidable in a complex industry taking hold in a developing economy. If their makers can withstand them, drugs will move from being “Made in China” to being invented there. ■



中国制药企业

冉冉升起的新星

中国的制药业正在不断壮大

生物科技公司百济神州位于北京的园区熠熠生辉，拥有一个资金雄厚的科研实验室该有的一切：用来测试它化合物库里的50万种化合物的筛选设备、有一万种动物的动物实验区，还有原辉瑞中国区负责人、去年到百济神州负责国内业务的吴晓斌。扩张的迹象随处可见，特别是在基因和细胞疗法等前沿疗法领域。自去年以来，研发这类药物的科研人员增加了将近一倍，还有更多人正在加入进来。曾经的办公室改造成了全新的实验室。

成立于2010年的百济神州用不止一种方式凸显出中国制药业的快速变化。9月5日，纽约一家资产管理公司指控它夸大销售数据。这是外界对制药业不信任的体现。这个行业久有质量低劣、不正当经营的恶名——却也是它应得的。在美国纳斯达克证券交易所上市的百济神州否认存在不当行为。投资者似乎选择相信其说法：其股价在因指控骤跌17%后已收复了一半失地。

市场的乐观情绪无疑受到中国制药业巨大前景的推动。2016年，中国成为世界第二大医药市场。2018年医药销售额达到1370亿美元，在短短六年内翻了一番。目前中国医药市场的价值为美国的四分之一，预计到2030年将上升至美国的一半。大部分增长将是来自国内而非国外的制药企业。同时，过去一直在生产仿制药供应国内市场的中国公司将越来越多地向全世界出售创新疗法，比如百济神州正在开发的那些。

中国的药品监管日益并轨国际标准，促成了制药业改头换面。2015年，中国以美国的做法为蓝本，开始加快药品审批流程。针对临床试验的监督管理正在与西方标准接轨。政府宣布实施新规后，约有3000份仿制药的批准申请被撤回，淘汰了许多不靠谱的公司。自2017年开始，药物依据国外临床试验的结果就可在中国获批上市。

与此同时，2015年开始的公立医院药品集中采购压低了仿制药虚高的价格。据估计，每年因此节省下了300亿美元用于购买更贵的药物，如最新的抗癌药。现在，大约有四亿中国人的医保可以报销此类药物。

中国的制药公司正在药物研发以及科研队伍上投入大量资金。大批理科毕业生，包括毕业于国外顶尖大学和在国外大型制药公司实验室遇到“玻璃天花板”的海归，正在加强中国在医药创新方面的优势。2013年以来，有约25万名海归回国后在生命科学领域工作。

国内蓬勃发展的高端药品市场也为高端制药商创造了良好的机遇。咨询公司麦肯锡的乐诚铎（Franck Le Deu）称之为“寒武纪大爆炸”。咨询公司ChinaBio的数据显示，2018年，对中国生物科技公司的风险资本和私募股权投资达到170亿美元。大部分资金来自中国国内。入驻上海张江高科技园区医药基地（中国最大的医药基地之一）的公司超过1000家，约为十年前的十倍。

生物科技占中国整个药品市场的比例仅为12%，是全球平均水平25%的一半。大多数中国公司还很年轻，尚未盈利，但它们成长迅速。今年上半年，全球前十大生物科技公司IPO中，中国公司占据半壁江山，共融资16亿美元。为与纽约和伦敦的证交所争夺明星创业公司，港交所去年放宽了上市规则，允许尚未产生收入的生物科技公司在香港上市。

尽管中国公司在发展之初通常是获得授权在国内市场销售已获批或处于研发后期的外国药品，但它们很快就建立起了自己的药品研发项目。乐诚铎说，现在的中国制药公司从一开始就有面向全球的抱负——紧盯利润丰厚的美国市场。有几家公司正在美国和欧洲开展后期临床试验。2018年，中国公司启动了26项多区域临床试验，而2013年只有四项。百济神州正在开展60多项国际临床试验。由和黄中国医药科技有限公司研发的中国首个本土抗癌药物正在美国进行临床试验。2017年，中国在重组患者免疫细胞的抗癌新疗法上的临床试验数量超过了美国。

目前，在中国研发的高端药物大多是模仿现有疗法的“仿制药”或“改进

药”。在创造出具有创新作用机制的药物方面只有零星的突破。研究公司盛博的何珊表示，在中国的大学研究实验室（在西方国家它们是生物科技创业公司的孵化器），将基础科学研究转化为疗法的努力尚处于起步阶段。但是，中国在这一领域开始与欧美抗衡只是时间问题。美国临床研究委托公司百瑞精鼎（Parexel）的李昌（Chang Lee，音译）估计，三足鼎立的格局可能在2030年之前就形成。

中国的医药创新可能会给西方的高价新药造成压力。一些生物科技公司的先进药物的售价比西方同类产品低70%。瑞士药品委托制造商龙沙（Lonza，即将在上海开设新工厂）的首席执行官马克·芬克（Marc Funk）坚称这“并没有牺牲质量”。

习近平希望快速推进中国制药业的全面改革，这是他争取全球领先地位的“中国制造2025”战略的一部分。一位中国制药业的高管表示，和许多改革一样，政府实施制药业全面改革的主要动机是维护社会稳定，因为越来越多的患者在质问为什么那些对他们的病情很有效的药物在美国能用，在中国却无法获得。去年，根据一名白血病患者的亲身经历改编的热门影片《我不是药神》上映两周后，总理李克强敦促监管机构落实抗癌药降价保供。

未来的发展可能会遇到一些障碍。一个担忧是大量中国生物科技公司涌入了癌症治疗领域。一旦它们开始发布后期试验的结果，就会发生一轮洗牌。就像在任何竞争激烈的市场一样，一些药品刚开始销售便会折戟。真正令人忧虑的是，在一两家公司出现问题后，中国投资者可能就会彻底逃离生物科技领域。中国医疗保健领域的大投资方启明创投的梁颖宇说，关于生物科技产业的运作方式，投资者仍有很多东西要学。他们对最先在香港上市的一些生物技术创业公司估值过高，结果就看到它们股价下跌。和黄医药科技、再鼎医药，还有百济神州等领先的中国公司已经在拥有经验丰富的生物科技投资者的纽约或伦敦上市。但并非所有公司都能选择这样做。

第二大隐患是中国脆弱的制药基础设施。尽管许多临床试验场所都符合全

球标准，仍有一些未能达标。免疫疗法比传统药丸和注射剂中的小分子化合物更难制造，因此出现问题批次的风险更大。习近平或李克强等施加的政治压力可能会促使企业和监管机构走捷径。乐诚铎说，与成熟的西方市场不同，只要出现一次质量丑闻就可能破坏整个中国生物科技产业的信誉。

在一个发展中经济体里，复杂的产业不可避免地会经历这种成长的痛苦。如果制药企业能够经受住这些痛苦，药物就将从“中国制造”转变为“中国创造”。 ■



China's "maritime road"

The best offence is a good defence

China's foreign port-building helps to protect existing trade routes

AN OLD SAYING warns about Greeks bearing gifts, but it might fit the Chinese better. In the 1400s Zheng He, a Muslim slave who became the Ming empire's admiral, led seven voyages south and west. He offered treasure to every leader he met—but only if they acknowledged the emperor, joining a world order centred on Beijing.

Chinese leaders today are following in Zheng's wake. The "road" half of its Belt and Road Initiative (BRI)—a global infrastructure-building scheme—is a maritime one of seaports and shipping channels. Xi Jinping, China's president, has said it will create a new model of "win-win co-operation". Some critics suspect nefarious motives, such as yoking poor countries to China by giving them unrepayable loans.

The BRI has evolved site by site and Chinese officials have not made their intentions clear. However, the locations of the 22 maritime-road projects that we have identified as under way show how it is most likely to aid China. They suggest it will be more useful for protecting existing trade routes than expanding Chinese influence.

To measure the maritime road's impact, we tested three benefits it could offer China. If the road were a resource grab, its projects should cluster in places that sell raw materials that China imports. If its aim were to boost trade, it should track the busiest routes used by Chinese shipping today, or where trade is likely to grow fastest. And if it were intended to secure current trade routes, its ports should sit near choke points—areas whose closure would force goods to travel circuitously—or in places that offer

alternative routes.

We tested these explanations by using them to predict if countries host a BRI port. The results were conclusive. After holding other factors constant, there was no statistically significant link between having a BRI port and exporting raw materials that China wants, or having high current or projected trade with it. In contrast, the “trade-protection benefit”—either the value of Chinese trade in a country’s waters multiplied by the extra distance goods would have to go if those routes were shut, or the amount of trade that would be diverted to a country if shipping were disrupted elsewhere—was a good predictor. Given two otherwise average countries, one with a high trade-protection benefit (like Libya) is 2.7 times likelier to host a BRI port than another with an average benefit (like Liberia).

Owning or running a port does not guarantee perpetual access, but it does give China influence by enabling it to disrupt the host’s own shipping if it chooses. Many overland “belt” routes in the BRI would also make Chinese trade more resilient. For example, if the Strait of Malacca were closed, China could switch to BRI ports it wants to build in Myanmar, and finish the trip on planned BRI rail lines.

China’s military footprint also shows a focus on guarding trade routes. Its only base abroad is at Djibouti’s Bab al-Mandab Strait—the waterway whose closure would hurt China more than anywhere else. ■



中国的“海上丝绸之路”

防御是最好的进攻

中国的海外港口建设有助于保护现有贸易路线

西方有句老话，警告人们小心带着礼物来的希腊人，但这句话用在中国人身上也许更合适。明朝有个叫郑和的穆斯林，早年曾做奴隶，后来任水师将领，在15世纪七次下西洋。他向沿途所经各地的首领送上财宝，但前提是他们承认明朝皇帝并加入以北京为中心的世界秩序。

今天的中国领导人正在仿效郑和的做法。全球基础设施建设计划“一带一路”倡议中的“路”指的是海路，以建设港口和航运通道为目标。中国国家主席习近平表示这将开创一种“合作共赢”的新模式。一些批评人士疑心这背后动机不纯，例如中国可能向穷国提供它们无力偿还的贷款，从而控制它们。

“一带一路”项目已在逐步推进，而中国官员尚未清楚表明他们的意图。但我们找到了海上丝绸之路22个在建项目的位置，显示出中国最有可能从“一带一路”获得的帮助。从这些地点来看，它更大的作用是保护现有贸易路线，而不是扩大中国的影响力。

为衡量海上丝绸之路的影响，我们检验了它可能带给中国的三个好处。如果这条“路”是为了抢夺资源，那么项目应集中在中国进口原材料的供应地。如果是为了促进贸易，那么项目应紧盯中国如今最繁忙的货运航线，或是对华贸易可能增长最快的地区。如果是为了保护现有贸易路线，那么项目建设的港口应靠近咽喉要道（一旦封锁将迫使货物绕行）或备选航道上的要地。

为检验这些解释是否合理，我们利用它们来预测各个国家能否吸引到“一带一路”的港口项目。结论是明确的。在其他因素不变的情况下，建设“一带一路”港口与出口中国所需的原材料在统计上没有显著关联，与当前已存在或未来可能发生的大笔对华贸易的关联也不显著。相比之下，“有利

于保护贸易”是个有效的预测根据，其计算方式或者是用一国海域内的对华贸易额乘以货物在现有路线封锁的情况下须绕行的额外里程数，或是因货运在其他地区受阻而转移到一个国家的贸易量。在其他条件相当的两个国家之间，更“有利于保护贸易”的国家（如利比亚）吸引“一带一路”港口项目可能性是此方面优势不明显的国家（如利比里亚）的2.7倍。

在国外拥有或经营港口并不能保证中国可以永久使用该港口，但在需要时，中国可以通过干扰东道国自身的货运来发挥影响。“一带一路”的许多陆上经济“带”也将增强中国贸易的弹性。例如，如果马六甲海峡被封锁，中国可改用计划在缅甸建造的“一带一路”港口，然后通过规划中的“一带一路”铁路完成运输。

中国的军事布局也显示了政府对保护贸易路线的重视。中国唯一的海外军事基地位于吉布提的曼德海峡（Bab al-Mandab Strait）——这条航道一旦关闭带给中国的伤害将比其他任何地方都要大。■



Open-source computing

Your own RISC

A new blueprint for microprocessors is challenging the industry's giants

MOST MICROPROCESSORS—the chips that do the grunt work in computers—are built around designs, known as instruction-set architectures (ISAs), which are owned either by Intel, an American giant, or by Arm, a Japanese one. Intel's ISAs power desktop computers, servers and laptops. Arm's power phones, watches and other mobile devices. Together, these two firms dominate the market. Almost every one of the 5.1bn mobile phones on the planet, for example, relies on an Arm-designed ISA. The past year, however, has seen a boomlet in chips made using an ISA called RISC-V. If boomlet becomes boom, it may change the chip industry dramatically, to the detriment of Arm and Intel, because unlike the ISAs from those two firms, which are proprietary, RISC-V is available to anyone, anywhere, and is free.

An ISA is a standardised description of how a chip works at the most basic level, and instructions for writing software to run on it. To draw an analogy, a house might have two floors or three, five bedrooms or six, one bathroom or two. That is up to the architect. An ISA, however, is the equivalent of insisting that the same sorts of electrical sockets and water inlets and outlets be put in the same places in every appropriate room, so that an electrician or a plumber can find them instantly and carry the correct kit to connect to them.

RISC-V offers computer architects a way to standardise their sockets and plumbing without having to gain permission from (and pay royalties to) either of the monopolists—for any company or individual may download it from the internet. It was originally written by computer scientists at the

University of California, Berkeley, who wanted an instruction set that they could use for publishable research. Commercial producers of ISAs were reluctant to make theirs available, so the academics decided to buckle down and write their own.

The result, RISC-V, made its debut in 2014, at the Hot Chips microprocessor conference in California. It is now governed by a non-profit foundation. Though there are no formal royalties, the foundation does solicit donations as *pro bono publico* gestures from firms that employ RISC-V architecture—for what was once a tool for academics is now proliferating commercially.

There are three reasons for this proliferation. The most obvious is that the lack of royalties means using RISC-V is less costly than employing a commercial ISA. If the final product is a high-price object like a smartphone, that may not be a huge consideration. But for cheaper devices it is. Moreover, as chips are built into a growing range of products, such as home appliances, city infrastructure and factory equipment, it makes business sense to keep them as cheap as possible.

A second, more subtle advantage is that, unlike chips based on proprietary designs, those involving RISC-V can be used without lengthy and expensive contractual negotiations. It can take between six months and two years to negotiate a licence to use a chip design involving a commercial ISA. In the world of computing, especially for a cash-strapped startup, that is an eternity.

The third reason people are shifting to RISC-V is the nature of open source itself. Since the instruction set is already published online, American export controls do not apply to it. This has made it particularly popular with Chinese information-technology firms. Alibaba, an e-commerce giant based in Hangzhou, announced its first RISC-V chip in July. Shanghai's municipal

government has a programme which supports startups using RISC-V in their designs. Huami, a big wearable-device firm in Hefei, is mass producing smart watches containing processors based on RISC-V. And in Shenzhen, Huawei, one of the world's largest electronics companies, has a team of developers working on RISC-V. In an interview in September Wang Chenglu, the boss of Huawei's consumer-electronics business, pointed to the RISC-V foundation's recent move to Switzerland, out of America's jurisdiction, as something that will encourage Huawei's use of the ISA.

RISC-V does have weaknesses. Arm has spent decades building software tools to work with its designs, and spends a lot of its time helping customers implement these on their chips. The tools that exist for RISC-V designs are not yet that sophisticated. Intel makes things simpler still. It carries out all of the development, testing and fabrication itself, delivering only finished chips to customers. This reliability will certainly keep these firms' products competitive for a while.

Despite all that, though, RISC-V seems likely to thrive, particularly in products that contain chips but which are not smartphones or computers. Open-source software was a prerequisite for the smartphone boom that has taken place over the past decade. Open-source hardware, such as RISC-V, may lead to a similar expansion of other devices in the decade to come. ■



开源计算

我行我“速”

一种新的微处理器设计正在挑战行业巨头

大多数微处理器，即在计算机中执行繁重工作的芯片，都是基于名为指令集架构（ISA）的设计而制造的。这种设计要么为美国巨头英特尔所有，要么为日本巨头安谋（Arm）所有。英特尔的ISA用于台式电脑、服务器和笔记本电脑，安谋的则供手机、手表和其他移动设备使用。两家公司共同主导了市场。例如，全球51亿部手机几乎全部依赖安谋设计的ISA。不过，过去一年里，基于名为RISC-V的ISA制造的芯片掀起了一波小高潮。如果小高潮能成大气候，芯片行业也许就会发生巨变，对安谋和英特尔不利。这是因为RISC-V与这两家公司专有的ISA不同，可供任何人在任何地方使用，而且还是免费的。

ISA是对芯片最底层工作方式的一种标准化描述，以及对编写在芯片上运行的软件的指引。打个比方，一栋房子可以是两层或三层，有五间或六间卧室，一间或两间浴室——全看建筑师怎么设计。而ISA就相当于坚持在每个合适的房间里、在同样的位置装上同一种电源插座和进出水管，方便电工或水管工立刻找到它们，并带上合适的工具箱来与之连接。

RISC-V为计算机架构师提供了一种将插座和管道标准化的方法，而不用获得两大垄断公司任何一家的许可（也无需支付授权费），任何公司或个人都可以从互联网上下载它。它最初是由加州大学伯克利分校的计算机科学家编写，他们想拿到一个指令集，用在可公开发表的研究中。但商用ISA的制造商不愿意免费提供它们的指令集，所以学者们决定倾尽全力自己写一个。

他们的成果——RISC-V——在2014年的加州Hot Chips微处理器会议上首次亮相，现在由一个非盈利基金会管理。尽管没有正式收取授权费，该基金会还是会以资助公益行为的名义向那些使用RISC-V架构的公司征集捐款，

因为RISC-V架构曾经是一种学术研究工具，而如今正大量应用于商业。

商业化应用激增有三个原因。最明显的一个就是RISC-V不收取授权费，因而比使用商业ISA成本低。如果最终产品是像智能手机那样的高价产品，成本可能不是什么大问题，但对于便宜一些的设备来说就不同了。此外，随着芯片被嵌入到越来越多的产品之中，如家用电器、城市基础设施和工厂设备，让它们尽可能便宜是具有商业合理性的。

第二个优势不易察觉些。与基于专有设计的芯片不同，使用RISC-V架构的芯片无需经过冗长而代价高昂的合同谈判。要拿到使用商业ISA的芯片设计的许可或许要谈判六个月到两年。在计算机行业里，特别是对于资金短缺的创业公司来说，这么长的时间是等不起的。

人们转向RISC-V的第三个原因是开源本身的特性。由于这个指令集已经在网上发布，美国的出口管制并不适用于它。这让它尤其受到中国信息技术公司的欢迎。总部位于杭州的电子商务巨头阿里巴巴于7月发布了它的首款RISC-V芯片。上海市政府的一个项目支持创业公司在设计中使用RISC-V。合肥的大型可穿戴设备公司华米正在大批量生产装有基于RISC-V架构处理器的智能手表。全球最大的电信设备公司之一华为在深圳的一个研发团队正在研究使用RISC-V。在9月的一次采访中，华为消费者业务软件总裁王成录指出，RISC-V基金会最近搬到了瑞士，不受美国司法管辖，这将促使华为使用这种ISA。

RISC-V确有其不足。安谋花了几十年的时间打造各种软件工具来配合它的设计，并且花费了大量的时间帮助客户在他们的芯片上应用这些工具。而用于RISC-V设计的工具还没有那么成熟。英特尔更是进一步简化了客户的工作。它包揽了所有的开发、测试和制造工作，只向客户交付成品芯片。这种可靠性肯定会让这些公司的产品在一段时间内保持竞争力。

尽管如此，RISC-V看起来很有可能会蓬勃发展，尤其是在一些含有芯片但不是智能手机或电脑的产品上。开源软件是过去十年来智能手机大发展的先决条件。而像RISC-V这样的开源硬件也许会在未来十年内让其他设备实

现类似的扩张。 ■



The world economy

Foggy outlook

How the twists and turns of the trade war are hurting growth

AFTER WELCOMING the St Louis Blues, a championship-winning ice-hockey team, to the White House on October 15th, President Donald Trump fondly recalled a recent triumph of his own: a tentative trade deal with China struck in the previous week. Simply put, America will impose no further punitive tariffs on Chinese imports if China promises to buy American farm goods worth billions of dollars. How many billions? “It’s very big numbers,” Mr Trump emphasised. “I said, ‘Ask for 70....My people said, ‘All right, make it 20.’ I said, ‘No, make it 50.’”

Will this carefully calibrated amount ever materialise? China does not want to pay over the odds or deprive other, friendlier suppliers of its custom. It also wants America to go beyond promising no new tariffs and to start removing existing ones. The deal may unravel before it is written down, let alone signed by the two countries’ leaders next month at the Asia-Pacific Economic Co-operation forum in Santiago.

That unpredictability is a problem. Not just higher tariffs but “prolonged trade-policy uncertainty” are damaging the world economy, said Gita Gopinath, the IMF’s chief economist, last week as the fund again cut its forecast for global growth. “Manufacturing firms have become more cautious about long-range spending and have held back on equipment and machinery purchases,” the fund notes. The fog of trade war is depressing investment spending. And because machinery, equipment and other capital goods are often imported, weak investment spending is further hurting trade. The IMF now expects the world economy to expand by just 3% this year, compared with 3.6% last year. That would be the slowest rate in the

decade since the global financial crisis.

Both America and the euro zone are expected to grow more slowly this year than the fund had envisaged in July, before trade tensions escalated. India's prospects have dimmed sharply: it is forecast to grow by 6.1% rather than the 7% expected only months ago. And in 2020 China is now projected to expand by less than 6% for the first time in 30 years.

The fund has, unsurprisingly, slashed its forecast for Hong Kong. The city is now expected to grow by only 0.3%, compared with the 2.7% foreseen in April, before its economic prospects vanished in a cloud of tear-gas. The unrest could also jeopardise the fragile trade truce between America and China. On October 15th the House of Representatives passed a measure enjoining America to assess Hong Kong's autonomy annually and sanction officials who violate it. China reacted angrily to what it describes as meddling in its affairs.

The IMF's economists have valiantly tried to quantify the damage to the world economy from the trade war if Mr Trump's putative deal falls apart. The direct impact is surprisingly modest. The tariffs already in place and in the pipeline could reduce America's GDP by just over 0.2% next year, compared with a world in which the trade war had never started (see chart). More harmful are indirect effects: weaker business confidence, productivity and risk-appetite on financial markets. These bring the damage to almost 0.6% of America's GDP in 2020. The damage to China would be almost 2% of its GDP.

These are small percentages—but of vast economies. If the IMF is right, an unresolved trade war could cost America roughly \$125bn of forgone output next year alone. The cost to China could exceed \$300bn (at market exchange rates). Big numbers indeed. ■



世界经济

前路迷茫

贸易战一波三折，损害增长

十月十五日，特朗普在白宫接待了北美冰球联赛总冠军圣路易斯蓝调队，在表示欢迎之后他欣欣然提到了自己最近取得的胜利：几天前与中国达成了临时贸易协议。简单来说，只要中国承诺购买价值几百亿美元的美国农产品，美国将不再对从中国进口的产品进一步征收惩罚性关税。具体是几百亿美元呢？“是个很大的数字，”特朗普强调，“我说，‘要求七百亿吧。’……我手下说：‘好，那就两百亿。’我说，‘不行，五百亿。’”

这个经过“仔细斟酌”的数字会最终实现吗？中国不愿被敲竹杠，也不想丧失其他更友好的供应渠道。它还希望美国除了承诺不再征收新关税外，还答应开始取消现有关税。此协议可能在定案之前就告吹，更别说等两国领导人下月在圣地亚哥举行的亚太经济合作论坛上签署。

这种不可预测性是个问题。除了关税上升外，“贸易政策的长期不确定性”也在损害世界经济，国际货币基金组织（以下简称IMF）的首席经济学家吉塔·戈皮纳特（Gita Gopinath）上周表示。IMF再次下调了对全球增长的预测。它指出：“制造业企业在长远支出上变得更谨慎，已经减少采购设备和机械。”贸易战的迷雾抑制了投资支出。由于机械、设备及其他资本货物通常是进口的，投资支出疲软正在进一步损害贸易。IMF现在预计今年的全球经济增长率将仅为3%，而去年为3.6%。这将是全球金融危机之后十年来最慢的增速。

如今看来，美国和欧元区的增长都将慢于IMF在7月（贸易紧张局势升级前）的预期。印度的前景急剧下滑：几个月前它的预期增速为7%，现在已经降到了6.1%。预计到2020年，中国的经济增速将首次跌破6%，是30年来的首次。

IMF不出所料地大幅下调了对香港的预测。4月时，在香港经济前景还未

被催泪弹烟幕湮没之前，其年增长预测为2.7%，如今预计仅为0.3%。香港的乱局也可能危及中美之间脆弱的贸易休战状态。10月15日，美国众议院通过了一项法案，要求美国每年评估香港的自治权并制裁侵犯这些权利的官员。中国对此十分愤怒，称这是干涉自己的内政。

如果特朗普假定的协议最终破裂，中美贸易战将对世界经济带来怎样的损害？对此IMF的经济学家做了大胆的量化预测。令人惊讶的是，直接影响会很轻微。与从未发生贸易战的情形相比，已执行和即将执行的关税可能仅会令美国明年的GDP下降0.2%多一点（见图表）。危害较大的是间接影响：商业信心、生产率以及金融市场风险偏好均下跌。在2020年，这些问题给美国造成的损失差不多将达到其GDP的0.6%，对中国的损害将接近其GDP的2%。

虽然比例很小，但它发生在庞大的经济体内。如果IMF的预测准确，单单是明年，这场拖延不下的贸易战就可能令美国损失约1250亿美元的产出。按市场汇率计算，中国的损失可能超过3000亿美元。的确是大数目啊。





Television

Enthusiasm curbed

Viewers love Netflix and HBO. Investors are getting antsy

IF CRITICAL ACCOLADES were the sole measure of well-being, Netflix and HBO would be in great shape. At the 71st annual Emmy Awards, held on September 22nd, the two accounted for three of the eight nominees for Outstanding Drama series, and two of the seven for Outstanding Comedy. Yet though content may be king, both companies are facing angry crowds wielding pitchforks.

Netflix has long framed its aggressive spending as part of a strategy to dominate people's leisure time, but investors' patience is being tested (see chart). Total returns have tumbled. Subscriber numbers in America fell earlier this year for the first time since 2011. Undeterred, Netflix keeps splurging on original and licensed content. It reportedly paid over \$500m for the rights to "Seinfeld".

Though HBO is widely considered to be the most profitable boutique network in America, its parent company, AT&T, is under fire. Elliott, an activist fund with a \$3.2bn stake in the conglomerate, has taken aim at AT&T's strategy, including a recent acquisition spree. After splashing out on DirecTV, Time Warner (which owns HBO) and other assets, AT&T sits on over \$170bn of debt, far more than any other company in its industry.

Both Netflix and HBO face stiffer competition. Disney, Comcast (via its NBC subsidiary) and Apple plan to launch streaming services within the next year. "Fleabag", co-produced by Amazon, bagged the Emmy for best comedy series. With over 500 scripted series being released each year, this battle for leisure time will make for gripping viewing. ■



电视行业

热情受抑

Netflix和HBO受到观众喜爱，投资者却坐不住了

如果艺术专业荣誉是衡量公司现状的唯一标准，那Netflix和HBO可说是形势大好。在9月22日举行的第71届艾美奖颁奖典礼上，两家公司在剧情类最佳剧集的八个提名中占了三个，在喜剧类最佳剧集的七个提名中占了两个。然而，尽管“内容为王”也许成立，两家公司都面临不少人的愤怒质询。

Netflix长期以来都在大举烧钱，将这作为它旨在主宰人们休闲时间的战略的一部分。但投资者的耐心正受到考验（见图表）。总回报已经大幅下滑。今年年初，美国付费订阅用户数量自2011年以来首次下跌。Netflix不为所动，继续大笔购买原创和授权内容。据称它支付了超过五亿美元购买《宋飞正传》（Seinfeld）的版权。

尽管HBO被普遍认为是美国最赚钱的精品电视网络，但其母公司AT&T正备受攻击。拥有这家大型集团32亿美元股份的维权基金埃利奥特（Elliott）将矛头指向了AT&T的战略，包括它近期展开的一轮疯狂收购。在大举投资DirecTV、时代华纳（拥有HBO）等资产后，AT&T负债已超过1700亿美元，远超业内其他公司。

Netflix和HBO都面临更激烈的竞争。迪士尼、康卡斯特（Comcast，通过子公司NBC参与竞争）和苹果都计划在明年内推出流媒体服务。由亚马逊联合制作的《伦敦生活》（Fleabag）将今年艾美奖的喜剧类最佳剧集奖收入囊中。在每年有超过500部剧本类剧集发布的大环境下，这场对休闲时间的争夺战将是一出引人入胜的好戏。 ■



Free exchange

Rich economics

Three economists win the Nobel prize for their pioneering efforts to understand poverty

THE MOST important question in economics is also the hardest: why do some countries stay poor while others grow rich? In 2015, 10% of the world's population lived on less than \$1.90 per day, down from 36% in 1990. But more than 700m people remain in extreme poverty, and the number grows every day in certain parts of the world, in particular sub-Saharan Africa. For their contributions to understanding gaps in development, the better to close them, Abhijit Banerjee, Esther Duflo and Michael Kremer have been awarded this year's Nobel prize for economics. All three are Americans, though Mr Banerjee and Ms Duflo are immigrants (and married to each other). Ms Duflo is only the second woman to have received the prize and, at 46, the youngest winner ever.

Thirty years ago, economists mostly looked at the big picture. They studied large-scale structural transformations: from rural and agricultural to urban and industrial. Macroeconomists built growth theories around variables such as human capital, then ran cross-country growth regressions to try to measure relationships—for example, between years of schooling and GDP per person. But data were scarce or poor, and the vast number of potentially relevant factors made it hard to be sure what caused what.

In the mid-1990s Mr Kremer, at Harvard University, tried something different. With collaborators and co-authors, he began studying poverty with methods more commonly associated with chemists and biologists: randomised trials. If human capital—health, education, skills and so forth—is essential for development, then economists had better make sure

they understand where it comes from. In Kenya he conducted field experiments in which schools were randomly divided into groups, some subject to a policy intervention and others not. He tested, among other things, additional textbooks, deworming treatments and financial incentives for teachers linked to their pupils' progress.

Each such experiment shed a little light on one small part of the "hardest question". Educational resources—textbooks, say—turned out to do little for learning outcomes. Making pupils healthier improved their attendance, but did not necessarily mean they learned more. The experiments had a larger result, however: they taught the economics profession that randomised trials could work in the field.

Mr Banerjee and Ms Duflo built on the foundation Mr Kremer laid, deploying randomised trials to study health care and entrepreneurship as well as education. In India, they found that focusing extra teaching resources on pupils who had fallen behind paid big dividends. They showed that microloans—small-scale lending to the cash-strapped poor—were less transformative than had been claimed, but could help ambitious entrepreneurs. The three scholars have studied absenteeism among teachers and nurses, immunisation programmes, the management of public infrastructure and the use of productivity-boosting technologies such as fertiliser. They have spent countless hours observing and learning from the daily struggles of the world's poor.

By breaking big questions into smaller ones, and tackling each in carefully designed experiments, they overcame some hard epistemological problems. Economists who used cross-country regressions could not easily say whether extra schooling boosted growth or merely occurred alongside it. Field experiments, by contrast, could show not only the link between better teaching and greater learning, but how the connection worked.

There remained the problem of “external validity”: the extent to which a measured relationship holds outside the research context. People are complex, and the world ever-changing; thus it is hard to be confident that a relationship between two variables will endure. Researchers must also be aware that the groups being tested may differ subtly from a broader population, or that something in the experiment may be influencing participants’ behaviour. In mastering field research, Mr Banerjee and Ms Duflo showed how to overcome these difficulties. “Natural” experiments, such as an oil shock, cannot be rerun to satisfy nagging doubts. Field experiments can be replicated. Structuring experiments so that they can be scaled up over time permits greater confidence still.

Each nugget of truth prised out of the data generated by field experiments represents a contribution to understanding the world. The hope is that many small truths can be piled together to make a big one. These laureates’ work uses economic theory as a guide, but nonetheless represents a departure from the discipline’s business-as-usual, in which economists peer down from on high at society and seek to discover the equivalent of Newton’s laws of motion. Randomised trials are a part of an important development in recent decades, away from high theory and towards an empirical grounding. With these awards the Nobel committee endorsed this shift. It is, furthermore, a practical award, celebrating work that offers ways to improve lives.

But the hardest question still looms. Mr Banerjee and Ms Duflo reckon that their work builds toward an answer. Taken together, their experiments reveal that the gap in productivity between the most and least efficient producers is much wider in developing economies than in advanced ones. Fix that, one small intervention at a time, and perhaps eventually the hard question will go away. More macro-minded economists counter that the huge fall in global poverty of the past three decades owes little to such fiddling. It happened, rather, as a confluence of global forces buoyed poor

countries' fortunes. The mystery of global poverty remains. If enough economists emulate the innovative spirit and scholarly care of this year's laureates, it will not remain for ever. ■

Listen to our interview with this year's economics Nobel laureates at economist.com/economicsnobel2019 ■



自由交流

富裕经济学

三位经济学家凭借对贫困问题的开创性研究获得诺贝尔奖

经济学中最重要的问题同时也是最难解答的：为什么有些国家变得富裕，另一些却深陷穷困？2015年，全球10%的人口每天的生活费低于1.90美元，低于1990年的36%。但是，仍有七亿多人生活在极端贫困中，而且在某些地区贫困人口与日俱增，特别是撒哈拉以南非洲地区。如何理解经济发展的差距，从而更有效地缩小差距？阿比吉特·班纳吉（Abhijit Banerjee）、埃丝特·迪弗洛（Esther Duflo）、迈克尔·克雷默（Michael Kremer）凭借在这方面的贡献获得了今年的诺贝尔经济学奖。三人同为美国籍学者，不过班纳吉和迪弗洛是外国移民（也是一对夫妻）。今年46岁的迪弗洛是第二位获得诺贝尔经济学奖的女性，也是有史以来最年轻的获奖者。

三十年前，经济学家关注的多为全局性问题。他们研究大范围的结构性转型：从农村和农业向城市和工业的转型。宏观经济学家围绕人力资本等变量构建经济增长理论，然后对跨国增长数据做回归分析，以此衡量各种联系，例如受教育年数与人均GDP之间的联系。但是数据稀缺，质量也不理想，而且存在大量的潜在影响因素，令人难以确信各种现象间的因果关系。

上世纪90年代中期，哈佛大学的克雷默另辟蹊径，开始与合作伙伴和论文合著者采用化学家和生物学家常用的方法来研究贫困问题：随机实验。如果健康、教育、技能等人力资本对经济发展至关重要，那么经济学家最好能确定这种资本从何而来。他在肯尼亚开展了田野实验，把当地学校随机分组，一些受到政策干预，一些没有。此外，他还测试了补充教材、驱虫治疗，以及与学生进步挂钩的教师财政激励等举措。

每一项实验都给那个“最难解答的问题”的某个局部带来了一点点启示。教

育资源（例如教科书）对学习成果的作用竟然很小。改善学生的健康提高了出勤率，但不一定使他们学到了更多东西。然而，这些实验收获了一个较大的成果：让经济学家们意识到可以将随机实验应用于自己的领域。

班纳吉和迪弗洛在克雷默奠定的基础上前行。除了教育，他们还通过随机实验研究医疗和创业。在印度，他们发现，向落后的学生集中投入额外的教学资源收效显著。他们还发现，向手头拮据的穷人提供小额贷款并不像此前一些人声称的那么具有变革性，但可能帮到有雄心的创业者。三位学者研究了教师和护士的缺勤问题、免疫接种计划、公共基础设施管理，以及对化肥等提升生产率的技术的应用。他们花费大量时间观察和了解全球穷人的艰辛日常。

他们把大问题拆分成小问题，以精心设计的实验逐一解析，从而攻克了一些认识论难题。那些使用跨国回归分析的经济学家无法轻易确定额外的学校教育促进了经济增长——或许它只是伴随经济增长出现而已。相比之下，田野实验不仅能显示改善教学与学习成果提高之间的关联，还能展现出其中的原理。

然而“外部效度”这个问题仍然存在，即测量到的某种联系在研究情境之外的有效程度几何。人是复杂的，世界也在不断变化，所以很难说两个变量之间的联系能一直持续。研究人员还必须意识到，受试人群可能在一些细微之处不同于更广大的人群，或者实验中有某些因素可能影响了参与者的行为。班纳吉和迪弗洛在熟练掌握田野研究的过程中展示了如何克服这些困难。类似石油危机这样的“自然”实验是无法重现来解答那些挥之不去的疑虑的。而田野实验可以复制。把实验设计成可以在日后扩大范围更是可以加强人们对实验结果的信心。

每从田野实验的数据中挖掘出一点真相，就为了解世界做出了一点贡献。希望是这些小的真相能够积少成多，揭示出一个重大的真相。这几位得奖者的研究虽然以经济学理论为指导，但却脱离了经济学研究的惯常做法。在一般的经济学研究中，经济学家高高在上，俯视社会众生，力求发现牛顿运动定律式的经济运作规律。随机实验是近几十年来经济学界从宏大理

论转向实证研究这一重大发展的一部分。此次颁奖显示诺贝尔委员会支持这一转变。此外，这也是对实践的奖励，表彰致力于寻求方法改善人们生活的研究。

但那个最难解答的问题仍然悬而未决。班纳吉和迪弗洛认为他们的研究正在逐步揭晓答案。总的来说，他们的实验表明，论效率最高与最低的生产者之间的效率差距，发展中经济体要比先进经济体大得多。用逐步、小幅的干预去解决这个问题，也许难题最终就会消失。更多宏观派经济学家反驳说，过去30年来全球贫困人口的大幅减少与这种修修补补关系不大，而是要归功于全球力量的汇聚改善了穷国的状况。全球贫困之谜仍未解开，但只要有足够多的经济学家效仿今年获奖者的创新精神和学术态度，它终有解开之日。

欲收听本刊对今年诺贝尔经济学奖得主的采访，请访问：economist.com/economicsnobel2019 ■



Self-driving cars

Autonomous ways

The path to driverless vehicles is long and winding. China is taking an alternative route to the West's

THE SELF-DRIVING cars that cruise around South Ronghua Road look just like their American counterparts: chunky sedans with a rack of sensors bolted to the roof and a supercomputer in the boot. Beijing's government has dubbed this south-eastern patch of the city Beijing-E-Town. It is one of a growing number of urban spaces across China designated for testing autonomous vehicles (AVs). Digital lane markers can switch parts of the road to AV-only on demand. Signs announce "National Test Roads". Cars bear the decals of China's leading AV companies: Baidu, Pony.ai, WeRide.

For years Western carmakers have promised a world awash with AVs by now, making roads safer and less congested (see table). That it is not shows just how tough a computational and regulatory nut self-driving is to crack. It increasingly seems that if AVs are to become widespread, it may happen first not in the West but in China. A fleet of Chinese firms hope to profit handsomely in the process.

That may seem counterintuitive. Technologically, the West appears streets ahead. "Everybody is behind Waymo and Cruise," concedes a senior Chinese AV executive, referring, respectively, to a subsidiary of Alphabet (Google's holding company), and of General Motors (GM), a giant carmaker. Waymo's cars alone have self-driven more miles than all Chinese AVs put together. Cruise has attracted \$6.2bn of investment since GM bought the startup for \$1bn in 2016. CB Insights, a research firm, estimates that \$11.9bn has been invested in American AV firms since 2014, compared with \$4.4bn in China.

Yet in the absence of driving software which can handle chaotic city streets, some Chinese firms are adopting an alternative strategy. They are turning the streets themselves into something that software can handle. The approach involves installing sensors to guide cars, writing and enforcing rules about how humans move around, designing (or redesigning) urban landscapes to be AV-friendly and, critically, limiting AV firms' legal liability in the event of inevitable accidents. All this is easier in authoritarian China than in the West's unruly, litigious democracies.

It also requires input from companies beyond dedicated AV-makers. Mobile-network operators, such as China Mobile, and telecoms-equipment manufacturers, like Huawei, are building technology into their systems which may in time help cars along the road. Huawei wants its zippy 5G mobile antennas to take on a large part of the processing required to run an AV—and a chunk of AV profits. That leaves a smaller share of the pie for AV companies. But the pie itself should grow more quickly. Lowering the cost of infrastructure per AV deployed should accelerate its roll-out, notes Feng Hao of Bosch, a German engineering conglomerate which supplies high-tech components to Chinese carmakers.

In a recent speech China's minister of industry and information technology, Miao Wei, said that the market for connected vehicles is projected to be worth 100bn yuan (\$14bn) by next year. And as with just about anything, the potential demand for AVs among 1.4bn Chinese is huge—\$2trn by 2040, reckon consultants at McKinsey.

Chinese firms may prosper well before the eventual arrival of all-out AVs. They already benefit from the leapfrog effect, says Wei Zhou, boss of China Creation Ventures, a venture-capital fund. Cowa Robot, one of his firm's investments, has sold autonomous street-sweeping robots to authorities in Changsha, the capital of Hunan province. Horizon Robotics, which is valued at \$3bn, furnishes specialised AV computers for companies like Cowa.

The ability to make money now by automating simpler tasks keeps the firms going on the way to fuller autonomy—a luxury few American rivals, up against powerful incumbents like municipal-services companies, enjoy. At the same time, they are shielded from foreign competition by rules that limit overseas AV companies to minority stakes in Chinese-led joint-ventures.

Chinese AV companies have one final advantage over their Western peers: explicit support from the Chinese state. “There’s a lot of fuel coming from the government planning,” says an executive of one Chinese firm. The government wants companies like his to succeed, and is willing to use its autocratic muscle to build infrastructure, promote new technology and rewrite policy. It will spend up to \$220bn on 5G by 2025, according to state media, and plans to install AV infrastructure throughout the 2020s, including telecoms networks to capture data from vehicles and their surroundings, cloud-computing capacity to process these data and map services to guide the cars.

In addition, the authorities promote AV-friendly standards and regulations. They can stitch “National Test Roads” into the urban fabric without the fuss Western authorities can expect from local residents. In one-party states like China “you have single-focus government that can make things happen”, sums up Amer Akhtar of DeepMap, a Californian maker of software for maps which AVs need to navigate.

The road is not all smooth for China’s AV industry. Together with the rest of Chinese tech, it is caught up in the Sino-American economic war. In May America’s government barred its companies from supplying Huawei, on the ground that its kit might allow Chinese eavesdropping. On October 7th another eight Chinese companies were added to the blacklist, including those working on things useful to AVs, like computer vision.

The prospect of losing access to American technology is particularly worrisome for AV companies, because the Chinese car industry relies heavily on foreign suppliers for the electronics that power modern vehicles. Last year Chinese imports of integrated circuits totalled \$312bn, ten times the value of imported car parts. Chinese entrepreneurs eyeing the Chinese AV market have founded plenty of promising startups—but many of them in Silicon Valley, subject to American law. Efforts to make more cutting-edge gubbins at home are moving slowly.

Nor are Chinese AV developers immune from the biggest problem which afflicts their Western rivals. Like them, Pony.ai, WeRide and others continue to lose money. This may not change soon. The desire of motorists to own self-driving cars has yet to be tested. The business model of ride-hailing, where future profitability is in part predicated on the eventual removal of costly human drivers, looks shaky. Investors are growing impatient with loss-making firms such as Uber, which has shed a third of its stockmarket value since going public in May. It may take longer for software to become competitive with *Homo sapiens* in China, where labour remains relatively cheap. As one global car executive puts it, “If drivers are abundant but space on the road is not, the problems you should be solving first are not about taking the driver out of the car.”

China’s approach to self-driving reflects its attitude to development more broadly: heavy on infrastructure and government oversight, lighter on cutting-edge technology and civil liberties. It may one day prevail over the Western path to autonomy. Whether Chinese AV companies will stand on their own four wheels as profitable businesses is another matter. ■



无人驾驶汽车

自主之路

通向无人驾驶汽车的道路漫长而曲折。中国正在走一条与西方不同的路

行驶在北京荣华南路上的无人驾驶汽车看上去和美国的无人驾驶汽车没什么两样：都是敦实的三厢车，车顶固定着一排传感器，后备箱里装着一台超级计算机。北京市政府将位于城东南的这个片区命名为亦庄开发区，这是中国越来越多用于测试无人驾驶汽车的城市空间之一。数字化车道标记可以根据需要将部分道路切换为仅供无人驾驶汽车通行。指示牌显示着“国家级测试道路”。汽车上的贴标都来自中国领先的无人驾驶汽车公司：百度、小马智行和文远知行。

按西方汽车制造商多年来的承诺，到今天应该满大街都是无人驾驶汽车了，这会让道路更安全，拥堵更少（见表）。现实却并非如此。这显示出无人驾驶的计算和监管难题有多难破解。越来越多的迹象表明，如果无人驾驶汽车能普及，可能也不会首先在西方实现，而会是在中国。一批中国企业希望在这个过程中收获丰厚的利润。

这似乎有悖直觉。从技术上讲，西方把中国甩出了几条街。中国无人驾驶汽车行业的一名高管承认：“谁都掉在Waymo和Cruise的后头。”这两者分别是谷歌的控股公司Alphabet和大型汽车制造商通用汽车的子公司。仅Waymo汽车的无人驾驶里程数就超过了中国所有无人驾驶汽车里程的总和。而创业公司Cruise自2016年被通用汽车以10亿美元收购以来，已吸引到62亿美元的投资。研究公司CB Insights估计，自2014年起，美国无人驾驶汽车企业获得的投资已达119亿美元，而中国企业仅为44亿美元。

然而，一些中国企业虽然没有足以应付混乱城市街道的驾驶软件，却在另辟蹊径，将街道本身改造成软件能对付得了的东西。其做法包括安装传感器来为汽车导航、编写和执行针对行人的规则，设计（或重新设计）城市环境而使之对无人驾驶汽车友好。此外还有至关重要的一步：在不可避免

的事故中限制无人驾驶汽车企业的法律责任。相比在西方那些民众不服管又爱打官司的民主国家，在专制的中国实现这一切要更容易。

除专业无人驾驶汽车制造商外，还需要其他公司的投入。中国移动等移动网络运营商以及华为等电信设备制造商正在自己的系统中嵌入日后可能对无人驾驶汽车有所帮助的技术。华为希望其强大的5G移动天线能承担无人驾驶汽车行驶所需的大部分处理任务，并从该行业的利润中分走一大块。这让无人驾驶汽车企业可分的蛋糕又少了一些。但蛋糕本身应该能更快地做大。向中国汽车制造商提供高科技部件的德国工程集团博世的冯昊指出，降低部署无人驾驶汽车所需的基础设施的平均成本应该能加快其普及。

中国工信部部长苗圩近年在一次讲话中表示，到明年，中国智能网联汽车的市场规模预计可达1000亿元人民币。在14亿人口的中国，几乎任何东西的潜在需求都很大，无人驾驶汽车也不例外。麦肯锡的顾问估计，到2040年，这方面的需求将达到2万亿美元。

在完全无人驾驶的汽车最终到来之前很久，中国企业可能就已办得风生水起。风投基金创世伙伴资本的老板周炜说，中国企业已经从“蛙跳效应”中受益。周炜的公司投资的一家企业“酷哇机器人”已向长沙有关部门出售了自主扫街机器人。估值30亿美元的地平线机器人公司则为酷哇这样的企业提供无人驾驶专用计算机。

这些企业现在就能通过将较简单的任务自动化来盈利，这让它们得以继续朝着更全面的无人驾驶迈进。这样的奢侈是美国竞争对手享受不到的——它们要与市政服务公司之类的实力派老牌公司较量。同时，按照规定，外国无人驾驶汽车公司只能在中方控股的合资企业持有少数股权，这也令中国企业免受外国竞争的影响。

中国无人驾驶汽车企业与西方同行相比还有最后一个优势：中国政府的明确支持。一家中国公司的高管说：“政府的规划会带来很多支持。”政府希望这样的企业成功，并愿意用专制手腕来建设基础设施，推广新技术，修

改政策。根据官方媒体的数据，到2025年，中国政府对5G技术的投入将达到2200亿美元，并计划在接下来的十年里打造无人驾驶汽车基础设施，包括从车辆及周围环境捕获数据的电信网络、用于处理这些数据的云计算能力，以及为汽车导航的地图服务。

此外，中国各级政府还在推进有利于无人驾驶汽车发展的标准和规定。它们可以轻松将“国家级测试道路”接入城市道路网，而西方政府若这么做必定会招致本地居民的异议。在中国这样的一党制国家，“政府要做的事一定就能做成”，DeepMap公司的阿莫尔·阿卡塔（Amer Akhtar）总结道。这家加州公司开发无人驾驶汽车的导航地图软件。

对于中国的无人驾驶汽车行业来说，前路并不平坦。与中国其他科技领域一样，它也被卷入了中美经贸战。5月，美国政府以中国政府可能通过华为的设备实施窃听为由，禁止美国企业向华为供货。10月7日，又有八家中国企业被加入美国贸易管制黑名单，其中包括开发计算机视觉等可用于无人驾驶技术的企业。

无法获得美国技术的前景尤其令无人驾驶汽车企业担忧，因为中国汽车工业严重依赖外国供应商来提供现代汽车所需的电子器件。去年，中国集成电路的进口总额为3120亿美元，是汽车零部件进口额的十倍。紧盯中国无人驾驶汽车市场的中国企业家已经创建了许多前景看好的创业公司，但其中许多都在硅谷，受美国法律约束。在本国制造更多先进元件的努力进展缓慢。

在困扰西方竞争对手的最大问题上，中国无人驾驶汽车的开发者同样不能免疫。和西方企业一样，小马智行、文远知行等公司还在持续亏损。这种局面可能不会很快扭转。驾车者拥有无人驾驶汽车的意愿尚未得到检验。网约车商业模式风雨飘摇。这种模式将其未来盈利能力部分押注于最终撤走高成本的人类驾驶员。投资者对优步这样持续亏损的公司愈发丧失耐心，该公司自5月上市以来市值已经缩水了三分之一。在劳动力仍相对廉价的中国，软件要能和人类竞争可能需要更长的时间。正如一位跨国车企高管所说：“如果驾驶员够多，但道路空间不足，那么首先要解决的问题

就不是撤掉驾驶员。”

中国发展无人驾驶的方式反映了其对发展的总体态度：重基础设施和政府监督，轻尖端技术和公民自由。有一天，它可能会在无人驾驶的道路上超越西方。不过中国的无人驾驶汽车企业能否操控自己的汽车来盈利就是另外一回事了。 ■



The Doing Business rankings

First across the tape

The remarkable influence of the World Bank's Doing Business report

A CLOTHING WORKSHOP, with just two sewing machines, established long ago on the outskirts of Lima, Peru's capital city, may be one of the world's most influential companies, even though it never started operating—and was never intended to do so. The business was conceived as an experiment by Hernando de Soto, a Peruvian economist, who commissioned a team to go through the motions of setting up the firm. Their aim was to find out how long it would take to comply with all the laws and regulations required to start a business. The answer was 289 painstaking days.

The answer now is a mere 26 days, according to the World Bank's latest report on the ease of doing business around the world. Inspired in part by de Soto's example, the bank each year asks thousands of lawyers, accountants and other experts how easy it would be for a company to obtain an electricity connection, transfer the title of a warehouse, enforce a debt contract, pay its taxes and so on. Based on the answers, the bank then ranks countries, from New Zealand at the top to Somalia at the bottom.

The report has its critics. Since it ignores infrastructure, price stability, workforce skills and the reliability of suppliers, among other things, it is not really a summary measure of the ease of doing business in a country. It is instead a snapshot of the cost of complying with formal regulations for companies that are not small enough to dodge the law or big enough to bend it. In one edition, the report described itself as a "cholesterol test". But it is sometimes interpreted as a full medical.

It has nonetheless become hugely influential. Costing less than 0.25% of the

bank's operating budget, it has caught the attention of some of the world's most powerful people. Narendra Modi, the prime minister of India, has resolved to lift his country into the ranks of the top 50 by 2020. It climbed to 63rd place this year, from 142nd when he took office. The country's success may have helped galvanise a similar effort in China (which improved this year to 31st place) and in Pakistan, which was also heralded this year as one of the ten most reformed economies.

But the biggest improvement in score was awarded to Saudi Arabia. Once ranked tenth, it had slipped to 94th place by 2016. This year it bounced back to 62nd. It is now the cheapest (and third-easiest) place to transfer a property title to a buyer. Firms can get an electricity connection in 35 days, little more than half the time it took in 2018. The government has also set up an online one-stop shop, where an entrepreneur can jump through many of the hoops required to start a business, instead of traipsing around multiple ministries and offices, for commerce, labour, social insurance, tax and Zakat (a religious tithe).

The kingdom's reform efforts were overseen by a dedicated committee, bringing up to 50 government bodies together, that met every Wednesday at 1pm. The committee also included business folk who explained how regulations feel to the regulated. The structure left the bureaucracy with nowhere to hide. "You have to come and either say you've done it; or if you didn't do it what's stopped you," says Dr Eiman Al-Mutairi, head of the country's National Competitiveness Centre. Any roadblock that lasted more than a week was referred up to Mohammad bin Salman, the kingdom's crown prince.

Not all reforms have won favour with business. Companies no longer need a government stamp on their registration certificates, for example. But many firms want one anyway, because it looks good on their papers. It's not easy to cut red tape when firms treat it like a ribbon and bow. ■



营商环境排名

率先冲破官僚防线

世界银行《营商环境报告》的显著影响

很久以前，在秘鲁首都利马的市郊建成了一家只有两台缝纫机的小制衣厂。它可能是全球最有影响力的公司之一，尽管它从未开业，也根本没打算开业。它是秘鲁经济学家埃尔南多·德索托（Hernando de Soto）开展的一项实验，他委托团队走了一遍成立这家制衣厂所需的程序，目的是了解依照法规成立一家公司需要多长时间。结果是要苦熬289天。

根据世界银行最新的全球营商便利度报告，现在在那里成立一家公司只要26天。一定程度上受德索托研究的启发，世行每年向成千上万名律师、会计师和其他专家了解企业在处理各方面事务上的便利度，包括获得电力、转让仓库所有权、执行债务合同、缴纳税款等。它随后根据答案对各国的营商环境排名，新西兰位居第一，索马里垫底。

该报告不乏批评者。它忽略了基础设施、物价稳定性、劳动者技能及供应商可靠性等多种因素，因此并不能综合体现一国的营商便利度，只是大致反映了那些既没小到可成“漏网之鱼”、也没大到可以“只手遮天”的公司按章办事的成本。某年的《营商环境报告》自称是一项“胆固醇测试”。但有时它会被人解读成全面的体检报告。

尽管如此，它仍然产生了巨大的影响力。它的成本不到世行运营预算的0.25%，却引起了全球一些手握重权的人物的关注。印度总理莫迪决心要在2020年前把印度的排名提升至前50。他上任时印度的排名是第142位，今年升至63位。印度的成功可能激发了中国和巴基斯坦在这方面的努力。中国今年排名上升至第31位，巴基斯坦和中国及印度一样，位列营商环境改善最大的十个经济体。

然而得分飞跃最大的是沙特阿拉伯。该国曾一度排名第10位，但到2016年

已滑落至第94位，今年又重新攀升到第62位。现在，沙特阿拉伯是产权转让费用最低（转让便利度排名第三）的国家。企业可在提交申请后的35天内接入电力，差不多比2018年少一半时间。政府还搭建了网上一站式办事平台，方便创业者集中办理成立公司的各种手续，而不必在商务、劳工、社会保险、税务和扎卡特税（Zakat，一种宗教税项）等诸多政府部门和办公室之间疲于奔命。

沙特阿拉伯的改革工作由一个专设的委员会监督。该委员会最多召集50个政府机构在每周三下午一点开会，还邀请商界人士畅谈企业对监管法规的感受。这种做法让官僚主义无处躲藏。“你必须来开会，说明已经做出的改革，不然就得解释是什么阻碍了改革。”沙特国家竞争力中心的负责人艾曼·穆塔里（Eiman Al-Mutairi）说道。所有持续超过一周的“障碍”会被上报给王储穆罕默德·本·萨勒曼（Mohammad bin Salman）。

不是所有的改革都受到企业欢迎。例如，公司的注册证书上不再需要政府盖章，但许多公司还是想要，因为它们觉得盖上政府大印才好看。如果企业把红头文件当作了装点门面的大红花，要破除这些繁文缛节就不容易了。 ■



Crowdshipping

Headed your way

The next stop for the sharing economy

CARPOOLING APPS to connect passengers with drivers going the same way are old hat. Now “crowdshipping” services are doing the same with parcels, allowing senders to “plug into” road traffic as if it were a utility, says Marc Gorlin, boss of Roadie, a startup based in Atlanta. Drivers get a tip; the middlemen take a cut. Firms like Mr Gorlin’s are proliferating. Rappi operates in 57 cities in Latin America. A Filipino firm, Jojo, does so in Manila, the capital, and a nearby province.

Many of the senders are companies. Amazon’s quick and cheap deliveries are forcing others to up their game, says Ravi Shanker of Morgan Stanley, a bank. Corporate fleets and logistics giants like FedEx will dominate long-haul routes. But by tapping into people’s movements, firms can withstand spikes in demand—floral bouquets on Mother’s Day, say—and save money on the “last mile”, often the costliest leg of a parcel’s journey.

Four-fifths of Roadie’s revenue comes from retailers such as Macy’s, Walmart or Home Depot (which has invested in Mr Gorlin’s firm). Airlines are another big client. Nearly half of Delta’s mishandled bags are delivered by travellers who use Roadie’s app to see if suitcases need dropping off along their drive home. The carrier’s head of cargo, Gareth Joyce, says this has cut costs, speeded up deliveries and boosted customer satisfaction. Alaska Airlines, Southwest and United also use Roadie to return lost luggage.

Other crowdshipping startups are eyeing free space inside travellers’ suitcases. PiggyBee, based near Brussels, and Grabr, with offices in Moscow, New York and San Francisco, operate worldwide, linking consumers

desirous of products only available—or cheaper—overseas with international passengers headed their way.

The buyer pays the product price, and any relevant taxes and duties, into an escrow account managed by the app, plus a tip to make it worth the transporter's while. The transporter buys the item and receives the reimbursement and tip on delivery. The apps discourage transporters from pretending a purchase is for personal use to avoid customs duties. But as David Vuylsteke, boss of PiggyBee, acknowledges, "since we're under the radar, no one cares." ■



众运

朝你赶来

共享经济的下一站

将乘客和顺路的司机配对的拼车应用已经过时了。现在出现了将包裹与司机配对的“众运”服务，让寄件人能像使用某种公用事业一样“接入”道路交通，总部位于亚特兰大的创业公司Roadie的老板马克·戈林（Marc Gorlin）说道。司机会得到小费，中间人会赚到提成。与Roadie类似的企业正在大量涌现。Rappi在拉丁美洲的57个城市开展业务。菲律宾公司Jojo在首都马尼拉和附近的一个省经营业务。

许多寄件人是企业。摩根士丹利的拉维·尚克（Ravi Shanker）说，亚马逊快捷而廉价的送货服务正迫使其他公司提高自身的服务水平。长途路线将由企业车队和联邦快递这样的物流巨头主导。但企业可以将人们的日常出行活动利用起来，这样它们在送货需求激增时（比如在母亲节送花）就不至于无力应付，而且还能在“最后一英里”省钱——这通常是包裹配送过程中成本最高的一段。

Roadie五分之四的收入来自梅西百货、沃尔玛或家得宝等零售商（家得宝投资了这家公司）。航空公司是另一个大客户。达美航空近一半处理不当的行李是由旅客派送的，他们使用Roadie的应用查看是否可以在开车回家时顺路递送什么行李。这家航空公司的货运主管加雷斯·乔伊斯（Gareth Joyce）说，这么做降低了成本，加快了派送速度，提高了客户满意度。阿拉斯加航空、西南航空和美联航也使用Roadie来归还丢失的行李。

其他众包运输创业公司盯上了旅行者行李箱内的多余空间。总部设在布鲁塞尔附近的PiggyBee和在莫斯科、纽约和旧金山设有办事处的Grabr在全球范围内开展业务。如果有消费者希望购买只在海外买得到、或在海外价格更优惠的产品，这两家公司就会为他们和前往该产品所在地的国际旅客牵线搭桥。

买家会支付产品的售价外加任何相关税项和关税，这些钱会打进由众包运输公司的应用管理的托管账户。此外买家还会支付小费，好让旅客觉得值得自己花功夫去跑腿。帮忙代购的旅客购买商品，之后会在商品送达时收到退款和小费。这类应用不鼓励代购的旅客为逃避关税而以个人用途之名购买某商品。但正如PiggyBee的老板戴维·武伊尔斯特克（David Vuylsteke）所承认的那样，“我们是无名小辈，所以也没人在乎。”■



Corporate governance

Power decouples

CEO-chairmen are an endangered species

ON OCTOBER 11TH Boeing, still navigating the fallout from two fatal crashes of its aircraft, announced it was stripping its embattled chief executive, Dennis Muilenburg, of his role as the aerospace giant's chairman. The same day the board of Renault voted to remove its CEO, Thierry Bolloré, as part of its own governance overhaul in the wake of financial-misconduct charges against his longtime predecessor, Carlos Ghosn, who was CEO-chairman of both Renault and Nissan, the French carmaker's Japanese partner (Mr Ghosn denies wrongdoing). Last year Elon Musk shed his chairmanship but remained at the executive wheel of Tesla amid an investigation of his tweets by America's Securities and Exchange Commission.

It is not just scandal-prone firms that are choosing to split the two roles. Since 2001 the share of S&P 500 firms with one person tasked with both managing and governing has nearly halved (see chart). Britain's corporate-governance code frowns on the practice. Germany's bars it altogether. New regulations in America have made shareholders pay more attention to it. Likewise in Japan Inc.

“CEO duality” allows for quicker execution of the board's strategic decisions and helps leadership maintain a unified front. But it also dulls a firm's checks and balances. Resulting conflicts of interest may inflate executive salaries or discourage whistleblowing. Studies examining the link between company performance and CEO-chairmanships have been collectively inconclusive.

Challenger, Gray & Christmas, a job placement firm, says that 2019 is on

track for a record-high turnover in the corner office. Since September heads have rolled at WeWork, eBay and SAP. If trends hold, newly minted bosses should not expect to oversee themselves. ■



公司治理

两权分离

CEO兼董事长成濒危物种

仍在设法应对两次致命坠机事故后果的航空航天巨头波音在10月11日宣布，将解除其四面楚歌的CEO丹尼斯·米伦伯格（Dennis Muilenburg）兼任的董事长职务。同一天，雷诺的董事会投票罢免了CEO蒂埃里·博洛雷（Thierry Bolloré）——这是博洛雷的前任、长期担任雷诺CEO的卡洛斯·戈恩（Carlos Ghosn）受到财务行为不当的指控后（戈恩予以否认），雷诺全面改革自身治理的一部分。戈恩曾在雷诺及其日本合作伙伴日产兼任CEO和董事长。去年，伊隆·马斯克发的推文招来美国证券交易委员会（SEC）的调查，他辞去了特斯拉董事长一职，但留任CEO。

选择将CEO和董事长这两个职位分开的不仅是容易爆发丑闻的公司。自2001年以来，标准普尔500成分股中由一人身兼管理和决策控制的公司所占比例减少了近一半（见图表）。英国的公司治理准则不鼓励一人身兼两职，德国则完全禁止。在美国，新规的出台令股东更加关注这种情况。日本也一样。

“两职合一”有利于更快地执行董事会的战略决策，并帮助领导层保持统一战线。但这也会削弱公司的制衡能力。由此产生的利益冲突可能会导致高管薪水猛涨，或阻碍对不当行为的举报。对公司绩效与兼任两职之间的联系的各种研究都还没有定论。

就业咨询公司Challenger, Gray&Christmas表示，2019年CEO离职率可能将再创新高。自9月以来，WeWork、eBay和SAP的CEO相继离职。如果这样的趋势持续，新上任的CEO不应再预期会兼任监督治理之责。■



Three challenges

Too much to do

Environmental, educational and administrative gridlock threaten India's future

INDIA'S INFRASTRUCTURE is creaking, its health-care system even more so. Poverty and inequality remain omnipresent, and now the economy is struggling. Narendra Modi's to-do list is long. But there are three issues that, if dealt with, could bring about big improvements. The environment is one. Twelve of the world's 15 most polluted cities are in India (see chart), and the country ranks 120th of 122 on the global index of water quality. A second is education. As more people move to cities for the first time, it is crucial that they are trained to find jobs in India's 21st-century economy. A third issue is administration. With its basic structures unchanged since the British Raj, India's government is undermanned, unevenly deployed and badly equipped to cope.

Take the environment first. A visitor from the past would scarcely recognise the plains of Punjab and Haryana in northern India. Vast irrigation works, mechanised farming and hybrid seeds have greened the horizons, turning once-hungry India into a big exporter of grain. But now a visitor may not even be able to see the plains. Every year farmers setting fire to rice stubble create a dense seasonal smog. This mixes with diesel exhaust, smoke from coal-fired power stations and other noxious gases to form a toxic cocktail engulfing the whole north Indian plain from Lahore in Pakistan to Dhaka in Bangladesh, where some 800m people live. The bad air may cause as many as 1.2m premature deaths a year, and shave four years off the average lifespan.

Some of this comes from changing agricultural techniques. Mechanical harvesters leave the rice stubble longer, so it cannot be ploughed in and

must be burned. “What do you expect us to do?” shrugs a turbaned farmer near Karnal, a rural town 100km north of Delhi. But much of India’s air pollution is simply the price of progress. Western countries went through it and their democratic process forced them to change. China is passing through it, too, but its one-party state can wield a big stick at polluters. India is stuck in between, with a democracy that is not robust enough to force environmental-policy change.

On paper, India has strong laws and institutions for protecting the environment, including a powerful National Green Tribunal, which helps bolster enforcement. Mr Modi’s government has taken some big steps, adopting stricter vehicle-emissions standards, and achieving some ambitious solar-power targets. It is spending \$150m on public messaging and new equipment to dissuade farmers from burning their fields, and has closed down some urban coal-fired power stations. Indians are not victims of deliberate policies but of a systemic failure to account for, and deal with, the uglier side-effects of progress. At the climate-change talks that led to the Paris agreement, Indian diplomats argued for, and won, relatively lenient commitments, having pleaded that it was unfair to be punished for following the same path as developed economies.

India promised, for instance, that solar power will make up an impressive-sounding 36% of its generation capacity by 2030. Yet the government itself predicts that it will still account for just 23% of actual generation as opposed to capacity. Coal’s share is expected to fall from 74% to 50% of the mix, but since the total amount of power generated will grow, that still means adding more coal-burning power plants. These suck up precious fresh water and spew out greenhouse gases. Whereas the growth in carbon-dioxide output has slowed or fallen in much of the world, including China, in India it has doubled since 2005.

As for water, a near-total reliance on moody monsoons has not made

Indians careful users. Around 70% of surface water is thought to be polluted, and pumping from 20m tube wells has dangerously lowered groundwater levels. Indian farmers use more groundwater than America and China combined. They draw as much as 6,000 litres of water to produce a kilo of rice, compared with as little as 600 in China. This is because for 50 years Indian governments have subsidised farming. Water for irrigation is free, and seeds, diesel fuel, electricity and fertiliser are all sold below cost. As a result, India now has a 70m tonne grain mountain and a 15m tonne sugar mountain. It ranks as the world's biggest exporter of virtual water, shipping out the equivalent of nearly 100bn cubic metres a year in its exports of rice, textiles and other goods.

Lack of access to clean water kills an estimated 200,000 Indians a year, and sickens millions more. Once-pleasant rivers such as the Yamuna in Delhi and the Mithi in Mumbai are devoid of oxygen and black with sewage. Bengaluru's suburban lakes now regularly burst into flames or erupt in towers of toxic foam. Between pollution, overuse and global warming—which appears to be making the monsoons more capricious and slightly less generous—India is fast approaching a water crisis.

Yet shifts in policy have been slow and piecemeal. Governments have preferred big, showy dams and canals to investing in urban sewage networks or enforcing rules on effluents. Many of the impressive 100m toilets built in Mr Modi's first term stand idle for lack of water. His government now plans a nationwide programme to bring piped water to every home—a transformational move if it can pull it off. Yet, wary of rural voters, it has shied away from fixing an appropriate pricing structure to reflect the rising value of water.

Only when it does is there likely to be the sort of decisive shift towards cities that China has recently undergone. Two-thirds of Indians still live in rural areas, compared with 41% of Chinese. One of the main reasons for

lower urbanisation is that subsidies to farmers make small rural holdings sustainable. More than drought or flood or government neglect, the resulting lack of profitability is the real root of India's rural distress.

As more Indians become city-dwellers, one thing they need is better education. Although some states—Kerala being the champion—are approaching universal literacy, others trail far behind. And though the official claim of 75% literacy sounds respectable, more detailed studies raise doubts. The most recent report by ASER, an NGO that has undertaken annual surveys of rural schools since 2005, reveals rising attendance, an overall improvement in school facilities and an encouraging, albeit small, recent rise in learning levels. Even so, barely half of fifth-grade students nationwide had reached second-grade reading level, and less than a third were able to do basic maths. Among students completing eighth grade, some 27% could still not read at second-grade level, up from 15% ten years ago.

Such results suggest not just that India's 1.5m schools are generally bad, but that many children fail to develop important skills and yet still move up to the next level. The trouble is not limited to rural elementary schools. Aspiring Minds, a recruitment firm that tests millions of tech-industry applicants every year, reckons in its latest report that only 1.5% of India's engineering graduates possess adequate skills to work in data-driven fields. More disturbing, this “employability ratio” has not improved since the company's first survey in 2010.

It is easy to ascribe such poor outcomes to low government spending on education. For decades, this has lingered below 4% of India's GDP, far below the world average. A disproportionate share of that, too, has gone to higher education, to ensure that India has a trained elite to run the country. As a result, many of India's top state universities are indeed globally competitive. The downside is that its ordinary state schools are not.

Karthik Muralidharan and Abhijeet Singh, two economists, say the solution is not just to spend more money, but to change the culture and structure of Indian education. Schools are so geared to passing exams that they fail to impart skills or values. Teachers have limited time or motivation to teach slower students.

Yamini Aiyar of the Centre for Policy Research, a Delhi think-tank, suggests the trouble starts higher up, in the educational establishment. The whole system, she argues, is designed and incentivised around enrolment and infrastructure rather than learning. The focus on measurement may reflect the scale of the challenge of managing so many schools in such diverse conditions. But add to this an 18% rate of absenteeism among teachers and it is not surprising the system is struggling.

To the relief of education experts who have long pleaded for reform, Mr Modi's government is considering a draft national educational policy that admits to a crisis. Its chief recommendation is for a massive focus on literacy and numeracy at the foundation stage, so that children stop falling behind. That would be a good start.

A third challenge facing Mr Modi is one that plagues every Indian government: its tools are not up to the task. Almost uniquely among large developing countries, India does not have a bloated administration. Its bureaucracy is underweight and overstretched. In the words of Milan Vaishnav of Carnegie, a think-tank, "India is a 21st-century economic and diplomatic entity powered by a 19th-century state."

The vaunted "steel core" of government, the elite Indian Administrative Service, is made up of just 5,000 active officers, the same number, in proportion to the population, as when this correspondent's great-grandfather joined it in 1889. That is some 1,500 officers short of the service's full strength, made worse by politicians' habit of shunting them

from post to post. Similar levels of understaffing, as well as the “transfer Raj” of frequent repostings, and mismatches between skills and duties, plague every other Indian service, from the courts to schools to the police.

The result is not just poor service. As many as 37% of high-court and 25% of district-court positions remain unfilled, which helps explain why Indian justice carries a backlog of more than 30m cases. If the most congested courts worked as efficiently as the least congested, one study found, India’s overall productivity would rise by 5%, an annual gain to GDP of some \$150bn. Considering that India spends a miserly 0.12% of GDP on justice, hiring enough judges to sit in courts would seem a useful investment.

If government is too flimsy, it is also the wrong shape, thin at the central and local levels but fat at the state level. Big cities, in particular, have neither the independence nor the political clout to cope with rapid urbanisation, let alone to plan for the future. “It is ironic that India, which is constitutionally federal, is less devolved than China,” says an urban-studies researcher.

Mumbai, the richest and most populous city, is run by the same unelected bureaucrats who manage the surrounding state of Maharashtra, similar in size and population to Vietnam or Germany. The 22m Mumbaikars are at last getting a metro system. Until now, public transport consisted of a rumbling state-run bus service and a Raj-era suburban railway, managed from distant Delhi, that is so crowded and precarious it kills some 3,000 commuters a year.

Freeing Indian cities to run their own affairs would cost very little but substantially boost the quality of life for millions of people. The reason it does not happen is political. In states like Maharashtra, party bosses like to milk urban areas to pay for vote-buying rural schemes. They also prefer big infrastructure to more mundane measures like making streets tidier or safer. If India is to thrive, the cities where the majority of Indians will soon

be living need to be much better run. ■



三大挑战

要做的太多

环境、教育和行政僵局威胁印度的未来【专题报道《印度》系列之三】

印度的基础设施嘎吱作响，医疗保健系统更是运转失灵。贫穷和不平等依然无处不在，如今经济又陷入挣扎。莫迪的待办事项有很多。但有三个议题，如果着手处理，会带来很大的改善。其一是环境。全球15个污染最严重的城市有12个在印度（见图表），该国在全球122个国家的水质指数中排名第120。其二是教育。随着越来越多的人首次迁入城市，让他们获得培训并在印度21世纪的经济中找到工作至关重要。第三个问题是行政管理。自英国统治时期以来，印度政府的基本结构没有变化，人员不足、部署不均、能力低下而疲于应付。

先说环境。前人若穿越来此，几乎不可能认得出印度北部旁遮普邦和哈里亚纳邦的平原。大量的灌溉工程、机械化耕作和杂交种子带来了一望无际的绿色原野，使曾经饥肠辘辘的印度变成了谷物的一大出口国。但是现在，访客甚至可能都看不到平原了。每年农民燃烧稻梗都会生成浓重的季节性烟雾。它与柴油机废气、燃煤发电厂的烟气及其他有害气体混合成了一杯毒鸡尾酒，席卷了从巴基斯坦的拉合尔到孟加拉国的达卡的整个印度北部平原，有约八亿人口居住在那里。污浊的空气可能导致每年多达120万人过早死亡，并使平均寿命缩短四年。

这有部分是因为不断变化的农业技术而导致。机械收割机留下的稻梗更长，无法犁进地里，只能焚烧。“你指望我们怎么做？”在德里以北100公里的小镇卡纳尔附近，一位戴头巾的农民耸耸肩说。但印度大部分的空气污染无非是进步的代价。西方国家已经经历过，它们的民主进程迫使它们做出改变。中国也正在经历这一挑战，但一党制国家可以对污染者挥舞大棒。印度陷于两者之间，其民主制度不足以迫使环境政策做出改变。

从纸面上看，印度有强有力的法律和体制来保护环境，包括一个强大的国

家绿色法庭帮助加强执法。莫迪的政府已采取了一些重大步骤，颁布了更严格的车辆排放标准，并实现了一些宏伟的太阳能目标。它正在公共讯息和新设备上花费1.5亿美元来劝阻农民烧田，并关闭了一些城市燃煤电站。印度人并非受累于蓄意制定的政策，而是因为系统性地未能考虑并解决进步带来的丑陋的副作用。在促成《巴黎协定》的气候变化谈判中，印度外交官辩称因为跟随发达经济体的道路而受惩罚是不公平的，结果赢得了相对宽松的承诺。

印度的承诺之一是到2030年太阳能发电将占发电总装机容量的36%，这令人赞叹。但据政府自己预测，它将仅占实际发电量的23%。燃煤发电的份额预计将从74%下降到50%，但是由于发电总量将增长，这仍然意味着要建更多的燃煤发电厂。这些发电厂抽取了宝贵的淡水并喷出温室气体。尽管世界上大部分国家（包括中国在内）的二氧化碳排放量增速都有所放缓甚至下降，但自2005年以来，印度的二氧化碳排放量已增长了一倍。

至于水，对喜怒无常的季风近乎完全的依赖并没有让印度人谨慎地使用它。大约70%的地表水据信受到了污染，而从20米深的管井中抽水已严重降低了地下水位。印度农民使用的地下水超过美国和中国的总和。他们生产一公斤大米要抽取多达6000升水，而中国仅为600升。这是因为50年来印度政府一直在补贴农业。灌溉用水是免费的，种子、柴油、电力和化肥全部以低于成本的价格出售。结果是，印度现在有一座7000万吨的谷物山和1500万吨的糖山。它是全球最大的虚拟水出口国，每年通过出口的大米、纺织品和其他商品输出相当于近1000亿立方米的水。

缺乏清洁用水每年估计导致20万印度人死亡，数百万人患病。曾经怡人的河流，如德里的亚穆纳河和孟买的密斯河，如今都缺乏氧气，且因污水而变黑。班加罗尔郊区的湖泊现在经常起火或喷发出大堆有毒的泡沫。在污染、过度使用和全球变暖（似乎使季风变得更加反复无常，而充足程度略有下降）的夹击下，印度正迅速滑向水危机。

然而政策变化缓慢又零碎。政府宁愿兴建庞大而招摇的大坝和运河，而不愿投资于城市排污网络或执行排放法规。莫迪在他的第一个任期里建造了

令人印象深刻的1亿个厕所，许多因缺水而闲置。他的政府现在计划实施一项全国措施来将自来水引入每个家庭——如果成功的话将是一项具有革命性意义的举措。但是，由于忌惮农村选民，它没有确立适当的价格结构来反映水不断上涨的价值。

只有当它建立这样的价格结构时，才有可能实现中国最近经历的那种决定性的城市化转变。三分之二的印度人仍生活在农村地区，而中国人只有41%。较低的城市化水平的主要原因之一是对农民的补贴使小农户能够维持简单的营生。由此造成的盈利能力不足才是印度农村困境的真正根源，而不仅仅是干旱、洪水或政府的忽视。

随着越来越多的印度人成为城市居民，他们需要的一样东西就是更好的教育。尽管一些邦（喀拉拉邦的形势最好）正在接近全民识字，其他邦却远远落后。尽管官方号称的75%识字率听起来还算不错，更详细的调查引发了质疑。非政府组织ASER自2005年以来对乡村学校开展年度调查，其最近的报告显示勤率不断提高，学校设施整体得到改善，学习水平在近期有所提高——虽然幅度不大但仍令人鼓舞。即便如此，全国只有一半五年级学生达到了二年级的阅读水平，不到三分之一能进行基础数学运算。在上完八年级的学生中，仍有约27%无法完成二年级阅读，而十年前这一比例为15%。

这样的结果不仅表明印度的150万所学校总体上状况不佳，而且许多儿童未能掌握重要的技能，却仍可以升入高一个年级。麻烦不仅仅限于农村小学。招聘公司Aspiring Minds每年都要对数百万名技术行业的职位申请人进行测试。它在最新报告中总结称，印度只有1.5%的工程专业毕业生具备足够的技能在数据驱动的领域工作。更令人不安的是，自该公司2010年启动首次调查以来，这种“可雇用率”毫无改善。

人们很容易把如此糟糕的结果归因于政府在教育上的低支出。几十年来，这一比例一直徘徊在印度GDP的4%以下，远低于世界平均水平。为确保印度拥有受过训练的精英来管理国家，经费中不成比例的份额被投入高等教育。这样一来，印度许多顶尖的公立大学确实具有全球竞争力。弊端是

普通公立学校没有。

经济学家卡尔提克·穆拉里达兰（Karthik Muralidharan）和阿比耶特·辛格（Abhijeet Singh）说，解决方案不仅是花更多的钱，而且是要改变印度教育的文化和结构。学校太过专注于让学生通过考试，而未能传授技能或价值观。老师们去教授落后学生的时间或动力都很有限。

德里的智库“政策研究中心”的亚米尼·艾亚尔（Yamini Aiyar）表示，问题始于教育机构的高层。她认为，整个系统的设计和激励都围绕着入学和基础设施，而非学习。对测量指标的关注可能反映了在如此多样化的条件下管理如此多的学校的困难之大。但除此之外，教师的缺勤率高达18%，整个体系步履维艰也就不足为奇了。

让长期以来一直呼吁改革的教育专家们稍感宽慰的是，莫迪政府正在考虑一项承认存在危机的国家教育政策草案。它的主要建议是在基础阶段将注意力集中在识字和算术上，确保孩子们不再掉队。那将是个好的开始。

莫迪面临的第三个困难困扰了每一届印度政府：它的工具无法胜任。印度并没有臃肿的政府，这在大型发展中国家里几乎独一无二。它的官僚机构人手不足，负担过重。用智库卡内基（Carnegie）的米兰·瓦什纳夫（Milan Vaishnav）的话说，“印度是一个由19世纪的政府驱动的21世纪经济和外交实体。”

被大肆吹嘘的政府“钢铁核心”，即精英云集的印度行政服务局仅有5000名在任官员，其人数相对于总人口的比例和本文作者的曾祖父于1889年加入该局时相同。这比该局满编制时少1500人，加上政客习惯于让他们不断调岗，让问题更加雪上加霜。类似的人员配置不足，加上频繁调职的“大调动”，还有技能和职责之间的不匹配，困扰着从法院到学校再到警察局的每一个印度服务机构。

其结果不仅是服务差。多达37%的高级法院和25%的地区法院职位未能填补，这有助于解释为什么印度司法部门积压了超过3000万个案件。一项研究发现，如果最拥挤的法院的工作效率与最不拥挤的法院一样，印度的

整体生产率将提高5%，每年GDP增加约1500亿美元。考虑到印度在司法上的支出仅为GDP的0.12%，聘请足够多的法官出庭似乎是一项有用的投资。

如果说政府过于虚弱，那么它的体型也不对：中央和地方政府太瘦，而邦政府太胖。特别是大城市，既没有独立性也没有政治影响力来应对快速的城市化，更不用说为未来做规划了。一位从事城市研究的研究者说：“讽刺的是，印度在宪法上是联邦制，权力下放的程度却不及中国。”

孟买是最富有和人口最多的城市，它由管理周边的马哈拉施特拉邦的非选举官僚管理，该邦的规模和人口与越南或德国相似。2200万孟买人总算是要拥有一条地铁了。到目前为止，公共交通包括隆隆作响的国营巴士服务和英国统治时代建造的一条郊区铁路。这条由遥远的德里管理的铁路极其拥挤和危险，每年造成约3000名通勤者死亡。

放手让印度的城市管理自己的事务花费很少，但可以大大提高数百万人的生活质量。它没有发生的原因是政治上的。在马哈拉施特拉这样的邦，政党大佬们喜欢压榨城市地区来在乡村地区买选票。他们喜欢大型基础设施也胜过更日常的措施，例如把街道变得更整洁或更安全。如果印度要蓬勃发展，那么大多数印度人不久将居住的城市就得比现在运作得好得多。■



Economy

Wake-up call

A downturn reveals the desperate need for deeper reform

WITHIN A FEW years, Indian planners hope that bullet trains will reduce the time taken for the 500km (310 miles) journey between Mumbai, the commercial capital, and Ahmedabad, the biggest city in Mr Modi's home state of Gujarat, from six hours to just two. For now, laws that protect tiny properties are holding up the railway's construction. Two years after breaking ground, the Japanese-financed project has not yet managed to acquire even half the land it needs. By contrast, China added another 4,000km of track for its nationwide high-speed network in 2018 alone.

Historians reckon that the two Asian giants have had roughly equal economies for much of their history. Only since the 1990s, when China began its daring, deep-seated economic reforms, has it raced ahead. Its nominal GDP is now five times India's. The dragon has slowed its pace, but even so, notes a report by Rakesh Mohan, a Yale professor and former deputy governor of the Reserve Bank of India (RBI), the country's central bank, it is still adding the equivalent of a quarter of India's economy every year. If India were to sustain its GDP growth per person of 7%—about its average for the past two decades—to 2030, it would barely have got to where China is today. And even that may prove ambitious.

Now, with alarming speed, India has gone from being the world's fastest-growing large economy to something more like a rumbling Indian railway train. In the quarter to June, growth slipped to 5%, the slowest in six years. Other indicators are more worrying still. Sales of trucks and buses fell 45% in the year to September, and even sales of cheap biscuits and soap have contracted. The 88% drop in overall credit flows to businesses in the two

quarters to September compared with the same period last year suggests a virtual freeze on lending.

Believing its own boosterism, the government failed to see the signs. Yet even as the slowdown became more pronounced, Mr Modi still managed to get himself re-elected in May with a huge majority. The first budget of his second term, announced in July by the incoming finance minister, Nirmala Sitharaman, signalled business as usual. The emphasis was on new taxes, more handouts, more regulations, a further bail-out of public-sector banks and the airy goal of doubling India's GDP to \$5trn within five years. As the summer wore on, however, it became clearer that the economy had turned against Mr Modi, even if the electorate had not. The big question now is whether the downturn will be bad enough to force the prime minister into some of the much-needed reforms that he avoided in his first term. Some changes have started to be made in the past few months.

Initial tweaks in August had little effect, but on September 20th the government abruptly decreed a sharp cut in corporate tax, from an effective rate of 35% to a far more competitive 25%. The move prompted Mumbai's biggest stockmarket leap in a decade. The market's instant, oversized joy suggests two things. One is that there is a great deal of pent-up energy in the Indian economy, waiting to be released by wiser government policies. The other is that if Mr Modi's government puts in some effort, it is capable of coming up with those wiser policies. Businesses are watching to see what will follow. There are rumours of a sweeping privatisation drive. But it is unclear whether Mr Modi's reforming side can override his conservatism, which reflexively favours an interventionist state, protectionist trade policies and the opinions of Hindutva trade unions, small business lobbies and ideologues.

These tensions played out during Mr Modi's first term, which saw the introduction of some welcome reforms. A long-overdue bankruptcy law

theoretically reduced the time to settle a business failure from around four years to nine months. The GST did, for all its paperwork, abolish absurd interstate duties and so sped up internal commerce. Fiscal discipline kept inflation modest. Infrastructure—and in particular power supplies—improved substantially. Over the past decade 30m more Indians every year have been connected to the electric grid, which now reaches 90% of all homes. India climbed a stunning 65 places up the World Bank's Ease of Doing Business Index and pulled in record hauls of foreign investment, totalling more than \$35bn in each of the past three years.

Yet the government shied away repeatedly from risking its political capital on deeper structural reforms. Labour laws that make hiring and firing too expensive remained a block to growth, as did laws making it hard for companies to acquire land. Such blockages continue to hamstring efforts to expand India's manufacturing base, Chinese-style, to create plentiful low-paid factory jobs for rural migrants. Instead of supporting small business, the government experimented with shock demonetisation, fancy new taxes and heavier enforcement. Rather than promoting trade, it scrapped existing bilateral deals, raised tariffs and sparred with the WTO. Disappointing his own business constituency, Mr Modi dodged calls to privatise some banks, industries and utilities, instead forcing healthy state-owned firms to swallow sick ones.

At the same time, regulators moved too slowly to deal with an urgent problem. Driven by starry forecasts and cronyism under the previous government, state-owned banks had let non-performing loans inflate to a \$200bn balloon. Then, caught in the glare of increased scrutiny, they reined in lending, further crimping investment and pushing credit-seekers towards non-banking financial corporations (NBFCs). In October 2018 a default by one of those caused hiccups across the financial sector. Despite \$30bn in government bail-outs for state banks, and a slow decline in non-

performing assets, lenders and borrowers remain wary.

Though foreign direct investment stayed strong in Mr Modi's first term, all but a trickle of the new money poured into services and a few big acquisitions, rather than job- or export-generating industry. The largest single deal saw Walmart, an American retail giant, splash out \$16bn for control of Flipkart, an online retailer. The ink had scarcely dried on Walmart's cheque before the government radically changed the e-commerce rules that had underpinned Walmart's decision to invest. Small traders, who are an important part of the influential Hindutva business lobby, had pressed the government for changes, revealing the kind of obstacles that reforms have to overcome.

All the while, talk of Indian growth obscured such facts as declining farmgate prices, stagnant urban wages, flat exports, rising household debt, a long-term decline in savings and investment rates, and flat or falling consumer spending.

Some of India's top economists did notice the gloomy numbers and realised that since the country's statistics agency changed its methodology in 2011, there had been growing divergences between calculations of GDP and a range of other indicators. The doubters, who include Arvind Subramanian, the government's chief economic adviser from 2014 to 2018, do not suggest foul play but rather poor methodology, compounded by the difficulty of measuring an "informal" sector that makes up 45% of the economy and accounts for 75% of employment. If the critics are right, growth since 2011 may have been overstated by 2-2.5% a year. As Mr Subramanian notes, the trouble with bungling the numbers is that it is like driving with a faulty speedometer. Indeed, the strongest proof that growth was overstated may be that India appears to have driven off course. The current slump can largely be ascribed to policies followed in the mistaken belief that India was hurtling along at 7-8% annual growth, when the reality was more like 5-6%.

Since the slowdown has taken hold, Ms Sitharaman has scrapped the most onerous of new taxes and compliance rules. She also announced the government would support NBFCs, and top up a range of schemes meant to ease access to export credits and housing loans. Amid a series of rate cuts by the RBI, the government also imposed a slew of mergers between state-owned banks that will, in theory, improve their books and make them keener to lend. The sudden move to slash company taxes came with a further sweetener, a two-year window for new industrial investments to attract a rate of just 17%.

Businesses have broadly welcomed all these moves, as well as having their tax cut by a third, but concerns persist. Though the supply-side tinkering helps, it does not indicate personal attention from Mr Modi, let alone the kind of policy shift many feel is needed to kick-start growth. “The lack of economic vision baffles me,” says a conservative think-tank scholar who now regrets voting for Mr Modi. “They get this monster electoral verdict, and then do nothing?”

Turning ten stodgy state banks into four bigger ones, for instance, may indeed strengthen the financial sector in the long term. More immediately, though, it ties up the institutions just when the economy needs them. The government promises to buy itself more cars, and to lower interest rates on housing for public servants, but neglects stronger demand-side prods such as rural public works. Ms Sitharaman talks of tweaking export credits and speeding tax reimbursements for exporters, when letting the overvalued rupee drop would boost exports even more. She has chastised tax officers for being overly aggressive, but aside from the cut in corporate rates that simply brings India closer to world averages, has proposed no other bold tax relief.

This is badly needed. India has some of the world’s most convoluted taxes, and enforces them with gusto. GST paperwork is tricky. Rates for some

goods are ruinously high. Cement and cars are taxed at 28% (plus hefty further taxes for cars), which is odd if you wish to save manufacturing jobs or spur housing investment. Some personal stories are hair-raising. One luxury-goods executive complains that inspectors invaded his home at gunpoint in the middle of the night and held him and his wife hostage for two days, threatening jail for not co-operating as they poked through his cupboards. They found nothing, but left the businessman shaken. He has decided to leave the country.

Despite the gouging, the government is faced with a chronic deficit. It pretends this is a mere 3.4%, but after allowing for hidden off-budget liabilities and state debts, overall government borrowing is closer to 9%. August brought a reprieve, with a hefty and controversial dividend payment from the central bank to shore up revenue. But those off-budget fudges, demands from states and shrinking tax receipts will soon start to squeeze the exchequer.

The gloom is not universal. The \$180bn IT sector, centred on boomtowns like Bengaluru (formerly Bangalore) and Hyderabad, continues to prosper. NASSCOM, an industry body, counted 7,200 start-ups in 2018, of which eight became “unicorns”, valued at over \$1bn. Tata Consulting Services passed another milestone for Indian IT firms, reaching a market capital of \$100bn. The sector cannot pull the rest of India along, however, and has its own limits. NASSCOM predicts that automation is likely to shrink the number of IT jobs—currently more than 4m—by some 14% in the next five years.

Population growth, rising productivity and growing aspirations can probably propel a big, diversified economy at a steady 5%. Barring a global crisis, even without ambitious new policies, India may be able to climb out of the current doldrums. Returning to the trajectory of 7-8% growth would take a little longer.

With luck, in a few years' time, the present slump may be regarded as a useful catalysing moment, like the economic crisis of 1991 that sparked India's initial market reforms. But bringing back the brash, risk-taking ebullience of the mid-2000s will not be easy. Many believed Mr Modi when he promised *achhe din*—good times—in 2014. Starting his second term with a deep slump, he has no one to blame but himself. Worse, say critics, he has no one to turn to. Ms Sitharaman is tough and straight, but her team does not inspire confidence. “We always had bad institutions, but a few really talented people—ninjas who could go in and make things work,” says a former finance-ministry mandarin. “Now it’s a Trumpian wasteland.” ■



经济

警钟鸣响

经济下滑表明更深入的改革已刻不容缓【专题报道《印度》系列之二】

印度的规划者希望，短短几年内，子弹头火车就能把商业首都孟买和莫迪故乡古吉拉特邦最大的城市艾哈迈达巴德（Ahmedabad）之间500公里的旅程从六小时缩短到两小时。眼下，保护微小地产的法律阻碍了铁路的建设。破土动工两年后，这个由日本人资助的项目甚至还没拿到所需的土地的一半。相比之下，仅2018年一年，中国遍布全国的高铁网络又延长了4000公里。

历史学家认为，这两个亚洲巨人在它们历史上的大部分时间里经济水平大致相当。1990年代中国开始了大胆、坚定的经济改革，自此才冲到了前头。如今中国的名义GDP是印度的五倍。巨龙已经放慢了脚步，但即便如此，据耶鲁大学教授、印度央行印度储备银行（RBI）前副行长拉克什·莫汉（Rakesh Mohan）在一项报告中指出，它每年都在增加相当于四分之一个印度的经济规模。如果印度能将其人均GDP增速维持在7%（大概是过去20年的平均水平）直至2030年，它将能勉强到达中国今天所在的位置。但可能连实现这个目标也很费劲。

如今，印度以令人震惊的速度，从全球增长最快的大型经济体变成了一列咣当咣当的印度火车。截至6月的一个季度里，其经济增速跌至5%，为六年来最低。其他指标更叫人担忧。在截至9月的一年间，卡车和公共汽车的销量下降了45%，连廉价饼干和肥皂的销售都萎缩了。截至9月的两个季度里，流向企业的整体信贷额同比减少88%，说明信贷几乎要冻结了。

吹嘘得自己都相信了的政府对这些迹象视而不见。不过，尽管经济放缓的趋势愈发明显，莫迪在5月仍以压倒性优势获得连任。新任财政部长尼尔·马拉·西塔拉曼（Nirmala Sitharaman）在7月宣布了莫迪第二个任期的第一个预算案，发出的信号是一切照旧。其重点是新税项、更多救济补助、

更多监管法规、进一步为国有银行纾困，以及在五年内将印度GDP翻番至五万亿美元这一不切实际的目标。然而，夏天就要过去了，一件事变得清晰起来：经济走向背叛了莫迪——尽管选民们没有。现在最大的疑问是，经济下滑是否会严重到足以迫使总理采取一些他在自己第一个任期内逃避的那些急需的改革。过去几个月里，一些改变已经开始发生。

自8月启动的微调收效甚微。但在9月20日，政府突然下令大幅削减公司税，从35%的实际税率降至竞争力大增的25%。这一举措引发了孟买股市十年来最大的一次暴涨。市场瞬间爆发的巨大欢乐暗示了两点：其一，印度经济中有大量被压抑的能量，等待被更明智的政府政策释放；其二，如果莫迪的政府花点心思，它是有能力提出更明智的政策的。企业正在静待接下来会发生什么。有传言称将会有一轮大范围的私有化行动。但是，目前尚不清楚莫迪身上改革派的一面能否压过保守主义的一面。这种保守主义让他不假思索地倾向积极干预的政府、保护主义的贸易政策，以及印度教民族主义的工会、小企业游说团体及理论派的观点。

这番拉锯在莫迪第一个任期里已有显现，政府在那时实行了一些受欢迎的改革。一项早该执行的破产法律理论上将企业破产清算的时间从约四年缩短到了九个月。尽管文书繁琐，商品和服务税（GST）废除了荒唐的州际关税，使国内商贸提速。财政纪律让通胀保持在适度水平。基础设施尤其是供电大幅改善。过去十年中每年有3000万印度人接入电网，目前电网已覆盖印度九成家庭。印度在世界银行的营商便利指数中惊人地跃进了65位，并吸引到了创纪录的外国投资——过去三年里每年总计超过350亿美元。

但政府一再回避更深入的结构改革，以免赔上自己的政治资本。令雇用和解雇成本过高的劳动法还在阻碍增长，让企业难以获得土地的法律也一样。这些障碍继续使得印度难以扩大中国式制造基地，无法创造大量低薪工厂职位来安置农村移民。政府没有为小企业提供支持，而是试验了冲击性的废钞令、花样翻新的税收和更严格的执法。它没有促进贸易，而是取消了现有的双边协议，提高了关税并与世贸组织争执。莫迪没有响应将一些银行、工业和公用事业私有化的呼声，反而迫使状况良好的国企合并深

陷困境的同伴，令支持他的商业选民深感失望。

与此同时，监管部门在一个紧急的问题上反应迟缓。在前任政府耀眼的预测数字和任人唯亲的驱动下，国有银行让不良贷款膨胀到了2000亿美元的地步。然后它们就陷入了监管部门越来越多的审查，于是收紧了放贷，这进一步限制了投资，并把寻求贷款的人群推向了非银行金融公司

（NBFC）。2018年10月，一家NBFC违约波及整个金融部门。尽管政府为国有银行提供了300亿美元的纾困，且不良资产慢慢减少，借贷双方仍心有余悸。

莫迪第一个任期内，尽管外国直接投资一直保持强劲的势头，但绝大多数新资金都流向了服务业和一些大型收购交易，而不是创造就业或出口的行业。最大的单笔交易是美国零售巨头沃尔玛斥资160亿美元收购了在线零售商Flipkart的控股权。然而还没等沃尔玛开出的支票墨水干透，政府就大改了电子商务规则，而这些规则是沃尔玛决定投资的基础。小商贩是颇具影响力的印度教商业游说团体的重要组成部分，他们在沃尔玛发起收购后向政府施压，要求做出改变。这揭示出改革需要克服的那类障碍。

一直以来，有关印度经济增长的说法掩盖了以下事实：农场交货价格下跌、城市工资增长停滞、出口增长乏力、家庭债务增加、储蓄和投资率长期下降，以及消费者支出持平或下降。

印度一些顶尖的经济学家确实注意到了令人沮丧的数字。他们意识到，自印度的统计部门于2011年变更方法以来，GDP计算与一系列其他指标之间的分歧不断扩大。质疑者包括在2014年至2018年担任政府首席经济顾问的阿尔温德·苏布拉玛尼安（Arvind Subramanian）。他们并不认为政府蓄意作弊，而是方法糟糕，再加上占印度经济高达45%、贡献了75%就业的“非正式”部门难以衡量。如果批评者是对的，那么自2011年以来的增长可能被夸大了每年2%到2.5%之多。正如苏布拉玛尼安指出的那样，把数字弄错的麻烦在于，这就像开一辆速度表不准的车。确实，经济增速被夸大的最有力证据是印度似乎已经偏离了轨道。当前的低迷在很大程度上可归因

于所颁布的政策是基于错误的认知做出的——误以为印度正以每年7%到8%的速度冲刺，而真实速度却是5%到6%。

由于经济放缓持续，西塔拉曼已经取消了新税项和合规规定中最繁琐的部分。她还宣布政府将支持NBFC，并添上了一系列旨在方便获得出口信贷和住房贷款的措施。在印度储备银行采取一系列降息措施之时，政府还迫使一些国有银行合并，从理论上讲这将改善它们的资产负债表，让它们更积极地放贷。政府在突然大幅削减公司税的同时又给了一点甜头：在为期两年的时间里，企业若开展新的工业投资可以将税率进一步降低到17%。

企业广泛欢迎所有这些措施，就像它们对于税赋大减三分之一的反应一样。但忧虑仍然存在。尽管对供给侧的些许改善有其助益，这并不表示莫迪个人关注这一块，更不用说许多人认为启动增长需要的那些政策转变了。“搞不懂怎么一点经济远见都没有，”一位保守派智囊团学者说，他现在后悔当初给莫迪投了票。“他们在大选中取得了这么夸张的胜利，然后什么也不做？”

举例来说，把十家缺乏生气的国有银行变成四家更大的银行，从长远来看或许确实能增强金融部门的实力。但在眼下，这恰恰在经济需要它们的时候束缚了它们。政府承诺自己会购买更多汽车，并降低公务员的购房利率，却忽视了诸如农村公共工程之类的更有力的需求侧刺激。西塔拉曼谈到要调整出口信贷和加快对出口商退税，而放任被高估的卢比贬值原本能更有力地提振出口。她斥责税务官员太过激进，但除了把公司税降至仅仅是更接近世界平均水平外，她并没有再提出其他大胆的税收减免方案。

而这是非常急需的。印度的税负的复杂程度在世界上名列前茅，而且执行起来还非常积极。商品与服务税的文书程序很麻烦。一些商品的税率之高简直是灾难。水泥和汽车要缴纳28%的税（汽车还有其他高额税项），这在政府希望保住制造业岗位或刺激住房投资的情况下让人看不懂。一些个人遭遇令人毛骨悚然。一位奢侈品高管抱怨说，巡查人员半夜举着枪冲进他的住处，把他和妻子扣押了两天，边翻查他的橱柜边威胁说如果不合作

就把他们关进监狱。他们什么也没找到，但这名商人惊魂未定。他已经决定离开这个国家。

尽管巧取豪夺，政府仍面临长期赤字。它自称赤字仅为3.4%，但在计入隐含的预算外债务和邦政府债务后，政府总借债接近9%。8月稍有缓解，因为央行支付了一笔有争议的巨额股息以增加政府收入。但那些预算外的弄虚作假、来自各邦的需求，以及税收收入的减少将很快开始让国库承压。

倒也不全是一片黑暗。以班加罗尔和海得拉巴等新兴城市为中心、价值1800亿美元的信息技术行业持续繁荣发展。据行业组织NASSCOM统计，2018年全国有7200家创业公司，其中八家已长成“独角兽”，价值超过10亿美元。塔塔咨询服务公司（Tata Consulting Services）跨越了印度信息技术企业的又一个里程碑：市值达到1000亿美元。然而，这个行业并不足以拉动印度其余部门，而且有其自身局限性。NASSCOM预测，自动化可能会在未来五年内将信息技术岗位（目前超过400万个）削减约14%。

人口增长、生产率提高以及膨胀的抱负可能会推动一个庞大的多元化经济体以稳定的5%的增速前进。除非发生全球危机，否则即使没有雄心勃勃的新政策，印度或许也能够摆脱目前的低迷。回到7%到8%的增长轨道上则需要略长一些的时间。

如果够幸运，几年后回头看，当前的低迷可能被看作一个有益的催化时刻，就像1991年的经济危机引发了印度最初的市场改革那样。但是，要让2000年代中期那种勇于冒险、生机勃勃的情绪回来不容易。莫迪在2014年承诺带来“好日子”，赢得了许多人的信任。他的第二个任期以经济滑入深度低迷开局，他除了自己外没有其他人可以责怪。更糟糕的是——评论人士说——他没有什么人可以求助。西塔拉曼坚韧而直率，但她的团队让人没有信心。“我们的机构从来都很糟糕，但还是有一些真正有才华的人，这些忍者会投身其中并把事情搞定，”一位前财政部官员说，“而现在，这是一个特朗普式的荒原。” ■



The supply side

You're hot then you're cold

How idiosyncratic price rises give economists a headache

IN FEBRUARY 2017 Verizon, an American mobile-phone carrier, started offering mobile-phone connections that put no limits on data. “Unlimited adventures, unlimited laughter, unlimited connections,” promised an advert. They might have added “unlimited woe for central bankers”. The category of inflation in which mobile-phone plans feature subsequently plummeted, dragging overall core inflation down by about 0.2 percentage points at a time when it had been forecast to rise. For the best part of a year the Verizon disinflation became crucial to central bankers’ own communications, as they promised financial markets that the effect would soon wear off.

One-shot changes in prices constantly play havoc with central bankers’ attempts to target inflation down to the last tenth of a percentage point. In early 2019 Germany’s statisticians improved their monitoring of how holiday prices vary with the seasons. Unfortunately this captured volatility that has disrupted the index. In May the prices were 9% down on a year earlier; in June they were 6% up. Package holidays make up nearly 3% of German household consumption, giving them enough weight to cause volatility in overall inflation. And because Germany accounts for nearly one-third of the entire euro-zone inflation basket, the movements are large enough to show up at continental level (just like the tourists themselves).

In India onion prices are an important part of the inflation recipe. The vegetable is prominent in the Indian diet. When prices rise it not only brings tears to the eyes of consumers, but can send financial markets tumbling. Politicians, fearing voters’ wrath, scramble to act. In 2013 a 370% jump in

wholesale onion prices caused inflation to spike; a sustained shortage led Prime Minister Narendra Modi to tighten export controls the following year.

In China pork is what matters—the country consumes as much hog meat as the rest of the world combined. Unfortunately an epizootic of African swine fever has recently wiped out at least a third of all the pigs in China. This pushed pork inflation to above 47% in August in a market that is already volatile, contributing nearly half a percentage point to headline inflation. In an attempt to abate price pressures China has released meat from its frozen-pork reserves, an emergency facility created in the 1970s (many countries have oil reserves for the same reason).

These are not the only ways in which idiosyncratic price rises trouble the world's economists. Staff at the International Monetary Fund are suffering from a heady rate of food inflation in their canteen: prices per ounce are up 38% in three years. The result of fewer distortive subsidies, perhaps. Or maybe some sort of programme is needed? ■



供给侧

时冷时热

特异性价格上涨如何让经济学家头疼【专题报道《世界经济》系列之三】

二〇一七年二月，美国手机运营商威瑞森推出了手机无限流量套餐。“无限探险，无限欢笑，无限连接。”一条广告这样承诺。他们其实可以再加一句：“给央行行长无限痛苦。”手机套餐所在的那一栏通胀数字随之暴跌，将原本预期要上涨的整体核心通胀下拉了约0.2个百分点。在一年中的大部分时间里，“威瑞森通缩”成了央行行长们言语中的关键词，他们向金融市场承诺其影响会很快消退。

央行行长们设置的通胀目标精确至0.1个百分点，这种努力不断被一次性价格变化搅乱。今年初，德国的统计人员改进了对度假费用随季节变化的监测，结果捕捉到了足以干扰价格指数的波动。5月份的价格比去年同期下降了9%，到了6月却同比上涨6%。一价全包式旅游占到德国家庭消费的近3%，足以导致总体通胀的波动。而由于德国占了整个欧元区通胀篮子的近三分之一，这种波动又足以在整个欧洲大陆的层面反映出来（就像游客们自己的足迹那样）。

在印度，洋葱价格是通胀食谱的重要食材。这种蔬菜在印度人的饮食中地位突出。洋葱涨价时，不但消费者会飙泪，金融市场也可能崩溃。忌惮选民怒火的政客们手忙脚乱地采取行动。2013年，洋葱批发价上涨了370%，导致通胀飙升；持续的供应短缺促使总理莫迪在次年加强了出口管制。

在中国，重要的是猪肉。中国消耗的生猪肉相当于世界其他地区的总和。不幸的是，近期非洲猪瘟的扩散干掉了中国至少三分之一的猪。在一个本已动荡的市场中，这导致猪肉价格通胀在8月份升至47%以上，为整体通胀贡献了近0.5个百分点。为缓解价格压力，中国政府已经投放了冷冻猪肉储备——在1970年代设立的一种紧急措施（许多国家出于同样的原因拥

有石油储备）。

特异性价格上涨给全球经济学家带来麻烦的例子不止这些。国际货币基金组织的员工们正在自己的食堂里忍受着食品价格快速上窜：三年内每盎司食物的价格上涨了38%。也许是扭曲性补贴减少的结果吧。还是说该采取点什么措施了？ ■



India

The two Modis

India is stumbling because its prime minister has not pursued his reformist instincts, says Max Rodenbeck

TO ROARS OF approval from the pumped-up crowd packing a stadium in Houston, Texas, India's prime minister gave his answer to the local greeting. "You ask, 'Howdy, Modi?', so I say, 'Everything is fine in India!'" The prime minister repeated the phrase in half a dozen Indian languages, drawing more roars from different parts of the crowd. Narendra Modi is a master at turning such shows to his advantage. For more than 4m Indian-Americans, he had subtly equated his own person with the Old Country. And, by persuading President Donald Trump to appear on stage with him, he was showing a resurgent India, respected by world leaders and walking tall on the world stage.

The son of a Gujarati grocer and a devout Hindu nationalist, the most powerful prime minister in a generation projects a comforting small-town conservatism. Yet his natty dress, uplifting talk of progress and cutting wit speak of upward mobility. Mr Modi's stilted English may be awkward, but his aura of confidence declares the arrival of a bolder, stronger country.

As on the world stage, so at home. When the results of India's election were announced in May, Mr Modi's Bharatiya Janata Party (BJP) surprised even its own supporters with the scale of its re-election success. The party had more money, more energy and a sharper message than its feeble, divided opponents. But mainly the outcome was a personal triumph for Mr Modi. Pundits now assert that after decades of wobbly coalition governments, India has entered a phase of hegemonic politics reminiscent of the 1950s and 1960s, when the Congress party held unchallenged power. The BJP's

current majority means it could push through almost any legislation Mr Modi wants. But for all his massive mandate, can he hold India together in all its contradictions and move it forward?

Judging by his first term, and his government's trajectory in the early months of his second, the answer is not at all clear. A great deal of hype accompanied Mr Modi's arrival on the national scene in 2014. He was praised as a can-do, pro-business pragmatist who would wipe clean and shape up a government widely seen as venal and rotten. Yet Mr Modi's first five years proved in many ways a wasted opportunity. With some notable exceptions, such as the introduction of a nationwide goods and services tax (GST) and a huge effort to stop "open defecation" by building more toilets, bold reforms were largely postponed in favour of policy tinkering, sops to noisy constituencies and packing the bureaucracy with loyalists. In his latest term, Mr Modi has seemed more intent on following another side of his character, consolidating personal control, punishing political foes and pursuing Hindu-nationalist ideological goals—such as placing 7.5m unhappy Muslims in Kashmir under extended lockdown and direct rule from Delhi—than dealing with more pressing economic issues.

Mr Modi's government has failed to acknowledge looming dangers to India's economy and is now struggling to cope with an alarmingly sharp slowdown. In the first half of 2019 new banking credit to businesses crashed by a shocking 88%, and growth fell from 8% in 2018 to just 5% this year. For a large and diverse economy, this remains a respectable figure. But demographic pressures mean that India must sustain growth of 7.5% just to keep unemployment in check—and needs to do even better if it hopes ever to catch up with China. "Anything less than 6% feels like a recession in India," says Pranjul Bhandari, chief India economist at HSBC in Mumbai. And some of the troubling domestic indicators—such as this year's sudden plunge in car sales, lingering debts in banking, property and power-distribution companies, and long-term declines in consumer spending,

household saving and industrial investment—could soon meet strengthening global headwinds to create a nasty storm.

India's current economic challenges are not due to some big outside cause. The country has the resources and talent to grow strongly for decades to come. This special report will argue that its troubles stem largely from policy failures, albeit more by omission than commission. Successive governments—at state as well as national level—have failed to pursue sensible, consistent policies to promote growth. Mr Modi, too, for all his promise, is failing in this regard, as he follows more his nationalist, rather than his reformist, instincts.

India is not easy to govern. What other country has nearly 800 spoken languages, 22 of them languages of state? And what other society is fragmented into more than 3,000 castes, each with its own proud creation myth? Some caste rigidities have softened over time, but the structure is remarkably robust: even now only one in 20 marriages crosses barriers of caste. India's large Muslim, Christian, Sikh, Buddhist and Jain minorities often claim to be free of caste. In practice they are nearly as compartmentalised as the 80% Hindu majority. Economic divisions coexist with social ones. When introduced in 2017, the GST replaced a web of local taxes stretched over 29 states and seven territories. Goods move faster now, but they still cross radically different economies. Residents of Goa on India's west coast enjoy incomes per person 12 times those in Bihar, a rural state to the north-east. Levels of fertility, literacy and life expectancy in the southern states of Kerala and Tamil Nadu approach those of Thailand or Turkey; in parts of the Gangetic plain in the north they are nearer to those of sub-Saharan Africa. Banks in Maharashtra, home to India's commercial capital, Mumbai, boast loan-to-deposit ratios of 100%, as in advanced economies. In India's most populous state, Uttar Pradesh, they are stuck at 40%, reflecting slim pickings and high barriers to enterprise.

Overlying such disparities are other divisions, between prospering cities and struggling hinterlands, and between the few big, globally competitive conglomerates with access to capital, knowledge and political clout, and millions of small firms at risk of extinction from a flick of the government's bureaucratic tail. India's "formal" economy may indeed have grown by 8% in early 2018, as the government's GDP figures insist. But the hard-to-measure "informal" economy, accounting for three out of four jobs, may have been growing by just 2%, or even tumbled into recession.

Understandably, India's many fractures generate anxieties. This is especially true when the pace of change accelerates, and when awareness of differences grows. Although India's population growth at national level has slowed markedly, the total tally is still expected to overtake China's by 2027. India faces both a big bulge in working-age people and a growing rural exodus. Unemployment figures are unreliable, but the trend is unmistakable. Fewer young people can find a job, never mind one that matches their hard-earned qualifications. Openings for even menial posts attract throngs of overqualified applicants.

As such competition mounts, an explosion in access to information is demolishing archetypes and encouraging greater ambition. By next year, 700m Indians will be online, a 14-fold increase in ten years. All but a small fraction of them use smartphones. Between 2014 to 2018, Indians' consumption of mobile data grew 56 times. The sheer volume of fake news, gossip, political spin and cricket highlights eclipses anything carried by print, broadcasting or Bollywood. For tens of millions of Indians, revolutions that took generations to unfold elsewhere seem to be happening overnight; in literacy, in exposure to the wider world and in expectations for personal achievement and freedom.

Such factors may explain why, despite strides in raising living standards,

Indians are not growing more cheerful. In 2018 they ranked alarmingly low in a Gallup survey of global well-being: just 3% said they were “thriving”, compared with 21% of Chinese. Moreover, India had sunk faster on the “happiness index” than Egypt, Greece or Yemen, which endured a collapsed revolution, national bankruptcy and a fierce civil war respectively. Strikingly, too, for a society so defined by caste, language and creed, India scored low on measures of social support. Many respondents said they had no one to count on in times of trouble.

In spite of the “Modi effect”, and in contrast to the ebullience of a decade ago, when India was at the tail of an economic boom, the mood today is anxious and unsettled. This special report will argue that for the country not only to prosper but to be strong as a nation, it needs to change course. Without sweeping administrative reforms, the government itself will remain hamstrung by inadequate capacity. Without a clearer vision and bolder approach to economic policy, India will continue to underperform. Without a firmer commitment to its own constitutional principles, the drift towards authoritarianism will accelerate. And unless Indians resist Mr Modi’s push towards heavy Hindu majoritarianism and instead embrace their diversity, what will soon be the world’s most populous country may remain a largely unhappy one. ■



印度

两个莫迪

本文作者马克斯·罗登贝克说，印度之所以步履蹒跚，是因为印度总理没有追随自己的改革派直觉【专题报道《印度》系列之一】

在得克萨斯州休斯敦一个拥挤的体育场内，面对情绪高涨的人群震耳欲聋的欢呼，印度总理回应了来自本地民众的问候。“你们问：‘你好吗，莫迪？’我要说：‘印度的一切都很好！’”总理大人用六种印度语言重复了这句话，引来人群的不同角落爆发出更多欢呼。纳伦德拉·莫迪（Narendra Modi）是用这类场合自我宣传的大师。对于超过400万印度裔美国人来说，他巧妙地将他自己与这个古老的国家等同起来。并且他还说服了特朗普总统与他一起出现在舞台上，由此展示了一个复兴的印度——受到世界领导人的尊敬，在世界舞台上昂首阔步。

古吉拉特邦杂货商的儿子，虔诚的印度教民族主义者——这位一代人中最有权势的总理体现了一种令人安心的小城镇保守主义。然而他光鲜的衣着、振奋人心的进步言论和敏捷的机锋又展现出向上的流动性。莫迪生硬的英语可能有些别扭，但他的自信光环宣布了一个更大胆、更强大的国家的到来。

在印度国内，莫迪也展现出和世界舞台上一样的形象。当印度大选的结果于5月宣布时，莫迪领导的印度人民党在竞选连任中取得的压倒性胜利甚至让其支持者都感到惊讶。与弱小而分散的对手相比，人民党钱更多，更有活力，传达的讯息也更清晰。但这个结果主要是莫迪个人的胜利。专家们现在断言，在数十年不稳定的联合政府统治之后，印度已经进入了霸权政治，让人联想起1950和1960年代权力不受挑战的国大党。人民党目前的多数席位意味着它可以推进莫迪想要的几乎所有立法。但是，尽管大权在握，他能否将矛盾重重的印度团结在一起并推动它前进？

从他的第一个任期以及第二个任期前几个月的发展轨迹来看，答案根本不清晰。莫迪在2014年登上国家舞台时噱头十足。他被誉为积极进取、支持

商业的务实主义者，将会把被普遍视为腐败堕落的政府大清洗并重整旗鼓。然而，莫迪的头五年在许多方面浪费了机会。除了一些个显眼的例外，如征收全国性的商品和服务税（GST），以及盖更多厕所来消除“露天排便”的巨大努力，大胆的改革在很大程度上被推迟了，改为对政策小修小补，用小恩小惠安抚聒噪的选民，并在官僚体制里塞满自己人。在新的任期中，莫迪似乎更愿意跟随他性格的另一面，巩固个人控制，惩罚政治对手，并追求印度教民族主义的意识形态目标——例如将克什米尔750万不满的穆斯林置于长期封锁和德里的直接统治之下——而不是去处理更紧迫的经济问题。

莫迪的政府未能承认印度经济面临的迫在眉睫的危险，现在则在苦苦应对骇人的急剧放缓。2019年上半年，银行向企业新发放的信贷暴跌了惊人的88%，经济增长从2018年的8%降至今年区区5%。对于一个庞大而多样化的经济而言，这仍然是一个相当体面的数字。但是人口压力意味着印度必须维持7.5%的增长才能控制失业率——而如果它希望有朝一日赶上中国，那需要的增长就更高。孟买的汇丰银行（HSBC）首席印度经济学家普兰祖尔·班达里（Pranjul Bhandari）表示：“增长不到6%放在印度就感觉如同衰退。”而一些令人不安的国内指标，例如今年汽车销量的骤降，银行、房地产和配电公司的债务缠身，以及消费者支出、家庭储蓄和工业投资的长期下降，都可能很快会遇上越来越强烈的全球经济逆风，引发危险的风暴。

印度当前面临的经济困难并不是什么大的外部原因造成的。该国拥有在未来几十年强劲增长所需的资源和人才。本专题报道将指出，它的麻烦主要缘于政策失灵，尽管更多的是因为遗漏而非做错。历届政府（无论是邦还是国家级）都没能奉行合理而一致的政策来促进增长。莫迪也一样，尽管信誓旦旦，但在这方面依然失败了，因为他更多地顺应了自己作为一个民族主义者而非改革派的直觉。

治理印度可不容易。哪个别的国家有近800种口头语言，其中22种是邦级官方语言？还有哪个别的社会分裂成3000多个种姓，每个种姓都有自己骄傲的创世神话？有些种姓的森严界限随着时间的流逝有所软化，但其结

构却非常坚固：哪怕是现在，只有百分之五的婚姻跨越了种姓壁垒。印度广大的穆斯林、基督教、锡克教、佛教和耆那教少数群体常常声称自己没有种姓。而实际上，它们几乎与占80%的印度教徒一样壁垒森严。与社会分隔并存的还有经济分隔。商品和服务税于2017年推出后，取代了覆盖29个邦和七个直辖区的地方税收网。现在货物的流动速度加快了，但它们仍然跨越着截然不同的经济体。印度西海岸果阿的居民人均收入是东北部偏远的比哈尔邦人均收入的12倍。南部的喀拉拉邦和泰米尔纳德邦的生育水平、识字率和预期寿命接近泰国或土耳其的水平；而在北部恒河平原的某些地区则更接近撒哈拉以南非洲地区的水平。与发达经济体一样，印度商业首都孟买所在的马哈拉施特拉邦的银行拥有100%的贷存比。在印度人口最多的邦北方邦，这一比例保持在40%，这反映出企业利润微薄，壁垒很高。

在这些纷乱的差异之上还有其他的分割：繁荣的城市和挣扎的内地；少数拥有资本、知识和政治影响力，且具有全球竞争力的大型企业集团，和被政府官僚主义的尾巴扫一下就会灭亡的数百万小公司。印度的“正式”经济在2018年初可能确实像政府公布的GDP数字所坚称的那样增长了8%。但是，占所有工作岗位四分之三的难以衡量的“非正式”经济可能仅增长了2%，甚至陷入了衰退。

可想而知，印度的许多裂痕都会引发焦虑。当变化的步伐加快、对差异的意识增强时尤其如此。尽管印度的全国人口增长显著放缓，但预计到2027年其总人口仍将超过中国。印度既面临适龄劳动者的激增，也面临着日益严重的农村人口外流。失业数字并不可靠，但趋势确定无疑。能找到工作的年轻人越来越少，更不用说能匹配他们辛苦得来的学历了。哪怕是枯燥低级的职位也会吸引大批资历过高的申请者。

随着此类竞争的加剧，信息获取的爆炸式增长正在推翻旧范式，刺激更大的雄心。到明年，将有七亿印度人上网，在十年内增长了14倍。其中除了一小部分人外，其他所有人都使用智能手机。从2014年到2018年，印度人

对移动数据的消费增长了56倍。大量的虚假新闻、八卦新闻、政治言论和板球精选让纸媒、广播或宝莱坞带来的一切都黯然失色。对于数以千万计的印度人而言，其他地方历经几代人才普及的革命似乎一夜之间就已完成：无论是识字率、接触更广阔的世界，还是对个人成就和自由的期望。

这些因素或许可以解释，为什么尽管生活水平取得了长足进步，印度人却没有变得更开心。2018年，在盖洛普的一项全球幸福感调查中，印度人的排名低到令人震惊：只有3%的人表示自己“蒸蒸日上”，而中国人为21%。此外，印度的“幸福指数”下跌比埃及、希腊或也门还要快，而这些国家分别经历了一场崩溃的革命、国家破产和激烈的内战。同样令人震惊的是，对于一个种姓、语言和信仰根深蒂固的社会，印度在社会支持措施上的得分很低。许多受访者表示遇到麻烦时谁也指不上。

尽管有“莫迪效应”，如今这个国家的情绪焦虑不安。这与十年前印度处于一轮经济繁荣的尾声时生机勃勃的情形大不相同。本专题报道将论证，这个国家如果不单要繁荣，还要成为一个强大民族，就必须改弦更张。如果不进行全面的行政改革，政府本身将因能力不足而运作失灵。如果没有更清晰的愿景和更大胆的经济政策方针，印度将继续表现不佳。如果不更加坚定地遵循自己的宪法原则，滑向威权主义的步伐将会加速。除非印度人抵制莫迪大力推行的印度教多数主义，转而拥抱自身的多样性，即将成为世界上人口第一大国的印度可能仍然是一个不怎么高兴的国家。■



Schumpeter

Chalk and cheese

As Airbnb prepares to go public, it is keen to point out how it differs from Uber

THEY ARE the two most prominent examples of what used to be called the “sharing economy”. Founded in 2008 and 2009, respectively, Airbnb and Uber pioneered asset-light platforms to bring together providers and consumers of particular services—accommodation for the first, transport for second. Both firms became bywords for entire categories: startups now claim to be Airbnb for dogs or Uber for doctors. But Uber’s stockmarket flotation in May did not go well. Its share price has fallen by nearly 35% since its listing (and that of its rival Lyft, which went public in March, by 50%). As Airbnb prepares to go public next year, its boss, Brian Chesky, has been making the case for his company, both to the press and behind closed doors. He is keen to get across that, sharing-economy heritage notwithstanding, Airbnb is no Uber.

Mr Chesky founded the firm with his friends Joe Gebbia and Nate Blecharczyk, after he and Mr Gebbia, both unemployed designers, began renting out an airbed in their San Francisco apartment to make extra money. He originally thought it would be a side-hustle while he started a social-media startup. As is often the way, the side-hustle turned out to be the better idea. After an initial focus on renting spare beds in cities during conferences, when hotel rooms were scarce, the startup expanded into rental of entire properties. In 2009 Airbed and Breakfast became Airbnb. Since then more than 500m stays have been booked through its platform, which now offers more than 7m properties (including 4,900 castles and 2,400 tree-houses) in over 100,000 cities. Each night, around 2m people around the world stay in an Airbnb.

Having been in roadshow mode for several months, Mr Chesky has polished answers for everything up his sleeve. Not that there is much room up the former bodybuilder's sleeve: his rippling physique sometimes strains the buttons of his shirt. Oof! He cleanly dispatches a question in a television interview about safety and hidden cameras, then flips it around into an opportunity to talk up Airbnb Plus, a premium tier of properties that are even more closely vetted. Pow! He bats away the notion that he is worried about Marriott, a hotel giant that is launching a rival to Airbnb called "Homes & Villas", instead seeing it as an endorsement of his model. Indeed, Airbnb is punching back, letting hotels list rooms on its site and investing in properties custom-built for Airbnb rental.

The firm has grand designs to move beyond accommodation, and provide the entire trip: where to go, what to do and how to get there, not just where to stay. It intends to team up with airlines to "elevate" the experience of air travel. As part of this effort earlier this year Airbnb hired Fred Reid, the founding chief executive of Virgin America, though Mr Chesky is cagey about details. Already, users of the Airbnb Luxe service (where those castles, and other fancy venues, are listed) are assigned a "trip designer" to help them arrange transport, restaurants and other perks. Indeed, Airbnb's main growth plans hinge on offering users not just a bed but an experience, "designed and led by inspiring locals" to boot. Airbnb Experiences, launched in 2016, uses the Airbnb platform to link guests with locals who can provide things like guided tours or cooking workshops. In June it added Airbnb Adventures, which arranges trips for up to 12 people in exotic places. People don't travel to sleep, Mr Chesky likes to say, but to have an experience.

So far, so Uber. The ride-hailing giant, too, has expanded into areas like food delivery and road freight. But here the similarities end, starting with money. Whereas Uber has yet to turn a profit (and, sceptics say, never will), Airbnb says it is already profitable (to be precise, EBITDA-positive) and has been since 2017, when it is thought to have earned \$93m on revenues of

\$2.6bn. That is not the only distinction. For ride-hailing firms like Uber and Lyft, supply and demand must be matched in the same city; a driver in Manhattan is no use to a rider in Mumbai. Airbnb's listings, by contrast, are global. Any property anywhere can potentially appeal to any user; a Mumbaiker may want to stay in New York. A telltale sign of Airbnb's superior "network effects" is that whereas drivers for Uber often drive for Lyft, and vice versa, doing their utmost to play the platforms off against each other, most of Airbnb's listings do not appear on any other platform.

Unlike Uber drivers, few of whom were previously riders, Airbnb hosts typically start out as renters first. Since it is a middleman for property rather than labour, Airbnb has avoided the controversy about "gig economy" exploitation, and the vexed question of whether ride-hailing firms should treat drivers as employees.

More broadly, Airbnb decided earlier than Uber to work with regulators rather than fighting them. It has struck deals in more than 500 big cities around the world. It says it has collected more than \$1bn in hotel and tourism taxes in America alone and is "on track to become the world's largest single collector of these taxes".

A few worries linger. One has to do with its long-running feud with regulators in New York, who in February demanded data about New Yorkers who are listing properties for short-term rental on the site, in violation of local laws. Another pertains to protests in cities, such as San Francisco, where residents gripe that renting properties to tourists leaves fewer for long-term renters, making already high prices unaffordable. Airbnb has also grappled with the problem of some hosts being racist towards guests.

These concerns pose the biggest threats to a smooth stockmarket debut (expected to be by the trendy mechanism of a direct listing) in 2020. Airbnb's most recent funding round valued it at \$31bn. In the meantime, Mr

Chesky tirelessly talks up its growth potential. This month Airbnb launched Animal Experiences, a subcategory of experiences, from honeybee therapy to llama-trekking to elephant-spotting. It is a reminder, if one were needed, that although they are often lumped together, Airbnb is not at all like Uber and Lyft—but a different beast entirely. ■



熊彼特

风马牛不相及

准备上市的爱彼迎急于指出自己与优步的不同

它们是原来所谓的“共享经济”的两个最突出的例子。爱彼迎和优步分别成立于2008年和2009年，它们率先推出了轻资产平台，将特定服务的供应商和消费者聚集在一起——爱彼迎是住宿，优步是出行。两家公司都成了整个类别的代名词：创业公司如今都自称宠物服务业的爱彼迎或医疗业的优步。但优步在5月上市的结果并不理想，其股价至今已下跌了近35%（优步的竞争对手Lyft自3月上市后股价已下跌了50%）。爱彼迎准备于明年上市，无论是在媒体面前还是关起门来，其老板布莱恩·切斯基（Brian Chesky）一直在力撑自家公司上市。他热切地想要传达一个观点：尽管两家公司都有共享经济的血脉，但爱彼迎并非优步。

切斯基和同为设计师的朋友乔·吉比亚（Joe Gebbia）曾一度失业，靠出租两人旧金山公寓里的气垫床来赚外快，后来他们和另一位朋友内特·布莱沙奇克（Nate Blecharczyk）共同创立了爱彼迎。切斯基最初以为这只是他创办社交媒体公司时的副业。结果很多时候一样，副业往往更有前途。一开始，这家创业公司主要是在大型会议期间酒店房间稀缺时出租市内房屋里的空床，后来扩展到出租整套物业。2009年，他们的Airbed and Breakfast（气垫床和早餐）服务正式更名为爱彼迎（Airbnb）。自那之后，通过其平台预订住宿已超过5亿次，现在平台上有超过700万个房源（包括4900座城堡和2400个树屋），分布在10万多个城市。每天晚上，全球约有200万人住在通过爱彼迎租赁的物业中。

切斯基进入路演模式已经有几个月了，他的锦囊里准备好了针对各种问题的答案。这倒不是说他身上有很多塞锦囊的空间：这位前健美运动员身上的肌肉凹凸有致，衬衫的纽扣有时都要崩开了。厉害呀！他在一次电视采访中干脆利落地打发了一个关于安全和隐蔽摄像头的问题，接着又把这个问题化解成一个讨论爱彼迎Plus（受到更严格审查的优质物业）的机会。

帅啊！他否认自己因为万豪而忧心——这家酒店巨头正在推出与爱彼迎竞争的“Homes & Villas”住宅短租服务——反而说这是对自己模式的认可。实际上，爱彼迎正在大力回击，让酒店把客房挂在它的网站上，并投资为爱彼迎出租量身定制的物业。

爱彼迎有宏伟的计划，要从住宿扩展到覆盖出行全程：去哪里，做什么，怎么去，而不仅仅是住哪里。它打算与航空公司合作以“提升”航空旅行的体验。为此它在年初聘请了维珍美国航空（Virgin America）的第一任首席执行官弗雷德·里德（Fred Reid），但切斯基对细节守口如瓶。爱彼迎已开始为Luxe服务（可选择城堡和其他高档场所）的用户安排“行程规划师”，帮助他们安排交通、餐厅和其他额外服务。确实，爱彼迎的主要增长计划的核心是不仅仅为用户提供一张床，而是由“热心鼓舞的当地人设计和带领”的体验。爱彼迎“体验”（Experiences）于2016年推出，在平台访客与当地居民之间架起桥梁，由当地人提供导游或烹饪作坊等服务。今年6月，它又新增了爱彼迎“探险”（Adventures），为用户在异域安排冒险体验，每个团不超过12人。切斯基总喜欢说，人们去旅行不是为了睡懒觉的，而是为了获得体验。

到这里，爱彼迎看起来很像优步。优步这个网约车巨头也已将服务拓展到送餐和公路货运等领域。但是，两者的相似点到此为止。差异首先在于钱。优步尚未实现盈利（持怀疑态度者认为它永远不会盈利），而爱彼迎自称已经盈利（确切地说是EBITDA为正），并且自2017年以来一直处于盈利状态，据估计它当年的收入为26亿美元，利润9300万美元。这不是唯一的区别。优步和Lyft这样的网约车公司只能在同一个城市里匹配供求——曼哈顿的司机没法去拉孟买的乘客。而爱彼迎的房源遍布全球，任何地方的任何房源都可能吸引到用户——比如说某个孟买的客户可能就想去纽约住几天。尤其能体现爱彼迎出众的“网络效应”的一点就是，它的大多数房源都不会出现在其他平台上，而优步和Lyft的司机经常通过对方的平台接单，使出浑身解数让两个平台相互竞争。

优步司机以前都不怎么打车，而爱彼迎房东通常一开始就是租户。由于爱彼迎是房产而非劳力的中间人，因此避开了有关“零工经济”压榨人的非

议，以及网约车公司是否应将司机视为雇员的烦人问题。

更广泛地看，爱彼迎比优步早一步决定与监管机构合作而不是与它们抗争。它已在全球500多个大城市达成协议。爱彼迎表示，仅在美国，它就已经代收了超过10亿美元的酒店和旅游税，并且“有望成为世界上代收这些税款最多的企业”。

但还是有一些疑虑挥之不去。其一事关它与纽约监管机构的宿怨，后者在2月要求爱彼迎提供在其网站上非法运营短租项目的纽约人的数据。另一个疑虑与旧金山等城市的抗议活动有关。那些城市的居民抱怨说，向游客出租房屋导致留给长期租客的房源减少，这使得本就高企的房租更让人难以承受。爱彼迎还一直在努力解决住客遭到某些房东种族歧视的问题。

这些担忧构成了爱彼迎在2020年顺利上市的最大威胁（预计它将选择时下流行的直接上市机制）。爱彼迎最新一轮融资对它的估值为310亿美元。与此同时，切斯基还在不知疲倦地谈论公司的增长潜力。本月，爱彼迎推出了“体验”的子项目“动物体验”（Animal Experiences），包括蜜蜂疗法、骑美洲驼跋涉和探寻大象等等。在此提醒大家一句——如果有人需要的话——尽管经常被混为一谈，但爱彼迎跟优步和Lyft根本不是一回事，它完全是另一个物种。 ■



Central banks

A new monetarism

How to make economic policy fit for a world of low inflation

THE HISTORY of monetary policy is one of intermittent revolution. In the whole of the 19th century, constrained by the gold standard, America's prices rose only 12%. After the second world war countries pegged their currencies to the dollar, which was in turn redeemable for gold. That system broke down in 1971 when it was abandoned by America. Its collapse ushered in the era of fiat currencies and preceded the inflation of the 1970s. Inflation-targeting was born out of that debacle and simultaneous intellectual advances by economists, who realised the importance of credible institutions. Over time more central banks committed to "flexible" inflation-targeting, meaning that in a crisis they could prioritise fighting unemployment.

Shortfalls in inflation, combined with very low interest rates, are causing another rethink today. In 2020 the Federal Reserve will report on a review of its targets and tools. The ECB is searching for new ways to fight low inflation in the euro area. Meanwhile economists are increasingly willing to question the dictum set out by Milton Friedman in 1963 that inflation is a monetary phenomenon. A decade of below-target inflation suggests that "what was previously treated as axiomatic is in fact false," according to Larry Summers and Anna Stansbury of Harvard University. "Central banks cannot always set inflation rates through monetary policy."

Central banking has also become more politicised. One of the few ideas to unite President Donald Trump with Alexandria Ocasio-Cortez, a left-wing congresswoman, is the belief that the Fed should stop worrying about inflation and gun for growth. Mr Trump has called Jerome Powell, the Fed's

chair, an “enemy” for failing to cut rates as much as he would like as America fights a trade war with China. In Europe the ECB is facing fierce hostility to its negative-interest policy among the German public.

On the left, wacky schools of thought like “modern monetary theory” (MMT), which says, roughly, that as long as inflation remains contained the government can borrow as much as it likes and that fiscal policy should manage the economic cycle, have influenced some people such as Ms Ocasio-Cortez.

This environment brings risks. A history of inflation by economists at Deutsche Bank warns that periods of high inflation have tended to accompany transitions between monetary-policy regimes like the abandonment of Bretton Woods. Nobody should welcome reforms to central banks led by populists. It would be wrong to suppose that low inflation expectations are immutable or there to be exploited, whether to boost growth or to fund more government spending. Stimulated too much, economies will eventually overheat. An environment of low inflation does not justify tearing down institutions that guard against currency debasement like that seen in Argentina and Turkey.

Yet reform is needed to achieve three goals. First, central banks must improve how they fight recessions. Second, they must find ways to steer the economy despite a flat and uncertain short-term Phillips curve, the relationship between inflation and unemployment. Third, fiscal policy must act as the stimulus-of-last-resort if economies weaken and inflation falls while interest rates can fall no further. These needs are increasingly recognised, but the reforms that are under consideration mostly lack ambition.

Take each aim in turn. First, recession-fighting. For several decades economists have had a prescription for monetary policy when nominal

interest rates can fall no further: reduce real interest rates instead, by promising more inflation in the future. At the very least, inflation expectations should not be allowed to slip. To that end the Fed may soon commit to targeting 2% inflation on average over the economic cycle rather than at any one point in time. In booms, inflation would be allowed to run a little higher than 2%. In a downturn, this should brighten the economic horizon.

A more effective reform would be to target a long-run path for the level of prices, rather than year-to-year inflation. Policymakers would have to correct their mistakes if prices veered off course. There could be no repeat of the persistent policy timidity seen in the 2010s. After a long downturn and disinflation central banks would have to push to find the limits of the economy's capacity.

Yet this would do nothing towards the second goal: freeing central banks from having to divine the short-term trade-off between inflation and unemployment. To target prices they would still have to judge whether movements in inflation were being driven by the labour market or by supply-side factors, such as technological change or global shocks reverberating through cross-border supply chains. Worse, they would lose some flexibility to ignore temporary distortions. Phenomena such as rising tariffs or oil prices that pushed inflation up and growth down could force central banks to tighten monetary policy to get prices back on course even as the economy suffered.

It would be better for them to remain agnostic on economic relationships that they do not understand and target a single, simpler variable: the level of nominal GDP, or, loosely speaking, output plus inflation. Such a target would incorporate both central bankers' underlying goals of stable inflation and a healthy economy. It would replace their faulty judgment about the Phillips curve with a better, implicit test: only when growth and inflation

rose in combination—a sign of overheating at home, rather than a shock to supply—would they need to get hawkish. There would be no more fine-tuning of the labour market.

The third aim, reform of fiscal policy, is the hardest to achieve. One idea is to sharpen the so-called automatic stabilisers, such as unemployment benefits, which ensure a mini fiscal stimulus during downturns. Governments could legislate in advance to cut, say, payroll taxes when the unemployment rate rises sufficiently. This would not hurt. But it would be an incremental reform that cannot compensate for a total loss of monetary-policy firepower. Calibrating a sufficient fiscal stimulus without knowing the economic circumstances in which it would apply is too difficult.

In addition to beefing up automatic stabilisers, governments should also find a way to give central banks some scope for fiscal action that can be used at their discretion. A recent paper by Blackrock, an asset manager, whose authors include Stanley Fischer, a former vice-chair of the Fed, suggests central banks should have a “standing emergency fiscal facility”. The idea is that in a deep slump, central banks would be authorised to create money to finance new spending or a tax cut.

Technocrats cannot easily oversee a fiscal stimulus. Monetary policy is not about building bridges or setting rates of income tax. The redistributive effects of low rates, which some say has exacerbated wealth inequality by boosting asset prices, are controversial enough without central banks deciding how society’s resources should be spent. So politicians would need to agree on the structure of the central bank’s fiscal tools in advance. One simple option would be a uniform handout to the public in which every adult received an equal share of newly created money. Central banks’ role would be what it has always been: to calibrate the size of the stimulus and ensure a credible commitment not to overdo it.

It is wishful thinking to imagine that these reforms can happen quickly, not least because they involve handing more power to technocrats. For good reason the role of monetary policy is constrained by law. In Europe it is set by treaty. It may take a downturn to create political impetus for change. But sooner or later economic policy will have to adapt to today's disinflationary world. ■



中央银行

新货币主义

如何让经济政策适应低通胀的世界【专题报道《世界经济》系列之四】

货币政策史就是一部时断时续的革命史。在整个19世纪，在金本位制的约束下，美国的物价仅上涨了12%。第二次世界大战后，各国将其货币与美元挂钩，而美元又可以兑换成黄金。1971年，这一体系被美国放弃而崩溃。它的崩盘迎来了法定货币时代，随即出现了1970年代的通货膨胀。这一灾难以及同时期经济学家的思想发展——他们意识到了可靠的制度的重要性——带来了通货膨胀目标制。随着时间的流逝，越来越多的中央银行致力于“灵活地”制定通胀目标，这意味着在出现危机时，它们可以优先解决失业问题。

今天，通货膨胀不足加上极低的利率正在引发另一种反思。美联储将在2020年汇报对自身目标和工具的评议。欧洲央行正在寻找新的方法来对抗欧元区的低通胀。同时，经济学家越来越倾向于质疑米尔顿·弗里德曼在1963年提出的“通货膨胀是货币现象”的名言。十年来低于目标的通货膨胀表明“以前被视为公理的东西实际上是错误的，”哈佛大学的拉里·萨默斯和安娜·斯坦斯伯里(Anna Stansbury)表示，“央行并不总能通过货币政策来设定通胀率。”

央行也已经变得更加政治化。能让特朗普总统与左翼女议员亚历山大·奥卡西奥-科尔特斯(Alexandria Ocasio-Cortez)统一战线的为数不多的几个想法之一，就是美联储应该停止担心通胀并力图经济增长。特朗普称美联储主席杰罗姆·鲍威尔(Jerome Powell)为“敌人”，因为在美国对华贸易战期间，鲍威尔未能按照他的意思大幅降息。而在欧洲，欧洲央行因其负利率政策而面临德国民众强烈的敌对情绪。

在左翼阵营里，像“现代货币理论”(MMT)之类的古怪的思想流派影响了奥卡西奥-科尔特斯等一些人。这种理论大致是说，只要通胀得到控制，

政府就可以随意借贷，而财政政策应该控制经济周期。

这种环境带来了风险。德意志银行的经济学家发表了一份对通货膨胀历史的研究，警告说高通胀时期往往伴随货币政策体制间的过渡而出现，比如放弃布雷顿森林体系时。没有人应该欢迎由民粹主义者领导的央行改革。假设对低通胀的预期会永恒不变或者可以利用将是一个错误，无论是为了刺激增长还是支持更多的政府开支。过度刺激终将导致经济过热。低通胀的环境并不能像在阿根廷和土耳其发生的那样，成为破除防止货币贬值的制度的理由。

然而，需要实施改革以实现三个目标。首先，央行必须改善它们应对衰退的方式。其次，尽管短期菲利普斯曲线（通货膨胀与失业率之间的关系）平坦而不确定，它们必须找到引导经济的方法。第三，如果经济疲软、通胀下降而利率无法进一步下调，则财政政策必须用作最后的刺激手段。人们日益认识到这些需求，但是目前纳入考量的改革大多缺乏野心。

我们逐一来看这些目标。首先，应对衰退。几十年来，当名义利率无法再下降时，经济学家有一个针对货币政策的处方：通过承诺将来会出现更多通胀来降低实际利率。至少不应让通胀预期下滑。为此，美联储可能会很快致力于将目标通胀率定为在整个经济周期内平均（而不是在任何时间点上）2%。在繁荣时期，通胀率将被允许略高过2%。在低迷时期，这应该会提振经济前景。

一种更有效的改革是为价格水平制定长远路径，而不是设定同比通胀目标。如果价格偏离正常轨道，决策者就得纠正他们的错误。他们在整个2010年代里在决策上持续的怯懦绝不能重演。经过长期的低迷和通货紧缩，央行将不得不努力寻找经济能力的极限。

但这对第二个目标没有任何帮助：使央行免于考虑通胀与失业之间的短期权衡。为了确定价格目标，它们仍然必须判断通胀变化的源头到底是劳动力市场还是供应方因素，如技术变革或在跨境供应链中回荡的全球冲击。更糟糕的是，它们将失去忽略暂时性扭曲的灵活性。诸如关税或油价上涨

等导致通胀上升、增长下降的现象可能会迫使央行收紧货币政策来让价格恢复正常，即使经济遭受重创。

它们最好对自己无法理解的经济关系置之不理，并把目标设定为一个更简单的单一变量——名义GDP水平，粗略来说就是产出加通胀。这样的目标同时涵盖了央行两大根本目标：稳定的通胀和健康的经济。这会用一个更好的、隐含的检验来代替它们对菲利普斯曲线的错误判断：只有当增长和通胀同时上升——表示国内经济过热而不是出现供应冲击——才需要变得鹰派。再不用对劳动力市场进行微调了。

第三个目标是财政政策改革，这是最难实现的。一种想法是加强所谓的自动稳定器，例如失业救济金，以确保在经济低迷时期能够实施小小的财政刺激。当失业率充分上升时，政府可以提前立法，比如削减工资税。这没什么坏处。但完全失去了货币政策的火力，采用这种渐进式的改革并不足以弥补。如果不知道身处何种经济环境，要调校出足够的适用的财政刺激措施太难了。

除了加强自动稳定器外，政府还应该找到一种方法，给予央行一定的余地来自主采取财政行动。资产管理公司黑石集团（Blackrock）最近发表了一篇论文，作者包括美联储前副主席斯坦利·菲舍尔（Stanley Fischer）等人。论文称央行应该拥有“常设的紧急财政便利”。其想法是，在严重的低迷时期，央行将被授权创造货币来为新的支出或减税筹集资金。

技术官僚们无法轻易地监督财政刺激措施。货币政策与修建桥梁或设定所得税无关。有些人说，低利率的再分配效应通过提高资产价格加剧了财富不平等。哪怕央行并不决定社会资源该如何使用，这一点引发的争议已经够多了。因此，政客们需要事先就央行采用的财政工具的结构达成共识。一个简单的选择是向公众统一派钱，每个成年人都会获得等额的新创货币。央行的角色将一如既往：调整刺激计划的规模，并可靠承诺刺激不会过度。

认为这些改革会迅速发生是一厢情愿，尤其因为它们需要将更多权力交给

技术官僚。货币政策的角色受到法律限制是有其充分的原因的。它在欧洲是由条约规定的。为变革创造政治动力可能需要一轮衰退。但是，经济政策迟早都要适应当今低通胀的世界。 ■



Globalisation

Prices without borders

Low inflation is a global phenomenon with global causes

ECONOMIC MODELS say that less slack in an economy leads to more inflation. But what defines an economy's borders? As inflation-targeting took off in the 1990s, globalisation also accelerated. Trade grew from 39% of world GDP in 1990 to 51% at the turn of the millennium, cross-border finance was liberalised and the internet slashed the cost of communicating. In the 2000s policymakers began to wonder whether integrated markets had made inflation a global process. Economists generally pooh-poohed the idea. But with central bankers searching for explanations for today's low inflation, the idea that global forces might be at work has come back into fashion. It has also become more relevant. If globalisation has held down inflation, might its reversal—thanks to the trade war and Brexit—send it shooting back up?

Inflation has been getting more synchronised across borders. On average, a common global trend accounts for nearly a quarter of the variation in national inflation rates since 2001, according to Jongrim Ha, Ayhan Kose and Franziska Ohnsorge of the World Bank. Add in factors specific to advanced economies and emerging markets, respectively, and trends spanning borders account for more than half the movement in inflation in the rich world and nearly a third of it in poorer countries.

This partly reflects simultaneous trends in monetary policy. But it may also indicate a growing role for global factors. Kristin Forbes of MIT, formerly a Bank of England rate-setter, has studied the drivers of inflation in 43 countries between 1990 and 2017. She includes in her models global factors such as exchange rates, an estimate of global economic slack, and

commodities prices, and finds that their input appears to have increased over the past decade. This is especially true when considering only temporary deviations in inflation from its long-term trend.

There are three main sources of global influence on inflation: the price of commodities, trade in goods, and capital flows. Commodities prices are the most obvious and longstanding. Synchronicity of inflation rises after large movements in the oil price, such as the shocks of the 1970s. More recently commodities prices have, on the margin, been driven by demand in emerging markets, especially China. Between 1996 and 2016 the seven largest emerging markets accounted for almost all of the rise in global consumption of metals and two-thirds of the rise in global consumption of energy. As a result, booms and busts in emerging-markets' demand for commodities are felt everywhere. In the mid-2010s it was a commodities bust that helped push Europe into deflation.

That much is not controversial. But another effect of globalisation has been to bring down the price of manufactured goods as their production has shifted to economies with low labour costs. Unlike with commodities, this has been a one-way bet, not a cycle. For decades goods have been getting cheaper relative to services.

Economists can get annoyed by claims that goods trade has dragged down overall inflation. In theory just some things getting cheaper should not be disinflationary because, with the right monetary policy, average prices will still rise fast enough to make up the shortfall. In practice monetary policy works only with a delay. That means changes in relative prices matter. Today, because the Phillips-curve relationship seems to have weakened, central banks often find themselves at the mercy of short-term trends.

Goods trade does not just mean imports of finished products. The recent

growth in cross-border supply chains has created conduits along which cost changes in one part of the world flow into the prices of goods that emerge from factories elsewhere. Research by Raphael Auer of the Bank for International Settlements (BIS), Andrei Levchenko of the University of Michigan and Philip Sauré of Johannes Gutenberg University in Mainz has found that half of global synchronisation in producer-price inflation is attributable to prices that can be traced through supply chains. Via this mechanism the average country imports one-fifth of any change in inflation in the rest of the world. Prices are more intertwined in integrated trading regions such as America, Canada and Mexico.

If firms can locate their supply chains where costs are lowest, it becomes easier to avoid economies that are running hot. Only if inflation is driven up everywhere are rising costs inescapable. In other work with his colleagues at the BIS, Claudio Borio and Andrew Filardo, Mr Auer finds that the greater a country's integration into cross-border supply chains, the more inflation tracks slack in the global economy. If imports of inputs to production double as a share of GDP, the sensitivity of inflation to global economic conditions also appears to double. Messrs Ha and Kose and Ms Ohnsorge also find that global factors explain a greater share of inflation in countries which participate more in global supply chains.

This view implies that prices in non-tradable sectors, such as services, will remain sensitive to domestic economic conditions. That is what James Stock of Harvard University and Mark Watson of Princeton University find in America. Hotels and restaurants, for example, remain fairly sensitive to labour-market slack. Messrs Stock and Watson are even able to separate inflation into an index that is "cyclically sensitive" and one that is not.

The third global factor is capital flows. As inflation has synchronised across borders, so too have long-term real interest rates. For the past four decades they have moved in tandem as saving and investment have been brought

into balance globally. And they have moved in one direction: down. In other words, there appears to be a glut of global saving. The potential reasons for this phenomenon, which was first identified in the mid-2000s, include ageing populations, slower productivity growth, a scarcity of safe assets relative to risky ones, and a dearth of lucrative opportunities for private-sector investors.

It is not just long-term rates that have fallen in tandem. So have the “equilibrium” short-term rates which anchor monetary policy, according to estimates by John Williams, president of the New York Fed, and Kathryn Holson and Thomas Laubach of the Fed in Washington, DC. Falling equilibrium rates mean that any interest rate central banks choose is less stimulative than it would have been a decade or two ago. In other words, the effects of excess saving spill across borders. Current-account surpluses in, say, Japan and Germany, which together totalled nearly half a trillion dollars in 2018, bear down on the interest rates that must be set by the central banks of other countries to keep inflation on target.

That is fine if central banks adjust accordingly. The problem is that equilibrium rates have been driven close to zero. Unable to cut rates much, central banks find that the only way to fight disinflationary pressure is with unconventional measures like quantitative easing (QE). These are themselves policies with global consequences. QE is supposed to work in part by getting investors to buy riskier assets. That adjustment happens on the balance-sheets of asset managers who invest worldwide. As a result it sends billions of dollars of capital looking for interest rates to drive down elsewhere.

Ironically, the recent incremental reversals of globalisation provide good examples of the importance of global financial conditions to inflation. In theory tariffs should boost inflation in the country that sets them. But as the trade war between America and China heated up during 2019, it sparked

fears about global growth and triggered a rush into safe assets such as Treasury bonds. Long-term bond yields fell to new depths and the dollar surged. In response the Fed has cut rates and the ECB has restarted QE.

The deflationary impact of a change in global risk appetite has proved far more significant than the modest inflationary impact of the tariffs themselves. Only in Britain has the rolling back of globalisation, via its vote to leave the EU, had a very noticeable upward effect on prices. But even that was due to a fall in the value of the pound; the direct effect of Brexit, if and when it happens, could seem small in comparison.

One group of countries feels the effects of the global financial cycle above all others. For emerging markets, it is so important that they face a distinct set of monetary-policy challenges. ■



全球化

价格无国界

低通胀是一个全球现象，有其全球成因【专题报道《世界经济》系列之二】

经济模型称，一个经济体中劳动力闲置的程度越低，通胀水平就越高。但一个经济体的边界是用什么定义的呢？上世纪九十年代，为通胀设定目标的做法流行起来，全球化也同时加速。贸易从1990年占世界GDP的39%增长到千年之交时的51%，跨境金融实现了自由化，互联网的发展削减了通信成本。在新千年之初，决策者开始怀疑一体化的市场是否令通胀变成了一个全球性进程。经济学家通常都对这种想法嗤之以鼻。但是，随着央行官员寻求对如今通胀持续走低的解释，认为全球力量可能在起作用的想法卷土重来。它在今天也变得更有意义了。如果全球化抑制了通胀，那么由贸易战和英国脱欧造成的全球化逆转是否会让通胀重新飙升？

通胀已经变得越来越跨国界同步。据世界银行的河钟林（Jongrim Ha，音译）、艾汉·科泽（Ayhan Kose）和弗兰齐斯卡·奥恩佐格（Franziska Ohnsorge）称，自2001年以来，平均而言，各国通胀率的变化有近四分之一可以用共有的全球趋势来解释。再加上发达经济体和新兴市场特有的因素，跨国界趋势可以解释富裕国家通胀率超过一半的变化、较贫穷国家近三分之一的变化。

这在一定程度上反映出货币政策的同步趋势。但这也可能表明全球因素的作用越来越大。麻省理工学院的克里斯汀·福布斯（Kristin Forbes）曾是英格兰银行的利率制定者，她研究了1990年至2017年间43个国家的通胀驱动因素。她在模型中纳入了全球因素，如汇率、对全球经济疲软的预估，以及大宗商品价格。她发现这些因素对通胀的影响在过去十年中似乎有所增加。当仅考虑通胀相对于长期趋势的暂时性偏差时尤其如此。

通胀受到的全球化影响主要源自三方面：大宗商品价格、商品贸易和资本流动。大宗商品价格是其中最明显也最持久的因素。在石油价格大幅波动

(如1970年代的石油危机)之后，通胀的同步程度上升。更近些时候，大宗商品价格基本上受新兴市场尤其是中国的需求的驱动。1996年至2016年间，前七大新兴市场几乎贡献了全球金属消费增长的全部以及全球能源消费增长的三分之二，导致全世界都能感受到新兴市场对大宗商品的需求起伏的影响。2014年左右，大宗商品价格暴跌令欧洲陷入通缩。

到目前为止没有争议。但是，全球化的另一个影响是降低了制成品的价格，因为这些商品的生产转移到了劳动力成本低廉的经济体。与大宗商品不同，这个价格一路走低而没有周期性。几十年来，相比服务，商品变得越来越便宜。

说商品贸易拉低了总体通胀可能会惹恼经济学家。从理论上讲，仅仅是某些东西变得更便宜并不应该导致通胀减缓，因为在正确的货币政策下，平均价格仍然会上涨得足够快以弥补缺口。但在实践中，货币政策的作用有延迟。这意味着相对价格的变化仍然重要。今天，由于菲利普斯曲线关系似乎已减弱，央行常常发现自己受到短期趋势的摆布。

商品贸易并不仅仅指成品进口。由于近年跨境供应链的发展，世界上某个地区的成本变化会沿着这些供应链“导管”流入其他地方的工厂生产的商品价格中。国际清算银行(BIS)的拉斐尔·奥尔(Raphael Auer)、密歇根大学的安德烈·列夫琴科(Andrei Levchenko)和美因茨大学的菲利普·绍里(Philip Sauré)开展的研究发现，全球生产者价格通胀同步化有一半可归因于可通过供应链追踪的价格。通过这种作用机制，一般国家会吸收世界其余地区任何通胀变化的五分之一。在美国、加拿大和墨西哥等一体化贸易区，价格相互交织的程度会更高。

如果企业可以将自身供应链放到成本最低的地方，那么就更容易避开过热的经济体。唯有到处都在加速通胀时，成本上升才无可避免。奥尔在与国际清算银行的同事克劳迪奥·博里奥(Claudio Borio)和安德鲁·菲拉尔多(Andrew Filardo)开展的其他研究中发现，一个国家融入跨境供应链的程度越大，其通胀就越易受全球经济疲软影响。如果生产中的进口部分相

对于GDP的比例翻番，通胀对全球经济状况的敏感度似乎也随之翻番。河钟林、科泽和奥恩佐格还发现，在更多地参与全球供应链的国家中，通胀中能用全球因素解释的部分也更大。

这种观点意味着，服务等非贸易部门的价格将继续对国内经济状况保持敏感。哈佛大学的詹姆斯·斯托克（James Stock）和普林斯顿大学的马克·沃森（Mark Watson）就在美国发现了这种情况。比如，酒店和餐馆对劳动力市场疲软仍然相当敏感。斯托克和沃森甚至能将通胀分成一个具“周期敏感性”的指数和一个不具有这种敏感性的指数。

第三个全球因素是资本流动。通胀跨国界同步后，长期实际利率也是如此。过去40年里，随着储蓄和投资在全球范围内取得平衡，各地的长期实际利率齐头并进。而且它们移动的方向只有一个：向下。换言之，看起来全球储蓄过剩了。造成这种现象的可能的原因最早于2005年左右被发现，包括人口老龄化、生产率增长放缓、相对于风险资产而言安全资产稀缺，以及私营部门投资者缺乏赚得丰厚利润的投资机会。

同步下降的不止长期利率。据纽约联储主席约翰·威廉姆斯（John Williams）以及华盛顿特区联储的凯瑟琳·霍尔森（Kathryn Holson）和托马斯·劳巴克（Thomas Laubach）估计，锚定货币政策的“均衡”短期利率也一样。均衡利率的下降意味着，央行选择任何的利率对市场的刺激都比放在一二十年前更弱。换句话说，过度储蓄的影响跨越了边界。例如，日本和德国的经常项目顺差——在2018年总计近五千亿美元——压低了其他国家的央行为保持通胀目标所必须设定的利率。

如果央行做出相应的调整，那也不错。问题在于均衡利率已经逼近零。央行已经无法大幅降息，它们发现对抗通胀放缓压力的唯一方法是采取量化宽松（QE）等非常规措施。而这些措施本身又都具有全球性后果。量化宽松本应在一定程度上通过促使投资者购买高风险资产来起效。而这种调整发生在那些在全球投资的资产管理人的资产负债表上。这就导致数十亿美元的资本到别的地方去寻找尚有下降空间的利率。

讽刺的是，近期全球化逐步逆转，很好地证明了全球金融状况对通胀的重要性。从理论上讲，关税应会推高设置它们的国家的通胀水平。但2019年中美贸易战加剧引发了人们对全球经济增长的担忧和对美国国债等安全资产的抢购。长期债券收益率跌至新低，美元飙升。作为回应，美联储降低利率，欧洲央行则重新启动了量化宽松。

事实证明，全球风险偏好的变化带来的通缩压力远远大于关税本身带来的些许通胀压力。唯在英国，因脱欧公投导致的全球化逆转给价格带来了非常明显的上行影响。而即便这也是由英镑贬值造成的，相比之下英国脱欧（一旦发生）的直接影响可能很小。

有一类国家比所有其他国家都更多地感受到全球金融周期的影响。对于新兴市场而言，它如此地重要，令它们面临着一系列独特的货币政策挑战。





Technology

Alexa, how much is it?

Technological progress is making inflation statistics an unreliable guide to the economy

AMAZON IS USED to fielding accusations: that it has killed off physical retail business, that it mistreats warehouse workers, that it abuses its dominant platform in online sales. So perhaps it is not a surprise that some people also blame it for low inflation. In 2017 Janet Yellen, then chair of the Federal Reserve, wondered aloud if cut-throat online competition might be stopping goods-producers raising prices even in a world of rising demand. Alberto Cavallo of Harvard Business School has found that Amazon's prices are 6% lower than those of eight large retailers, and 5% lower than on those retailers' websites. The internet in general is no place to go in search of inflation: in America online prices have been falling fairly steadily since about 2012 and are lower than they were at the turn of the millennium.

Yet the so-called “Amazon effect” should not seem so novel. The winds of disinflation have been blowing through American retail for decades. In the 1990s and 2000s big-box retailers like Walmart and Target ruthlessly cut goods prices as they optimised their supply chains. Cheap imports from China and other emerging-market economies squeezed domestic producers. One study in 2008 found that low-wage countries capturing 1% of market share in America was associated with a 3.1% fall in producer prices. There has been barely any cumulative rise in American consumer-goods prices, excluding food and energy, for two decades. Before the financial crisis, inflation as a whole behaved normally because services inflation held up. Today, both goods and services inflation are low (see chart). The rise of online retail does not easily explain that broader shift.

Nonetheless, technological advance is a disinflationary force worth pondering. At a basic level, it allows an economy to produce more with its finite resources. If aggregate demand does not keep up, prices will fall—or at least not rise as fast. The idea that inflation has been low lately because productivity growth has been strong seems laughable everywhere except Silicon Valley because economic statistics have documented a global slowdown in productivity growth. Yet there is an argument that statisticians fail to capture some technological advances, making productivity seem lower and inflation higher than they really are.

The basic concern is a longstanding one. Because it takes a while for statisticians to notice that consumers are buying new products, they miss precipitous price falls early in a product's life. It is also hard to tell how much better new products are than what went before. In today's economy the missed value comes from smartphones, social media and online streaming. Spencer Hill, an economist at Goldman Sachs, recently calculated that the measured growth in consumption of personal electronics, communications and media was lower in the 2010s than in any of the five preceding decades. That was despite the fact that in 1990 it would have taken perhaps \$3,000 to replicate even the basic functions of a modern phone—and only by using very bulky devices. In real terms, consumption in this category is surely soaring. The statistics must be missing something.

Statisticians are constantly battling the problem. But a review of America's inflation indices in 2018 by Brent Moulson, a former top government official, estimated that the inflation index targeted by the Fed remained upwardly biased by almost half a percentage point, primarily because of new products and quality changes. The shift to online sales could be making new-product bias worse. A paper by Austan Goolsbee and Peter Klenow of Stanford University found that even excluding clothing, for which tastes are fickle, 44% of online sales in a database produced by Adobe Analytics, a computing company, were of goods that did not exist in the prior year.

With such high churn the basket of goods monitored by official statisticians would quickly go stale. Messrs Goolsbee and Klenow have, for some categories of goods, helped Adobe Analytics to construct its own “digital price index” which shows much less inflation than official measures. For example, they find that furniture and bedding fell in price by almost 12% online between January 2014 and June 2019, while the official consumer price index records a fall of only 2.1%.

A bigger problem than falling prices is prices that are zero from the start. Most consumers today carry devices in their pockets with which they can make a video-call anywhere in the world, access information on any subject and translate languages instantaneously, all for free. The explosion in the provision of free services is usually cited as a reason to doubt the accuracy of GDP. But it is as big a problem for inflation. First, free services sometimes replace ones that were previously paid for, which puts new-product bias on steroids. Second, if consumers derive a greater share of their well-being from things that come free, inflation ceases to be a good measure of the cost of living or of the purchasing power of incomes.

Measuring the price of something and measuring its value to consumers are two different tasks. Erik Brynjolfsson of MIT and two co-authors have run experiments in an attempt to do the latter. They asked 3,000 online participants what they would need to be paid to give up Facebook for a month, offering to enforce the deal for a few randomly selected participants using Facebook features that reveal to friends when somebody last logged on. The median response was \$42. About a fifth of users quoted somewhere near \$1,000. In another experiment they struck similar agreements with participants at a Dutch university, enforcing the contract by getting users to change their passwords, in effect locking them out of their accounts, or to submit to monitoring of their electronic devices. The median figure participants quoted to give up mapping services for a month was about €59 (\$64); for WhatsApp it was €536. In another paper Mr Brynjolfsson and his

colleagues asked consumers what they would need to be paid to forgo free online search engines for a year: the median response was over \$17,500.

These figures can mislead. People will always fear the social isolation that would come with being cut off from the predominant communications technology of the day, whether it is telephones, texts or TikTok. Inflation and GDP were never intended to measure consumer welfare. Some free services are displacing activity which has never been counted in GDP, like casual matchmaking. Free services funded by advertising are not new: radio and television have been around a long time. And advertising is only small relative to the economy. John Fernald of the San Francisco Fed argues that many of the consumer benefits from modern technology are “conceptually non-market”.

Yet the line between market and non-market services is hazy. Imputed rent, the money homeowners would have to pay to rent a house equivalent to the one they own, is included in inflation and GDP, despite not representing any market transaction. In another recent paper David Byrne of the Federal Reserve and Carol Corrado of the Conference Board, a business group, argue that smartphones, broadband connections and Netflix subscriptions should be viewed as investments that reap variable dividends over time depending on how intensively they are used. Armed with trends in data usage and time-use surveys Mr Byrne and Ms Corrado construct a quality-adjusted price index for digital access services that shows prices falling by 21% between 2007 and 2017. The official price index for internet access, by contrast, shows prices up 4.5% over the same period.

The fact that inflation may be even lower than is reported is, in one respect, good news: it means that growth in living standards has been understated. But it is troublesome for central bankers who are already undershooting their inflation targets. Moreover, the justification for targeting inflation in the first place rests on the notion that the number is a meaningful

representation of the economic experiences of the public and of firms. The more economic activity shifts into a domain where price is a slippery concept, the weaker that link will become. And there is another source of breakdown in economists' understanding of how prices are formed: globalisation. ■



技术

Alexa，多少钱？

技术进步使通货膨胀统计数据无法可靠地指导经济【专题报道《世界经济》系列之一】

亚马逊已经习惯于应付各种指控了：有说它扼杀了实体零售业务的，有说它虐待仓库工人的，也有说它滥用了自己具支配地位的在线销售平台的。所以有人将低通胀也归咎于它也许就不足为奇了。2017年，时任美联储主席的珍妮特·耶伦（Janet Yellen）提出质疑：即使全球需求增长，激烈的在线竞争是否阻止了商品生产商提高价格。哈佛商学院的阿尔贝托·卡瓦洛（Alberto Cavallo）发现，亚马逊的价格比八家大型零售商的价格低6%，比这些零售商的网站的价格低5%。互联网总体上绝不是寻找通货膨胀的好地方：在美国，自2012年左右以来，在线价格一直在相当稳定地下降，比千年之交时还要低。

然而，这种所谓的“亚马逊效应”并不应该算是什么新鲜事。低通胀之风席卷美国零售业已经几十年了。在1990和2000年代，沃尔玛和塔吉特（Target）等大型零售商优化供应链，狠狠地降低了商品价格。来自中国和其他新兴市场经济体的廉价进口商品挤压了美国国内的生产商。2008年的一项研究发现，低薪国家在美国每多占1%的市场份额，生产者价格就下跌3.1%。20年来，不包括食品和能源在内的美国消费品价格几乎没有任何累积性上涨。在金融危机之前，在服务业通胀的支撑下，通货膨胀总体上表现正常。如今，商品和服务的通胀都很低（见图）。在线零售的兴起并不能轻易解释这一更广泛的转变。

尽管如此，技术进步是一个值得思考的引发通胀放缓的力量。从根本上讲，它让经济体利用有限的资源生产出更多的产品。如果总需求没有跟上，价格就会下跌——或至少不会以那么快的速度上涨。除在硅谷以外，由于生产率增长强劲而使得通胀一直保持低位的想法放在哪里似乎都很可笑，因为经济统计数据已经表明全球生产率增长放缓。不过，有一种论点

是，由于统计学家未能捕捉到某些技术进步，使得生产率看起来低于实际，而通胀则高于实际。

这种基本的担忧是长期存在的。由于统计人员需要一段时间才能注意到消费者开始购买新产品，他们就错过了产品在生命周期早期的价格骤降。新产品到底比以前好了多少也很难衡量。在当今的经济中，统计中错漏的价值来自于智能手机、社交媒体和在线流媒体。高盛的经济学家斯宾塞·希尔（Spencer Hill）最近计算出，2010年代测得的个人电子、通信和媒体消费增长低于过去五个十年中的任何一个。尽管有这样一个事实，那就是在1990年，要花上3000美元才能复制现代电话的基本功能，而且还得使用非常笨重的设备。按实值计算，这一类别的消费量肯定在飙升。统计肯定漏掉了什么东西。

统计人员一直在与这个问题作斗争。但前政府高级官员布伦特·穆尔森（Brent Moulson）回顾了2018年美国通胀指数后认为，美联储的目标通胀指数仍然向上偏差了将近0.5个百分点，主要是因为新产品和质量变化。转向在线销售可能会让新产品造成的偏差愈发严重。斯坦福大学的奥斯坦·古尔斯比（Austan Goolsbee）和彼得·克莱诺（Peter Klenow）的论文发现，在信息技术公司Adobe Analytics提供的数据库中，即使不包括品味易变的服装，在线销售中有44%是上一年不存在的商品。更迭率如此之高，官方统计人员监控的一篮子商品很快就会过时。对于某些类别的商品，古尔斯比和克莱诺已经帮助Adobe Analytics构建了自己的“数字价格指数”，该指数显示的通胀率远低于官方指标。例如，他们发现家具和床上用品的在线价格在2014年1月至2019年6月期间下跌了近12%，而官方消费物价指数仅下跌了2.1%。

比价格下跌更大的问题是价格从一开始就是零。如今，大多数消费者的口袋里都揣着设备，可以用来在世界任何地方进行视频通话，访问任何主题的信息并即时翻译语言，而所有这些都是免费的。人们常把免费服务的激增作为怀疑GDP准确性的一个原因。但这对通货膨胀来说也是个大问题。首先，免费服务有时会取代以前付费的服务，大大加剧了新产品偏差。第二，如果消费者从免费的东西中获得更多的幸福感，通胀就不再是衡量生

活成本或收入购买力的良好标准。

衡量一件东西的价格和衡量它对消费者的价值是两码事。麻省理工学院的埃里克·布林约夫森（Erik Brynjolfsson）和两位论文合著者开展的实验尝试做第二件事。他们询问了3000名在线参与者，要付给他们多少钱才愿意放弃使用Facebook一个月，并向其中一些随机选择的参与者提出使用Facebook“向好友显示最近登录时间”的功能来执行协议。回复的中位数为42美元，而约五分之一的用户报价接近1000美元。在另一个实验中，他们与荷兰一所大学的参与者达成了类似的协议，通过让用户更改密码（相当于将其帐户锁定）或接受对其电子设备的监控来执行合同。参与者报价放弃一个月地图服务的中位数约为59欧元（64美元），放弃使用WhatsApp的报价为536欧元。布林约夫森和同事在另一篇论文中问消费者，放弃一年的免费在线搜索引擎需要支付他们多少钱：中位数报价超过17,500美元。

这些数字可能会误导。人们永远都会担心用不上时下主流的通信技术会让自己与社会隔离，无论这种技术是电话、短信还是抖音。通胀和GDP从来都不是为了衡量消费者福利的。一些免费服务正在取代之前从未计入GDP的活动，例如非正式的相亲配对服务。依赖广告的免费服务并不是什么新鲜事：广播和电视已经存在了很长时间。相对于经济总量来说，广告的规模很小。旧金山联储的约翰·费纳尔德（John Fernald）认为，现代技术给消费者带来的许多好处“在概念上是非市场化的”。

然而，市场化服务与非市场化服务之间的界限也很模糊。“推定租金”，即房主租用与自己的房屋相当的物业时必须支付的钱，已被计入通胀和GDP中，尽管它不代表任何市场交易。联储的戴维·伯恩（David Byrne）和商业团体世界大型企业研究会（Conference Board）的卡罗尔·克拉多（Carol Corrado）在最近发表的另一篇论文中提出，应将智能手机、宽带连接和网飞（Netflix）订阅视为随时间流逝能获得可变股息的投资，股息则取决于使用强度。借助在数据使用和使用时间调查中发现的趋势，伯恩和克拉多构建了按质量调整后的数字访问服务价格指数，显示价格在2007年至2017年之间下降了21%。相比之下，官方发布的互联网访问价格指数显示

同期价格上涨了4.5%。

从某一个角度来说，通胀甚至可能比报道数字还要低是个好消息：这意味着生活水平的增长被低估了。但这对于通胀已经低于目标的央行行长们来说是个麻烦。此外，给通胀设定目标，其根本理由就是这个数字能够有意义地体现公众和企业的经济活动。而经济活动转移进价格概念靠不住的领域越多，这种关联性就越弱。经济学家对价格形成机制的理解出了问题还有另一个原因：全球化。 ■



Gross national happiness

Reading between the lines

Books reveal a country's historical sense of its own well-being

DO A COUNTRY'S inhabitants get happier as it gets richer? Most governments seem to believe so, given their relentless focus on increasing GDP year by year. Reliable, long-term evidence linking wealth and happiness is, however, lacking. And measuring well-being is itself fraught with problems, since it often relies on surveys that ask participants to assess their own levels of happiness subjectively.

Daniel Sgroi of the University of Warwick and Eugenio Proto of the University of Glasgow, both in Britain, think, nevertheless, that they have an answer. By examining millions of books and newspaper articles published since 1820 in four countries (America, Britain, Germany and Italy), they have developed what they hope is an objective measure of each place's historical happiness. And their answer is that wealth does bring happiness, but some other things bring more of it.

Previous research has shown that people's underlying levels of happiness are reflected in what they say or write. Dr Sgroi and Dr Proto therefore consulted newspaper archives and Google Books, a collection of more than 8m titles that constitute around 6% of all books physically published. They searched these texts for words that had been assigned a psychological "valence"—a value representing how emotionally positive or negative a word is—while controlling for the changing meanings of words such as "gay" and "awful" (which once most commonly meant "to inspire awe"). The result is the National Valence Index, published earlier this month in *Nature Human Behaviour*.

Placed alongside the timeline of history (see chart), the valence indices for the places under study show how changes in national happiness reflect important events. In Britain, for example, happiness fell sharply during the two world wars. It began to rise again after 1945, peaked in 1950, and then fell gradually, including through the so-called Swinging Sixties, until it reached a nadir around 1980.

America's national happiness, too, fell during the world wars. It also fell in the 1860s, during and after the country's civil war. The lowest point of all came in 1975, at the end of a long decline during the Vietnam war, with the fall of Saigon and America's humiliating defeat.

In Germany and Italy the first world war also caused dips in happiness. By contrast, during the second world war these countries both got happier as the war continued. Initially, that might be put down to their early successes, but this can hardly explain German happiness when the Red Army was at the gates of Berlin. The researchers hypothesise that what is being measured here is the result of propaganda and censorship, rather than honest opinion. But they cannot prove this. Earlier in Italian history, though, there was a clear and explicable crash in happiness in 1848, with the failure of revolutions intended to unite into a single nation what were then half a dozen disparate states. Surprisingly, however, successful unification in the 1860s also saw a fall in happiness.

As to wealth, the steady progress of the Victorian period matched a steady increase in British happiness, as did the economic boom of the 1920s, which also lifted American spirits. Both countries' spirits fell again in the Great Depression that followed the stockmarket crash of 1929. After the lows of the 1970s, though, happiness in both has been on the rise ever since.

Overall, then, Dr Sgroi and Dr Proto found that happiness does vary with

GDP. But the effect of health and life expectancy, which does not have the episodic quality of booms, busts and armed conflict, is larger, even when the tendency of wealth to improve health is taken into account. A one-year increase in longevity, for example, has the same effect on national happiness as a 4.3% increase in GDP. And, as the grand historical sweep suggests, it is warfare that causes the biggest drops in happiness. On average it takes a 30% increase in GDP to raise happiness by the amount that a year of war causes it to fall. The upshot appears to be that, while increasing national income is important to happiness, it is not as important as ensuring the population is healthy and avoiding conflict. ■



国民幸福总值

字里行间寻幸福

书籍揭示了一个国家国民幸福感的历史变化

一国国民变得更富裕了，就会更幸福吗？大多数政府似乎都这么认为，不然它们也不会把重点放在不懈地逐年提高GDP上。然而，没有可靠的长期证据显示财富与幸福感之间存在关联。而且衡量幸福感本身就问题重重，因为它往往依赖让受访者主观评估自己幸福感的调查。

尽管如此，英国华威大学的丹尼尔·斯格罗伊（Daniel Sgroi）和格拉斯哥大学的欧金尼奥·普罗图（Eugenio Proto）认为他们找到了答案。二人在研究了自1820年以来在四个国家（美国、英国、德国和意大利）出版的数百万本书籍和报刊文章后，描绘出了每个国家的幸福感历史，他们希望这种衡量方式是客观的。他们的答案是，财富确实能带来幸福感，但其他一些东西带来的幸福感更强。

先前已有研究表明，人们的内在幸福感体现在他们所说或所写的内容中。因此，斯格罗伊和普罗图查阅了报纸档案和谷歌图书（Google Books，已有超过800万种图书，占所有已出版纸质图书的6%）。他们在其中搜索被赋予了心理“价”（该值表示一个词在情感上正面或负面的程度）的词语，同时把诸如“快乐的”（gay）和“可怕的”（awful，曾经最常用的意思是“令人敬畏”）等词汇在词义上的变化考虑在内。最终他们得出了国民幸福价指数（National Valence Index），于本月稍早时发表在《自然人类行为》杂志（Nature Human Behaviour）上。

沿历史时间轴铺开后（见图表），所研究国家的国民幸福价指数显示了其国民幸福感的变化与重大事件之间的关联。以英国为例，两次世界大战期间该国居民幸福感急剧下降。1945年之后又再次上升，到1950年触顶，之后一直逐渐下降——包括在所谓的“摇摆的六十年代”，直到在1980年前后达到谷底。

美国国民的幸福感也在两次世界大战期间下降了。19世纪60年代内战期间及之后的几年里其国民幸福感同样出现了下降。越战期间幸福感长期下滑。1975年，美国在西贡被攻陷后狼狈撤退，同年国民幸福感也跌至该国史上最低水平。

德国和意大利也因第一次世界大战而幸福感下降。而在二战期间，随着战事的推进，两国的国民幸福感都提升了。一开始，这或许可被归因为两国早期的成功，但苏联红军即将攻入柏林之际德国人的幸福感还那么高就很难解释了。研究人员推测，这里所衡量到的数据是政治宣传和审查制度的结果，而不是真实的想法。但他们无法证实这一点。不过，往前追溯意大利历史会发现，在1848年发生了一次显而易见且易于解释的幸福感暴跌：当时旨在统一意大利六个邦国的革命以失败告终。然而令人惊讶的是，19世纪60年代成功统一后，幸福感也下降了。

至于财富的作用，维多利亚时期经济稳步发展的同时，英国的幸福感也在稳步提升；20世纪20年代的经济繁荣也一样，它让英国人和美国人的精神都有所提振。1929年股市崩盘后的大萧条期间，两国的幸福感再次下降。不过，在经历了20世纪70年代的低谷之后，两国的幸福感一直在上升。

总体而言，斯格罗伊和普罗图发现幸福感确实会随GDP的变化而改变。但是，健康和预期寿命对幸福感的影响更大（即使考虑到财富增加对健康的促进作用），这两者的影响不像繁荣、萧条和武装冲突那样是阶段性的。例如，寿命延长一年，对国民幸福感的影响与GDP增长4.3%的影响相同。而且，正如对漫长历史的研究所显示的那样，战争导致幸福感下降最多。平均而言，一年的战争所导致的幸福感降幅需要GDP增长30%才能拉平。结果似乎是，虽然增加国民收入对提升幸福感很重要，但确保人口健康和避免冲突的作用更大。■



Robotics

Pick-a-stick

Robots' abilities to recognise and manipulate things are improving

A TRACKED ROBOT approaches a pile of brushwood blocking its path. This is RoMan, short for Robot Manipulator, and it is practising for what is, in effect, its graduation ceremony, on October 17th, when it will show off its skills to a group of American army top brass in a so-called capstone demo at Carnegie-Mellon University, in Pittsburgh. After a pause for thought, it reaches out an arm, takes hold of a branch, lifts it up and drags it clear. Though this is a trivial action for a human being, it is a breakthrough for robots, according to Stuart Young of the Army Research Laboratory (ARL), in Adelphi, Maryland, who is in charge of the RoMan project. And it has implications for the future of robotics.

As anyone with a Roomba cleanerbot knows, robots easily become confused by something unexpected, like a piece of furniture in the wrong place. A barricade can be made of many objects, some unfamiliar, and none with convenient handles. Taking it apart is far beyond the capability of any industrial robot.

Progress in automated manipulation of this sort has been slow. Amazon, a large e-commerce firm, ran a “pick and place” challenge for three years, with teams of roboteers competing to retrieve random known objects from warehouse shelves. The competition ended in 2017, with machines still failing to approach the capabilities of human pickers. Similarly, the European Union’s “pick-place” initiative for robotic manipulation has set only modest goals for improving the handling of known objects. This lack of technology from the private sector inspired the ARL to push forward with its own programme, the Robotics Collaborative Technology Alliance,

which has involved, besides Carnegie-Mellon, General Dynamics, a military contractor, the Jet Propulsion Laboratory (JPL), a NASA facility in California, and the University of Washington.

Dr Young says that, as far as he knows, RoMan is the first machine capable of manipulating unfamiliar objects in an unknown and unstructured environment. Currently, the obstacles it can deal with include piles of logs and brushwood, metal objects and concrete blocks.

Just as a human being would, it has to learn about the world through observation and experiment before it can manipulate it. So it is trained, for example, on numerous tree branches until it is able to recognise unfamiliar ones for what they are and knows to grasp the trunk, rather than the leaves or the twigs. Having so grasped an object, RoMan assesses its weight and decides whether to try to lift it or drag it. Dr Young describes this process as "intuitive physics". Then, when confronted with a real barricade, the robot can recognise objects within the heap, work out whether they are best lifted, pushed or pulled, and position itself in the optimum place to do so and thus dismantle the obstacle.

Dr Young hopes to take this further, for example by dismantling piles of burning tyres. He also wants RoMan to be capable of "whole body manipulation", to exert more force. That would include things like the robot using its body weight in the way a human being might, in order to push open a stiff door or to move heavy furniture by bracing against a wall.

One problem with RoMan is that it is still impractically slow. It often takes 10-15 seconds to decide what to do. Dr Young says that this delay will have to come down tenfold to meet military requirements. RoMan will also need to learn to deal with a wider range of objects.

All this done, however, the device's future could be bright. Beyond military

applications, its descendants might work in warehouses, pick fruit, clear litter or tidy people's homes. They might even, if JPL has its way, collect rocks from the surface of Mars. Picking up a branch is one small act for a robot, but it could put a whole new world within the grasp of robotkind. ■



机器人技术

捡树枝

机器人识别和操控物品的能力正在提高

一堆树枝挡住了一台履带式机器人的去路，它朝这些拦路虎走去。它叫RoMan——Robot Manipulator（机器人操作手）的缩写，这会儿它正在为10月17日举行的“终极演示”做练习。这场演示实际上是它的毕业典礼，它将在位于匹兹堡的卡内基梅隆大学向一群美国陆军高层展示技能。在树枝前停下思考片刻之后，它伸出手臂，抓住一根树枝，提起来拖到了一边。在马里兰州阿德尔菲市（Adelphi）的陆军研究实验室（ARL）负责RoMan项目的斯图尔特·扬（Stuart Young）说，完成这个动作对人来说微不足道，对机器人来说却是一项突破。而这一突破将影响机器人技术的未来。

家里有Roomba扫地机器人的人都知道，机器人很容易被它预期外的东西搞蒙，例如移动了位置的家具。一个障碍可能由很多物品组成，有些是机器人不熟悉的，而无一有方便抓握的地方。要清除它远远超出了任何工业机器人的能力。

像这种自动操作方面的进展一直很缓慢。大型电子商务公司亚马逊举办过三届机器人“拾放”挑战赛，由机器人设计团队比赛从仓库货架上拾取随机摆放的已知物品。该挑战赛于2017年结束，当时机器的能力仍不及人类拣货员。欧盟也有个类似的机械手“拾放”计划，给提高机器人处置已知物体的能力设置了较低的目标。私营部门缺乏技术，这促使陆军研究实验室继续推进自己的项目——机器人协作技术联盟（Robotics Collaborative Technology Alliance）。联盟成员除卡内基梅隆大学外，还有国防承包商通用动力公司（General Dynamics）、NASA在加州的喷气推进实验室（JPL）以及华盛顿大学。

扬说，据他所知，RoMan是第一台能够在未知且非结构化的环境中操控陌生生物体的机器。目前，它可以处理的障碍物包括成堆的木头和树枝、金属

物体和混凝土块。

和人类一样，它必须先通过观察和实验来了解世界，然后才能驾驭它。因此它接受了训练，例如运用了许多树枝来训练，直到它能够识别出没见过的树枝，并知道在抓取的时候要抓住树干，而不是树叶或细枝。如此抓好物体后，RoMan会评估物体重量并决定是举起还是拖拽。扬将此过程描述为“直观物理学”。以后若遇到真正的路障，机器人可以识别一堆物体中的不同对象，确定是应该举起、推动还是拉拽它们，然后将自身移动到最佳位置来做这些动作，从而清除障碍。

扬希望能在此基础上更进一步，比如让机器人搬走成堆着火的轮胎。他还希望RoMan能够“全身操控”，从而施展更大的力量，比如让机器人像人类那样利用自身体重，推开一扇坚硬的门或依靠抵住墙来移动沉重的家具。

RoMan的一个问题就是它还是太慢，不够实用。它通常需要10到15秒来决定要做什么。扬说，这一延迟必须降低十倍才能满足军事要求。它还需要学习处理更多种类的物体。

不过等这些都做到了，RoMan的未来可能会一片光明。除了应用于军事，它的后代产品还可以用于仓库作业、水果采摘、垃圾清理或家居清洁。若能如喷气推进实验室所愿，它们甚至还可能在火星表面收集岩石。捡树枝只是机器人做出的一个小动作，却可能将一个全新的世界放入了机器人大军的手掌心。 ■



Buttonwood

Tale risk

How stories can help explain booms and busts

EVERYONE KNOWS, or thinks they know, the story of the Wall Street shoeshine boy. In 1929 Joseph Kennedy, patriarch of the Boston-Irish political clan, had an epiphany while his shoes were being cleaned. When the boy who shined his shoes offered him stock tips, he realised the stockmarket was about to implode. Kennedy promptly sold all his shares and took a short position, betting that the market would fall. When it crashed that October he made a killing.

In his new book, “Narrative Economics”, Robert Shiller, a Nobel laureate, offers this tale as an example of a contagious narrative that becomes part of folk wisdom. A story need not be accurate to spread. Mr Shiller searched archives of newspapers from the period, and could find no record of it. But he did find a similar kind of story in the *Minneapolis Morning Tribune*. The stockmarket, it said, could not yet have peaked because “we do not hear of the chamber maids and bootblacks who have cleaned up fortunes by lucky plays.” That story was published in 1915.

Whatever their provenance, says Mr Shiller, it matters which kinds of narratives are contagious and why. The ones that catch on have the power to influence behaviour. Stories sway decisions to hire or fire; to buy or sell; to spend or save. These individual choices, writ large, move markets and drive the business cycle. Fundamentals such as prices and profits are just one part of the reckoning. The stories that people tell themselves and each other matter at least as much.

To wield such influence, economic narratives must first become popular.

Epidemiology offers a model for how they take hold. Disease epidemics are hump-shaped when plotted on a graph. In the rising phase, the rate of increase of newly infected people (the contagion rate) is faster than the recovery rate plus the death rate. When the recovery rate exceeds the contagion rate, the epidemic falls off. It is the same with stories. A growing number of “infected” people spread the narrative; later on comes a period of lost interest and forgetting.

The most contagious economic narratives drive boom-and-bust cycles. Such narratives have common features. They tend to be oversimplified models of reality and thus catchy. Their success may owe to a “super-spreader”, perhaps a celebrity, capable of infecting many people. And they are often part of a narrative cluster, which adds weight to their plausibility. The stockmarket boom of the 1990s was powered by an array of stories: the triumph of capitalism; the rise of the internet; the decline of inflation; and so on.

Some of the most contagious narratives are newer, more resistant variants of old ones. Behind every property boom is a mutation of the eternal narrative about the scarcity value of land. “Who could think of tilling or being contented with a hundred acres of land, when thousands of acres in the broad west were waiting for occupants,” says a tract documenting the follies of America’s land boom of the 1830s. The global housing boom that led up to the Great Recession of 2007-09 was driven by narratives that persuaded people to think of their homes as speculative investments in scarce land.

A science of economic narratives, of the kind Mr Shiller calls for, would require high-quality data. It would need regular surveys designed to draw out people’s justifications for their economic decisions. But interpreting even good data would be tricky. Narratives tend to be ignored by economists because their links to events are complex and variable—as Mr Shiller

himself notes. Any official data on narratives would, once published, surely become part of the narrative itself.

The most prominent economic narratives today are not cheery. A monthly survey conducted by Bank of America finds that two-fifths of fund managers expect a recession in the next year. The same proportion thinks the trade dispute between America and China will never be resolved. Besides the trade war, fund managers list the impotence of central banks and a bubble in bond markets as their biggest worries.

Take these messages, add to them bleak surveys of business confidence worldwide, and you might decide to batten down the hatches for a coming storm. If so, you may still be troubled by a nagging doubt, a sense that the story does not quite add up. The usual end-of-cycle euphoria, which causes companies to make unwise investments and draws greenhorns into speculative assets, is not there. The chambermaids and bootblacks have gone missing. ■



梧桐

故事风险

故事如何影响盛衰交替

人人都知道华尔街擦鞋男孩的故事，或自以为知道。1929年，波士顿的爱尔兰裔政治家族肯尼迪家族的族长约瑟夫·肯尼迪（Joseph Kennedy）从一个给他擦鞋的男孩身上获得了一番顿悟。当男孩告诉他一些买股票的技巧时，肯尼迪意识到股市即将崩溃。他迅速将自己所持的股票悉数卖出，选择做空。同年10月，美国股市崩溃，他大赚了一笔。

诺贝尔奖得主罗伯特·席勒（Robert Shiller）在其新书《叙事经济学》（Narrative Economics）中以这个故事为例，说明富有感染力的叙事如何成为民间智慧的一部分。一个故事要广为流传，内容不必真实无误。席勒搜索了那些年的报纸档案，没有找到任何相关记录。但他确实在《明尼阿波利斯晨报》（Minneapolis Morning Tribune）上找到了一个类似的报道。其中提到，股票市场不可能已经见顶，因为“还没听说有哪个女佣和擦鞋匠撞大运发了大财。”这则报道发表于1915年。

席勒表示，不用管出处，重要的是要知道哪种叙事会口口相传，原因是什么。广为流传的叙事会影响人们的行为，左右他们的选择：招聘还是裁员，买入还是卖出，花钱还是存钱。这些选择一经放大，就会影响市场并推动经济周期变化。价格和利润等基本要素只是计算的一部分参数，人们向自己和他人讲述的故事也需要考虑，而且其重要性并不亚于前者。

要发挥这种影响力，经济学叙事必须先流传开来。如何流传？流行病学提供了一个传播模型。从统计图表上可以看出，传染病的扩散进程呈拱形。在上升阶段，新感染者的增长率（传染率）超过康复率加死亡率。当康复率反超传染率，疫情渐渐消退。故事的传播也是这样。先是越来越多“被感染”的人传播某个故事，然后人们的兴趣减退，故事被逐渐淡忘。

“传染力”最强的那些经济学叙事推动了经济周期的盛衰交替。这类叙事有

一些共通点。它们往往对现实做了过度简化，因而更通俗易记。它们的成功可能也要归功于能感染许多人的“超级传播者”，例如名人。而且这些讲述通常是一系列叙事的一部分，从而显得更加可信。上世纪90年代股市的繁荣就是由一系列故事推动的：资本主义的胜利、互联网兴起、通胀下降等。

一些传染力最强的故事不过是旧语新说，但抗药性更强了。每轮房地产热的背后都是有关土地稀缺价值的老套故事被重新演绎。一则短文记录了19世纪30年代美国土地开发热潮中的荒唐事，其中写道：“知道广阔的西部有成千上万英亩的土地等着人去抢占，谁还会去耕种或满足于自己眼前那几百英亩的田地呢？”而推动那场最终导致了2007至2009年经济大衰退的全球房产热潮的，是种种劝说人们将购房视作对稀缺土地的投机性投资的叙述。

要像席勒提倡的那样建立起一门研究经济学叙事的学科，就要有高质量的数据。这需要定期做调查，探求人们做经济决策的理据。然而，即便有优质的数据，解读起来也不容易。正如席勒本人指出的，经济学叙事往往被经济学家忽略，因为它们与经济事件的关联复杂又多变。任何有关这些叙事的官方数据一经发表，肯定又会成为叙事本身的一部分。

眼下最突出的经济学叙事并不让人欢欣鼓舞。美国银行所做的月度调查发现，有五分之二的基金经理预计明年将出现衰退。同样比例的人认为，中美贸易争端永远也无法解决。除了贸易战，央行的无能和债券市场的泡沫也被基金经理们列为最大的忧虑。

综合这些信息，加上调查显示全球商业信心萎靡，你可能觉得风暴即将来临，需要未雨绸缪。如果是这样，你也许还有一个疑虑挥之不去——感觉这个故事有点说不通。通常来说，在繁荣周期的末期，人们会得意忘形，导致企业做出非理性投资，新手也会被吸引到投机性资产里，现在故事里却没有这一幕。女佣和擦鞋匠不见了。■



The Economist film

Tech and the city

By 2050, two-thirds of the population will live in cities. Urbanisation is happening faster than at any time in human history.



经济学人视频

科技与城市

到2050年，城市人口将占到全球人口的三分之二。现在是人类历史上城市化最快的时期。



The rise of the financial machines

Masters of the universe

Forget Gordon Gekko. Computers increasingly call the shots in financial markets

THE JOB of capital markets is to process information so that savings flow to the best projects and firms. That makes high finance sound simple; in reality it is dynamic and intoxicating. It reflects a changing world. Today's markets, for instance, are grappling with a trade war and low interest rates. But it also reflects changes within finance, which constantly reinvents itself in a perpetual struggle to gain a competitive edge. The latest revolution is in full swing. Machines are taking control of investing—not just the humdrum buying and selling of securities, but also the commanding heights of monitoring the economy and allocating capital.

Funds run by computers that follow rules set by humans account for 35% of America's stockmarket, 60% of institutional equity assets and 60% of trading activity. New artificial-intelligence programs are also writing their own investing rules, in ways their human masters only partly understand. Industries from pizza-delivery to Hollywood are being changed by technology, but finance is unique because it can exert voting power over firms, redistribute wealth and cause mayhem in the economy.

Because it deals in huge sums, finance has always had the cash to adopt breakthroughs early. The first transatlantic cable, completed in 1866, carried cotton prices between Liverpool and New York. Wall Street analysts were early devotees of spreadsheet software, such as Excel, in the 1980s. Since then, computers have conquered swathes of the financial industry. First to go was the chore of “executing” buy and sell orders. Visit a trading floor today and you will hear the hum of servers, not the roar of traders. High-frequency trading exploits tiny differences in the prices of similar

securities, using a barrage of transactions.

In the past decade computers have graduated to running portfolios. Exchange-traded funds (ETFs) and mutual funds automatically track indices of shares and bonds. In September these vehicles had \$4.3trn invested in American equities, exceeding the sums actively run by humans for the first time. A strategy known as smart-beta isolates a statistical characteristic—volatility, say—and loads up on securities that exhibit it. An elite of quantitative hedge funds, most of them on America's east coast, uses complex black-box mathematics to invest some \$1trn. As machines prove themselves in equities and derivatives, they are growing in debt markets, too.

All the while, computers are gaining autonomy. Software programs using AI devise their own strategies without needing human guidance. Some hedgefunders are sceptical about AI but, as processing power grows, so do its abilities. And consider the flow of information, the lifeblood of markets. Human fund managers read reports and meet firms under strict insider-trading and disclosure laws. These are designed to control what is in the public domain and ensure everyone has equal access to it. Now an almost infinite supply of new data and processing power is creating novel ways to assess investments. For example, some funds try to use satellites to track retailers' car parks, and scrape inflation data from e-commerce sites. Eventually they could have fresher information about firms than even their boards do.

Until now the rise of computers has democratised finance by cutting costs. A typical ETF charges 0.1% a year, compared with perhaps 1% for an active fund. You can buy ETFs on your phone. An ongoing price war means the cost of trading has collapsed, and markets are usually more liquid than ever before. Especially when the returns on most investments are as low as today's, it all adds up. Yet the emerging era of machine-dominated finance

raises worries, any of which could imperil these benefits.

One is financial stability. Seasoned investors complain that computers can distort asset prices, as lots of algorithms chase securities with a given characteristic and then suddenly ditch them. Regulators worry that liquidity evaporates as markets fall. These claims can be overdone—humans are perfectly capable of causing carnage on their own, and computers can help manage risk. Nonetheless, a series of “flash-crashes” and spooky incidents have occurred, including a disruption in ETF prices in 2010, a crash in sterling in October 2016 and a slump in debt prices in December last year. These dislocations might become more severe and frequent as computers become more powerful.

Another worry is how computerised finance could concentrate wealth. Because performance rests more on processing power and data, those with clout could make a disproportionate amount of money. Quant investors argue that any edge they have is soon competed away. However, some funds are paying to secure exclusive rights to data. Imagine, for example, if Amazon (whose boss, Jeff Bezos, used to work for a quant fund) started trading using its proprietary information on e-commerce, or JPMorgan Chase used its internal data on credit-card flows to trade the Treasury bond market. These kinds of hypothetical conflicts could soon become real.

A final concern is corporate governance. For decades company boards have been voted in and out of office by fund managers on behalf of their clients. What if those shares are run by computers that are agnostic, or worse, have been programmed to pursue a narrow objective such as getting firms to pay a dividend at all costs? Of course humans could override this. For example, BlackRock, the biggest ETF firm, gives firms guidance on strategy and environmental policy. But that raises its own problem: if assets flow to a few big fund managers with economies of scale, they will have disproportionate voting power over the economy.

The greatest innovations in finance are unstoppable, but often lead to crises as they find their feet. In the 18th century the joint-stock company created bubbles, before going on to make large-scale business possible in the 19th century. Securitisation caused the subprime debacle, but is today an important tool for laying off risk. The broad principles of market regulation are eternal: equal treatment of all customers, equal access to information and the promotion of competition. However, the computing revolution looks as if it will make today's rules look horribly out of date. Human investors are about to discover that they are no longer the smartest guys in the room. ■



【首文】金融机器的崛起

宇宙之王

忘了戈登·盖柯吧。计算机正在逐渐统领金融市场

资本市场的任务是处理信息以使存款流向最优秀的项目和公司。这么说让人感觉复杂的巨额金融交易很简单，但实际上它变化多端，令人兴奋沉迷。它反映的是一个不断变化的世界。例如，如今的市场就在努力应对贸易战和低利率的问题。但它也反映了金融业内部的变化。为赢得竞争优势，金融业始终都在重塑自我。最新的一轮变革正如火如荼地展开。机器正在逐步控制投资行为——不仅仅是常规的单调的证券买卖，还有监控经济运行和资本配置这样的制高点。

由按照人类设定的规则运行的计算机管理的基金分别占美国股市的35%、机构股权资产的60%以及交易活动的60%。新的人工智能程序也已在编写自己的投资规则，而它们的人类主人对此也只是一知半解。从披萨外卖到好莱坞，各行各业都在因科技而改变。但金融业有别于其他行业，因为它可以行使对企业的投票权、重新分配财富，在经济中引发混乱。

金融业从事的是巨额交易，因而总有足够的资金率先采用创新科技。1866年第一条跨大西洋电缆铺设完成后，就被用来在利物浦和纽约之间传输棉花价格。上世纪80年代，华尔街的分析师们一早成为了Excel等电子制表软件的拥趸。自那之后，计算机攻占了金融业的许多环节。最先陷落的就是“执行”买卖指令的常规操作。如今去交易大厅，听到的不是交易员的喧哗声，而是服务器的嗡鸣。通过密集的买进卖出，高频交易利用相似的证券之间微小的价差赚钱。

过去十年来，计算机已经逐渐发展到管理投资组合。交易所交易基金（ETF）和共同基金自动追踪股票和债券指数。9月，经由这些工具向美国股市投入的资金达4.3万亿美元，首次超过了由人类积极决策的投资总额。一种被称为“智能贝塔”（smart-beta）的策略会分离出某种统计特

性，比如波动性，然后再大量购买显示出这种特性的证券。主要聚集于美国东海岸的一批顶级定量对冲基金运用复杂的黑箱数学运算投资了大约1万亿美元。随着计算机在股票和金融衍生品市场大显身手，它们在债券市场也越发有用武之地。

与此同时，计算机也在赢得自主权。使用人工智能的软件程序不需要人类的指导便能自主设计策略。尽管一些对冲基金投资者对人工智能持怀疑态度，但随着处理能力的增强，人工智能的本领也在增强。不妨来看看作为市场命脉的信息流。人类基金经理在严格的内幕交易法与信息披露法的规定下阅读报告并与公司接触。这些都是为了管控进入公共领域的信息，确保人人都能平等获取信息。而如今，近乎无穷尽提供的新数据和处理能力正在创造出一些全新的评估投资的方法。例如，一些基金公司试图利用卫星来追踪零售商停车场的情况，并从电子商务网站挖掘通胀数据。它们最终获得的信息甚至可能比公司董事会所掌握的还新鲜。

到目前为止，计算机的兴起降低了成本，从而使金融大众化。常规的ETF每年收取0.1%的费用，而主动型基金的收费可能是1%。人们在手机上就能购买ETF。持续的价格战导致交易成本大幅下降，市场流动性通常也都胜过以往任何时候。特别在如今大多数投资的回报都很低的情况下，这些微小的成本下降累积起来也很可观。然而，这个由机器控制金融业的新兴时代还是引发了各种担忧，其中任何一种都可能对这些利好产生冲击。

一是对金融稳定性的担忧。经验丰富的投资者抱怨计算机可能会扭曲资产价格，因为很多算法都追逐具有某种特定特征的证券，而后又突然将它们抛售。监管机构担心，随着市场下跌，流动性也会消失。这些说法可能过于夸张——人类自己就很擅长制造“金融惨案”，而计算机能够帮助控制风险。尽管如此，还是发生了一系列的“闪电崩盘”和吓人的事件，包括2010年的ETF价格崩盘、2016年10月的英镑暴跌以及去年12月的债市暴跌等。随着计算机能力的增强，这种混乱可能变得更加严重和频繁。

另一个担忧是计算机化的金融可能会使财富大量集中。由于业绩在更大程度上取决于处理能力和数据，那些影响力大的人群赚到的钱可能大大超出

正常比例。量化投资者辩称，自己享有的任何优势都很快会在竞争中消失殆尽。然而，一些基金公司正在出钱购买数据的专有权。想象一下，假如亚马逊（其老板杰夫·贝佐斯曾在一家量化基金公司工作）开始利用自己独家掌握的电子商务信息进行交易，或者摩根大通利用其内部的信用卡资金流向数据在美国国债市场上交易。这种假想的冲突也许很快就会变成现实。

最后一个担忧是公司治理。几十年来，基金经理一直在代表客户投票决定公司董事会成员的去留。如果这些股票由行事难测的计算机管理，或者更糟糕的是，这些计算机的程序被设计为追求某个狭隘的目标，比如不惜一切代价让公司支付股息，那会怎样？当然，人类可以插手控制。比如，最大的ETF公司贝莱德（BlackRock）就为企业提供策略和环境政策方面的指导。但这本身也引发了问题：如果资产流向了少数具有规模经济的大型基金管理公司，那么它们将对经济拥有过大的投票权。

金融业最伟大的创新势不可挡，但这些创新在真正立足之前常会引发危机。18世纪，股份公司制造了泡沫，经过不断调适后，到19世纪使大规模的商业活动成为可能。证券化引发了次贷危机，但如今却是消除风险的重要工具。市场监管的普遍性原则是永恒的：对所有客户一视同仁、平等享有信息以及促进竞争。然而，计算革命似乎会让当下的规则显得极度过时。人类投资者很快会发现，自己不再是房间里最聪明的家伙了。■



Big Tech and antitrust

How to dismantle a monopoly

Would it be possible to carve up Big Tech? If so, would it ever happen?

“FATHER LENNON, have you some money? Buy Standard Oil.” That’s what John D. Rockefeller is said to have told his golf partner, a priest, when he heard the news in 1911 that the Supreme Court had ruled his oil company was to be broken up into 34 smaller firms. It was good advice. Within a few years the value of those firms rose threefold. The net worth of Rockefeller, who owned more than 25% of each, grew from about \$300m in 1911 to \$900m in 1913, around \$23bn in current dollars.

A break-up of today’s tech titans—Google, Amazon, Facebook and Apple—could also unlock vast value, say some with an eye on the industry. If the most radical plan, proposed by Elizabeth Warren, a leading Democratic contender for America’s presidency, were fully implemented, by some calculations the parts spun off alone could be worth over \$2trn—roughly half the value of the four complete firms today.

Ms Warren’s two-pronged scheme was presented in March, but it is now coming under closer scrutiny as her campaign for the Democratic presidential nomination gathers steam. The first part is relatively straightforward. She intends to unwind tech mergers deemed “anticompetitive” because they were undertaken to neutralise potential competitors. This is mainly aimed at Facebook, which in 2012 bought Instagram, a picture-heavy social network, for \$1bn and in 2014 paid \$19bn for WhatsApp, an instant-messaging service. Both of these, industry insiders argue, could have become serious rivals to Facebook. But Ms Warren also aims to undo other deals, such as DoubleClick, an advertising exchange bought by Google, and Whole Foods, a grocery chain acquired by

Amazon.

The second prong requires more explanation. The tech titans are mostly two-headed beasts. They not only operate a market but compete in it too. Amazon owns the world's biggest e-commerce marketplace and also sells products on it under its private labels. Apple hosts the app store on the iPhone but also offers its own apps. This creates incentives for these firms to promote their wares unfairly, for instance by showing them at the top of the result pages of their search engines.

Ms Warren wants operators of any online marketplace which generates annual global revenues of more than \$25bn to be declared "platform utilities" and prohibited from both owning a platform and doing business on it. At a minimum this would mean, for instance, that Amazon would have to spin off its private brands, in particular Amazon Basics. Apple would have to shed such apps as Mail and Maps.

Determining the effect of break-ups is tricky, though an analysis of the revenues of various parts of the tech titans' businesses gives a sense of their worth (see chart). Equity analysts who engage in "sum-of-the parts" (SOTP) analysis also try to estimate the value of bits of a business using similar firms as a yardstick. Their over-excited assessments of how much these might be worth sometimes look like flights of fancy. But the approach may work reasonably well for business units that have closely comparable peers, such as Instagram. In June Bloomberg Intelligence reckoned that Instagram would fetch \$100bn (although some in Silicon Valley put the number much higher, at around \$200bn, because of its fast growth). Brent Thill of Jefferies, a bank, values Amazon's online retail business (including Amazon Basics, but without its marketplace) at nearly \$200bn and the firm's physical stores (mostly Whole Foods) at up to \$6bn.

If good comparisons and financial data are absent, such estimates are more art than science, says Brian Wieser of Group M, the world's largest advertising buyer. That makes it even harder to put a number on Google's advertising business as a whole (Jefferies' estimate is \$539bn). Ms Warren wants to split it into an ad marketplace and services that operate in it. But valuing its constituent parts is guesswork. The firm is not forthcoming with numbers.

These are not the only problems. WhatsApp, despite the whopping price Facebook paid for it, does not make much money, which makes assessing its worth hard. Trying to estimate a price for Apple's and Google's apps would be hopeless.

The fuzziness of Ms Warren's plan also makes estimating a total break-up value difficult. If Facebook has to part with WhatsApp, why should it keep Messenger, its other instant-messaging service? Or why should Apple keep iMessage? Both may be regarded as services on top of a platform utility. It is similarly unclear what would happen to the app stores of Apple and Google or the cloud-computing arms of Amazon and Google (and Microsoft's, for that matter, a rival to Amazon). A spin-off of Amazon Web Services, for example, would create the world's second-most-valuable corporate IT firm. It would be worth \$438bn, says Morgan Stanley, a bank—about four times more than IBM.

Even though most analysts assume that the separate parts are worth more than the whole, could the opposite be true? Break-ups could destroy value. Synergies would evaporate, points out Amit Daryanani of Evercore ISI, a financial firm. Apple may no longer be able to offer a tightly integrated package of hardware, software and services, which is its main competitive advantage. If Amazon were shorn of cloud-computing arm, it would lose its most profitable business, making whatever is left a less attractive investment. It is also unclear how markets would react if divestitures were

to weaken network effects, the economic forces that let big firms get bigger and are pervasive in the digital world.

Those who think they can benefit from break-ups ought not to be too hopeful. Political and legal barriers abound. Even if Ms Warren wins next year's election, the Senate would probably remain under Republican control and might be unwilling to endorse a radical break-up. The other path, through regulatory agencies, seems equally rocky. Ms Warren intends to appoint regulators "committed to reversing illegal and anticompetitive tech mergers". But they would probably have to make their cases in court. Both federal appeals-court judges and the conservative majority on the Supreme Court are antitrust sceptics.

Second, practical difficulties will act as a further drag. In other industries "line-of-business" prohibitions, of the sort Ms Warren wants to impose on Amazon and Apple, have been used to avoid abuse of a dominant position. American railways were banned from carrying commodities they produced themselves and banks from engaging in commerce. In the digital world, these borders are more arbitrary and fluid.

Separating platforms from services which run on them sounds elegant. But how would one divvy up all the data the tech giants have collected? What is part of the platform and what is not? What happens if the lines between them move? Instant-messaging could be described as a feature of a social-networking platform but also a separate service. The case against Microsoft was triggered when it bundled its Windows operating system with its web browser, which were then separate pieces of software. Today, browsers are usually considered part of an operating system.

Third, the fear of unintended consequences will act as a brake on break-ups. Ms Warren's plan was in part inspired by Lina Khan, a legal scholar, who in 2017 published an influential paper entitled "Amazon's Antitrust

Paradox” and now advises the antitrust subcommittee of the House of Representatives in its investigation of Big Tech. But in a more recent paper she lists several drawbacks to heavy regulation. Quickly evolving technology can make break-ups obsolete. Because they introduce friction, they could lead to higher prices. If they are limited in what they can do, platforms may cut investment, thus slowing innovation. Although she identifies these drawbacks she says they are “not a compelling argument for inaction”.

What is more, break-ups alone will not suffice to tame big tech. Harold Feld at Public Knowledge, a left-leaning think-tank, notes the “starfish problem”. Some starfish have incredible powers of regeneration: tear them up and the pieces quickly grow into complete new creatures. Similarly, one part of a tech giant could become dominant again because of network effects. Break-ups, he argues, need to be complemented by regulation that weakens this effect, for instance with requirements that a user of one instant-messaging service can exchange texts with another.

Given all these hurdles, will break-ups ever happen? Sector-wide divestitures seem unlikely, but even Makan Delrahim, head of the Department of Justice’s antitrust division, said on October 22nd that they are “perfectly on the table”. Amazon looks vulnerable. It is disrupting many industries and creating many enemies. A line-of-business prohibition seems a relatively easy sell politically. The most likely victim is Facebook. Privacy scandals and its role in distributing misinformation have made the firm a target for both Democrats and Republicans.

The case against Facebook is relatively easy to make. Scott Hemphill and Tim Wu, two legal scholars based in New York, have already started advancing it. Backed up by Chris Hughes, a co-founder of Facebook now turned critic of the firm, they have been giving presentations to regulators explaining that “available evidence indicates that as of 2010, Facebook launched a programme of serial defensive acquisitions in order to maintain

its dominance.”

Legal arguments notwithstanding, it will be hard to unscramble the eggs. WhatsApp is still a separate entity but Instagram is not. It uses the same advertising platform as Facebook’s social network. And the firm is busy tying its biggest services together even more tightly by merging their address books. Facebook subscribers will at some point be able to send messages on WhatsApp. The goal, the firm says, is to make life easier for users. Critics argue that the aim is to make divestiture more difficult. To avoid “irreparable harm”, Messrs Hemphill and Wu call on regulators to ask for a preliminary injunction that would put an end to the integration work.

Mark Zuckerberg, Facebook’s boss, knows that he has a target on his back. If Ms Warren were elected president, he recently told staff, “then I would bet that we will have a legal challenge.” He would also bet that he would win, he added. Mr Zuckerberg may want to read up on the history of Standard Oil. Rockefeller thought so too—until it was too late. ■



科技巨头与反垄断

如何拆除垄断

拆分科技巨头有无可能？如果有，真的会发生吗？

“列侬神父，你有些闲钱吗？买标准石油（的股票）吧。”据说这是1911年洛克菲勒听闻最高法院做出裁定，要将他的石油公司拆分为34家小公司时，对他的高尔夫球友列侬神父说的话。这个建议不错。在随后的几年内，这些公司的价值增长了两倍。而在每家公司都持股25%以上的洛克菲勒，其净资产也从1911年的三亿美元增长到1913年的九亿美元——大约相当于现在的230亿美元。

一些关注科技行业的人士表示，对谷歌、亚马逊、Facebook、苹果等当今的科技巨头进行拆分也可能释放出巨大的价值。最激进的计划是由伊丽莎白·沃伦（Elizabeth Warren，在民主党内总统竞选人中排名领先）提出的。一些计算显示，如果该计划全面实施，仅拆分出来的部分价值就可能超过二万亿美元，大约是今天这四家公司总市值的一半。

沃伦这项计划是在今年3月提出的。但随着她争取民主党总统候选人提名的活动声势渐长，该计划受到了更密切的审视。计划分为两部分。第一部分相对简单明了。她打算废除被视为“反竞争的”科技公司合并交易，因为它们是为了清除潜在的竞争对手。这主要针对Facebook。2012年，Facebook斥资10亿美元收购了以发布图片为主的社交网络Instagram，2014年又花费190亿美元收购了即时通讯服务WhatsApp。业内人士认为，这两家公司原本都可能成为Facebook的劲敌。除此之外沃伦还打算撤销其他的合并交易，比如谷歌对广告服务商DoubleClick的收购，以及亚马逊对食品杂货连锁店全食超市的收购等。

计划的第二部分尚需要更多解释。科技巨头大多是双头兽。它们不仅经营着市场，也参与其中的竞争。亚马逊拥有全球最大的电子商务平台，并在该平台上销售自有品牌的产品。苹果在iPhone中开设了应用商店，但同时

也提供自己的应用。这便促使这些公司为自家产品提供不公平的促销手段，比如在搜索结果页置顶显示自己的产品。

沃伦希望将所有全球年营收超过250亿美元的在线集市运营商判定为“公用事业平台”，并禁止它们一手拥有平台，一手在该平台上开展业务。举例来说，这样做至少意味着亚马逊将不得不剥离其自有品牌，尤其是亚马逊倍思，而苹果将不得不放弃邮件和地图等应用。

弄清拆分的影响是件棘手的事情，不过分析一下科技巨头旗下不同业务的收入，可以大致了解它们的价值（见图表）。采用“分类加总估值法”（SOTP）的股票分析师还试着以类似公司为参照，来评估一家公司旗下各项业务的价值。他们在评估这些业务的价值时忘乎所以，有时显得异想天开。不过，对于Instagram这样有着可比性很强的同行公司的业务部门，这种方法可能相当有效。彭博行业研究（Bloomberg Intelligence）6月估计，Instagram的估值达1000亿美元（不过硅谷一些人认为它发展迅速，因而给出的估价比这高得多，大约为2000亿美元）。杰富瑞银行（Jefferies）的布伦特·蒂尔（Brent Thill）对亚马逊在线零售业务（包括亚马逊倍思，但不包括其平台）的估价接近2000亿美元，对以全食超市为主的实体店的估价为60亿美元。

全球最大的广告采购商群邑（Group M）的布莱恩·韦瑟（Brian Wieser）表示，如果没有合理的对照和足够的财务数据，这样的估计就更像是艺术而非科学。这令估算谷歌整个广告业务的价值难上加难（杰富瑞对其估值为5390亿美元）。沃伦希望将谷歌广告业务拆分为一个广告平台和在该平台运营的一些服务。但对它各部分的估值只能算猜测。谷歌不愿透露具体数字。

问题还不止这些。尽管Facebook为收购WhatsApp耗费了巨资，但后者并未赚到多少钱，因而很难评估它的价值。而想要给苹果以及谷歌的应用估价几乎没有可能。

由于沃伦计划的模糊不清，估算拆分后的总价值也成了一桩难事。如果

Facebook必须放弃WhatsApp，那它为什么还要保留另一款即时通讯服务Messenger呢？或者苹果为什么要保留iMessage呢？两者都可以被看作在公用事业平台上运营的业务。同样不清楚的是，对苹果和谷歌的应用商店、亚马逊和谷歌的云计算部门（说到这一点，还有亚马逊的竞争对手微软的云计算）又将如何处置。例如，拆分亚马逊的云服务将产生出全球价值第二高的企业IT公司。摩根士丹利认为其价值将达4380亿美元，大约是IBM的四倍。

尽管大多数分析师认为，拆分后各部分的总价值会高于未拆分时的价值，但事实会不会截然相反？拆分确有可能损毁价值。金融公司Evercore ISI的阿米特·德莱纳里（Amit Daryanani）指出，拆分会让协同效应消失。苹果或许不再能够提供紧密结合的硬件、软件和服务，而这正是其主要竞争优势所在。如果亚马逊的云计算部门被剥离，它将失去盈利最多的业务，导致余下所有部门的投资吸引力下降。同样不清楚的是，如果拆分削弱了网络效应，市场会作何反应。网络效应渗透至数字世界各个角落，是推动大公司不断壮大的经济力量。

那些自认能从拆分中获益的人不应该抱有太大希望。首先，政治和法律障碍比比皆是。即使沃伦赢得明年的选举，参议院仍有可能由共和党控制，因而可能不愿支持激进的拆分。而通过监管机构进行拆分似乎同样困难重重。沃伦打算任命一些“坚定不移地撤销不合法和反竞争的科技公司并购”的监管者。但他们很可能不得不为此对簿公堂。而联邦上诉法院的法官和最高法院占多数的保守派都对反垄断持怀疑态度。

其次，实际操作中的困难也会进一步阻碍拆分。沃伦想对亚马逊和苹果实施的“经营范围”限制已被其他行业用于防止企业滥用市场主导地位。比如，美国铁路公司被禁止运载自己的货物，银行被禁止从事贸易活动等。而在数字世界中，这些界线更加随意而多变。

将平台与在平台上运行的服务分割开来听上去很美妙。但这些科技巨头收集的所有数据又该如何分配呢？哪一部分数据属于平台，哪部分不属于？如果它们之间的界线发生了改变又会怎样？即时通讯既可以被视为社交网

络平台的一项功能，也可被视为一项独立的服务。之前微软将其Windows操作系统与浏览器捆绑销售，结果遭到诉讼。当时两者还被视作各自独立的软件，而如今浏览器通常被认为是操作系统的一部分。

第三，对意外后果的担忧也会阻碍拆分。沃伦的计划一定程度上是受法学家莉娜·卡恩（Lina Khan）的启发。卡恩在2017年发表了一篇颇有力的论文《亚马逊的反垄断悖论》（Amazon's Antitrust Paradox），目前她为众议院的反垄断委员会对科技巨头的调查提供咨询。但卡恩在更近的一篇论文中又列举了严加监管的一些弊端。科技的快速演进可能让拆分的操作过时。由于拆分会引发分歧，可能导致涨价。如果平台的业务范围受到限制，它们可能会削减投资，从而阻碍创新。尽管卡恩指出了这些弊端，但她表示它们“并不足以构成不作为的理由”。

更重要的是，仅靠拆分还不足以驯服科技巨头。左倾智库Public Knowledge的哈罗德·菲尔德（Harold Feld）特别提到“海星现象”。有些海星的再生能力惊人——就算将它们撕碎，碎片也能迅速长成新的海星。同样，得益于网络效应，从科技巨头拆分出来的某家公司可能会重新占据主导地位。他认为，拆分还需要辅以削弱网络效应的法规，比如要求不同即时通讯服务的用户之间可以互发消息。

既然存在种种障碍，那还要不要拆分呢？全行业范围内的剥离似乎不太可能，不过就连美国司法部反垄断部门的负责人马坎·德尔拉希姆（Makan Delrahim）也在10月22日表示，拆分已经“蓄势待发”。亚马逊看上去岌岌可危。它颠覆了许多行业，树敌众多。限定经营范围从政治上说似乎相对容易接受。Facebook最有可能被拿来开刀。隐私丑闻以及传播虚假消息致使这家公司成为民主、共和两党共同的攻击目标。

针对Facebook做出指控相对容易。纽约的两位法律学者斯科特·亨菲尔（Scott Hemphill）和吴修铭已经开始着手推动此事。在Facebook的联合创始人、如今却对该公司持批评态度的克里斯·休斯（Chris Hughes）的支持下，他们已向监管机构提交报告，称“有证据表明，自2010年起，Facebook启动了一系列防御性的收购计划，以保住自身主导地位”。

尽管有法律依据，但让业已合并的公司重新分离却并非易事。WhatsApp仍是家独立的实体，但Instagram不是。Instagram与Facebook的社交网络使用同一个广告平台。Facebook正加紧合并旗下最大的几项服务的通讯录，使它们更紧密地整合在一起。Facebook的用户有朝一日将能在WhatsApp上发送信息。Facebook表示，公司的目标是为用户创造更轻松的生活。但批评者认为，它的目标是增加资产剥离的难度。为了避免“不可弥补的损害”，亨菲尔和吴修铭呼吁监管机构出台初步禁令，终止Facebook的整合工作。

Facebook的老板扎克伯格知道自己被盯上了。近期他对员工说，如果沃伦当选总统，“那么我打赌我们将面临法律挑战”。但他又补充说，他敢打赌自己会赢。扎克伯格可能需要仔细研究一下标准石油公司的历史。洛克菲勒当时也是这么想的——但等到他醒悟时，一切为时已晚。 ■



America Inc's profits are under pressure

America Inc reports

CEO confidence declined to its lowest level in a decade

DESPITE A GOOD run of profits and the longest economic expansion in history, the mood in corporate America is darkening. The latest survey of bosses' confidence is plunging. That gloom is reflected in forecasts for the third-quarter earnings season, which is now under way. While the median firm will still see rising profits, earnings per share for the S&P 500 index are expected to fall when compared with the previous year, dragged down by a small number of Goliaths (such as Apple, Exxon and Boeing). Companies continue to splash out on share buybacks, though less zealously than last year. Since 2017 firms that favour buybacks have outperformed the index, according to analysis by Goldman Sachs. But those that used their cash on mergers and acquisitions did even better. Discouragingly, those that ploughed money into capital expenditure and R&D, which are necessary to boost long-term growth, fared far worse. ■



美国公司面临盈利压力

美国公司报告

CEO信心指数跌至十年最低水平

尽管利润飘红，而且又经历了史上最长的经济扩张期，但美国商界的情绪正变得低落。最新调查显示企业老板们的信心骤降。第三季度财报季拉开之际，这种愁闷情绪也渗透进对这一季度财报的预期之中。位于中位的公司盈利预期仍会上升，而标普500公司的每股盈利预计将同比下滑，原因是受到少数几家大公司的拖累，如苹果、埃克森和波音。公司仍在大笔回购股票，尽管较去年已有所收敛。高盛的分析显示，自2017年以来，更偏爱回购股票的公司表现好于总体指数。但那些把资金用于并购的公司表现还要更好。令人沮丧的是，在资本支出和研发等促进长期增长所必需的环节上投下重金的公司处境却糟糕得多。 ■



Management education

The next business revolution

American business schools are reinventing the MBA. About time

ON A VISIT to New York in October Marc Benioff, boss of Salesforce, compared Facebook to cigarettes and backed a corporate tax hike to deal with homelessness in San Francisco. If badmouthing a fellow technology giant and cheering the taxman were not heterodox enough for a billionaire entrepreneur, Mr Benioff laid into American management education. It “programmes” students to favour profit over the public good. This, he noted, is out of step with “the new capitalism”.

Many deans concur. “We need our students to be thoughtful about the role of business in society, particularly at a moment in time when capitalism is coming under attack,” says William Boulding of Duke’s Fuqua School of Business. Nitin Nohria of Harvard Business School (HBS) reports how younger alumni and incoming classes want “the place of work to reflect purpose and values”. Jonathan Levin of Stanford’s Graduate School of Business (GSB) talks of business schools’ responsibility to recognise the societal consequences of corporate actions. “Corporations, their leaders and owners need to act to restore trust,” he intones.

America’s business schools still dominate our annual ranking of the world’s top MBAs (see table). But the industry is being shaken up. According to the Graduate Management Admission Council (GMAC), an industry association, American MBA programmes received 7% fewer applicants this year than last. Nearly three-quarters of full-time, two-year MBA programmes reported declines from coast to coast. Not even the most illustrious ones were spared: HBS (located in Boston) and Stanford’s GSB (in Palo Alto) both saw applications dip by 6% or so. Schools face growing competition from

overseas and online programmes—and, as Mr Benioff's critique implies, questions over hidebound curriculums. "We're being disrupted left, right and centre," confesses Susan Fournier, dean of Boston University's Questrom School of Business.

When management education boomed in the 1960s, American schools taught mostly American students. As the world economy globalised in the 1980s and 1990s, so too did American curriculums and student bodies. Sangeet Chowfla, who heads GMAC, now discerns a "third wave": improved schools outside America are letting foreign students study closer to home (and future employers). Many offer cheaper one-year MBAs, popular in Europe but uncommon across the pond. Whereas three in four two-year MBA programmes in America saw declines in overseas applicants in the latest application cycle, numbers applying to Asian business schools rose by 9% from 2017 to 2018. A recent uptick in America's anti-immigrant sentiment is accelerating the trend.

Americans, too, are cooling on MBAs. More than half of American schools report fewer domestic applicants. Soaring tuition costs, which have far outpaced inflation, put them off as much as they do foreigners. A top-notch MBA will set you back more than \$200,000 (including living costs). Even with financial aid, many students are saddled with \$100,000 debts at graduation. The opportunity cost of forgoing two years' worth of paycheques is higher when the economy is booming and labour markets are tight. Weak demand has caused the number of full-time MBA programmes in America to fall by nearly a tenth between 2014 and 2018, according to the Association to Advance Collegiate Schools of Business, another industry body.

Geoffrey Garrett, dean of the Wharton School, at the University of Pennsylvania, believes that a flight to quality is benefiting top institutions

like his—and their graduates. Add non-wage compensation and alumni often recoup their investments in a few years. Not counting signing bonuses, the average base salary for graduates of the five American schools with the highest earning potential was \$139,000.

Consultancies and investment banks, historically the keenest MBA recruiters, claim their appetite for holders of elite degrees has not diminished. A prestigious MBA “puts a floor on your career”, explains Kostya Simonenko, a 28-year-old consultant on leave from Oliver Wyman (which is paying for his course at Columbia Business School). Silicon Valley, which used to dismiss MBAs as overpaid know-nothings, has become less hostile. As startups grow into large corporations, they need managers to help run things, not just software engineers to run code. A survey of recruiters by GMAC this year found that 80% of technology companies planned to hire MBAs, on a par with consultancies (82%) and financial firms (77%).

Even the finest schools, though, are not sheltered from the forces buffeting business education. Global competition and new technology platforms enable a lower cost structure for the delivery of high-quality courses. This forces “a reckoning of the MBA value proposition”, says Ms Fournier.

As part of that reckoning, Questrom has teamed up with edX, a big online-education firm, to offer a full MBA degree online for just \$24,000, less than a third of the cost of its on-campus equivalent. Better to cannibalise yourself than let others do it, as Ms Fournier puts it. MIT’s Sloan School of Management provides similarly affordable bundles of online courses, dubbed MicroMasters, in areas like supply-chain management and finance. These grant certificates but the credits will be honoured if a student one day decides to pursue a full degree. 2U, an online-education platform, is introducing deferred-tuition schemes for some hybrid MBA degrees. It will share the upfront costs with its business-school partners; students will pay only when they get a job.

It is not just how MBA courses are taught that is changing. So, too, is what they teach. Many budding woke capitalists agree with Mr Benioff—and demand to be taught business beyond the primacy of shareholder value. At Stanford Luisa Gerstner, a millennial MBA student from Germany, notes that sustainable capitalism plays a more central role in European schools. Julia Osterman, her American classmate, laments how, despite some social, environmental and ethical topics in its curriculum, core classes are still “too Finance 101”.

Some of their professors are not so sure. One greybeard at HBS estimates that a third of its faculty (and many older alumni) view the embrace of cuddly “stakeholder capitalism” as an unrigorous sop to political correctness. It certainly introduces lots of grey areas, Mr Boulding concedes. But, he says, schools can at least provide students with “frameworks for making choices”. A new course at Duke is entitled “Capitalism and Common Purpose in a World of Differences”. HBS has made “Leadership and Corporate Accountability” (which delves into “the responsibilities of business to the broader system in which it is embedded”) a required first-year course, with case studies weighing up things like the morality of looking beyond financial metrics at Japan’s Government Pension Investment Fund.

Curriculums are being transformed in less lofty ways, too. Employers, who partly or wholly bankroll half of all executive education, which earns elite schools between \$100m and \$150m a year, want it to impart technical skills. In response, deans such as Costis Maglaras, the newish head of Columbia Business School (and an engineer by training), are bolting courses on data, analytics and programming onto the timetable. As their popularity rises, they may displace stodgier subjects. Columbia used to offer several courses on debt markets but now offers perhaps one each academic year. Meanwhile, students have flocked to coding classes. The idea is not to turn business types into boffins but to prepare them to work with and manage

technical staff, says Mr Maglaras. A recruiter for a big consultancy affirms that tech-savvy MBAs are “very attractive”.

Richard Lyons, former dean of the Haas Business School at the University of California, Berkeley, sees the future in providing lifelong professional education as a service: “Give alumni know-how on demand, searchable online.” Scott DeRue, dean of the University of Michigan’s Ross School of Business, is giving alumni tuition-free access to executive education. “The new stuff will come from insurgents, not the big MBA schools,” thinks John Kao, a management guru who formerly taught at HBS. He wants training benchmarks and standardised transcripts to make skills portable and universally recognised.

At HBS, home to perhaps the most hallowed MBA, Mr Nohria accepts that the market for its traditional offering is shrinking. In a sign of the times, his school has frozen tuition fees. He sees a dramatic expansion for “unbundles” of online education, who “separate knowing, doing and being”. In time, he says, they will converge with “bundles” like HBS. Far from collapsing, he reckons, management education will the richer for it. ■



管理学教育

下一场商业革命

美国商学院正在重塑MBA课程，是时候了

今年10月，Salesforce的老板马克·贝尼奥夫（Marc Benioff）到访纽约，期间他把Facebook比作香烟，又表示支持对企业加税来帮助旧金山的无家可归者。如果对一位身家亿万的企业家来说，讲同行科技巨头的坏话和支持税务部门还算不上特立独行，那么贝尼奥夫还狠批了美国的管理学教育。他认为管理学教育向学生“灌输”利润高于公共利益的思想。他指出，这有违“新资本主义”的理念。

许多商学院院长同声应和。杜克大学富卡商学院（Fuqua School of Business）的威廉·博尔丁（William Boulding）说：“我们需要让学生多加思考商业在社会中扮演的角色，尤其是在资本主义备受炮轰的时刻。”哈佛商学院的尼汀·诺里亚（Nitin Nohria）指出，其年轻一代毕业生和新生希望“职场能体现使命感和价值观”。斯坦福商学院的乔纳森·莱文（Jonathan Levin）谈到，商学院有责任意识到公司行为带来的社会后果。他曼声说道：“公司、其领袖及所有者都需要采取行动，重新赢得公众的信任。”

美国的商学院仍雄霸本刊的全球顶尖MBA课程年度排行榜（见图表）。但这个行业正受到冲击。据行业协会“美国管理专业研究生入学考试委员会”（以下简称GMAC）的数据，美国今年申请MBA课程的人数比去年减少了7%。全美近四分之三的全日制两年期MBA课程的申请人数都出现了下滑。就连名气最大的商学院也未能幸免：位于波士顿的哈佛商学院和位于帕洛阿尔托的斯坦福商学院的申请人数均下降约6%。商学院面临来自海外和在线课程日益激烈的竞争，而且正如贝尼奥夫的批评所示，它们保守僵化的课程也受到越来越多的质疑。波士顿大学奎斯特罗姆商学院（Questrom School of Business）院长苏珊·福尼尔（Susan Fournier）承认：“我们不仅腹背受敌，还被直捣核心。”

上世纪60年代管理学教育蓬勃发展，当时在美国商学院学习的大多是美国学生。到了80、90年代，世界经济迈向全球化，美国的课程和学生群体也朝着这一方向发展。GMAC主席桑吉克·乔弗拉（Sangeet Chowfla）看到“第三股浪潮”正在兴起：由于美国以外的商学院水平提升，外国学生可以在更靠近本国及未来雇主的地方修读课程。很多商学院提供更便宜的一年制MBA课程，这在欧洲很流行，但在大西洋彼岸的美国并不多见。在最近一个申请周期中，美国两年制MBA课程有四分之三出现了海外申请人数下滑的情况，而2017年到2018年，亚洲商学院的申请人数上升了9%。近期美国反移民情绪高涨正在加速这一趋势。

美国人对MBA课程的热情也在降温。超半数美国商学院称其课程的国内申请者在减少。升幅远超通胀的天价学费不但令外国学生却步，也让本地学生生畏。一流MBA课程的学费超过20万美元（包括生活费）。即使有助学金，许多学员到毕业时仍要背负10万美元的债务。当经济繁荣且劳动力市场吃紧时，放弃两年工作薪水的机会成本就显得更高。据另一行业团体“国际商学院促进协会”（Association to Advance Collegiate Schools of Business）的数据，需求疲软导致2014年至2018年间美国全日制MBA课程的数量减少了近十分之一。

宾夕法尼亚大学沃顿商学院的院长杰弗里·加勒特（Geoffrey Garrett）认为，人们对高质量课程的追捧令沃顿这样的顶尖商学院及其毕业生受益。加上非工资报酬，其毕业生通常可在几年内收回投资。不算签约奖金，美国“钱途”最远大的五大商学院毕业生的平均基本工资为13.9万美元。

咨询公司和投资银行历来最热衷招聘MBA毕业生，它们声称自己对于名校毕业生胃口不减。28岁的克里斯托亚·西蒙内科（Kostya Simonenko）在奥纬咨询（Oliver Wyman）担任顾问，公司资助他脱产读哥伦比亚大学商学院的MBA。他解释说，名校MBA学位能“为事业打下基础”。硅谷曾对MBA毕业生不屑一顾，认为他们高薪低能，如今也渐渐收敛了敌意。创业公司在成长为大企业的过程中不单要有软件工程师来编写代码，还需要管理人员来负责运营。GMAC今年对招聘者的一项调查发现，有80%的科技公司

计划招聘MBA毕业生，与咨询公司（82%）和金融公司（77%）的比例基本相当。

但即便是顶尖商学院也难逃各路冲击商业教育的力量。全球竞争和技术平台使得以较低成本提供高质量课程成为可能。福尼尔说，这迫使人们“重新估计MBA的价值主张”。

作为这种重估的一部分，奎斯特罗姆商学院与大型在线教育公司edX合作，提供全套在线MBA学位课程，学费仅为24,000美元，不到同等在校MBA课程的三分之一。正如福尼尔所说，自我颠覆总比被别人打倒强。麻省理工学院斯隆管理学院提供名为“微硕士”课程（MicroMasters）的在线课程包，学费同样实惠，涵盖供应链管理和金融等专业。这些课程授予证书，但涉及的学分要在日后学员攻读完整学位才被承认。在线教育平台2U已开始为一些混合型MBA学位课程推出“延付学费”的计划。平台与合作商学院分担前期费用，学员在毕业找到工作后才支付学费。

MBA课程的改变不仅在于授课方式。授课内容也在变化。许多意识到眼下社会问题的新生代资本家都同意贝尼奥夫的观点，要求MBA课程传授“股东价值第一”以外的经营之道。斯坦福大学商学院来自德国的千禧一代MBA学员路易莎·格斯特纳（Luisa Gerstner）指出，欧洲的商学院更强调可持续资本主义的理念。她的美国同学朱莉亚·奥斯特曼（Julia Osterman）则叹息说，尽管学院的课程内容会探讨某些社会、环境和道德方面的问题，但核心课程仍“过于偏重金融学基础”。

他们的一些教授则持保留态度。哈佛商学院一位资深教授估计，该校三分之一的教员（及许多较年长的校友）认为，拥抱讨人喜欢的“利益相关者资本主义”是无原则地讨好“政治正确”。对此，博尔丁承认这肯定会引入很多灰色地带。但他表示，商学院至少可为学生提供“选择的框架”。杜克大学开设了一门名为《差异化世界中的资本主义和共同目标》的新课程。哈佛商学院已将《领导力和企业责任》（深入研究“企业对自身所处的更广泛体系负有怎样的责任”）作为其MBA的一年级必修课，其中包含一些案例研究，比如权衡在日本政府养老金投资基金中考虑非财务指标是否符

合道德。

课程也变得不那么高高在上了。有一半企业高管的MBA进修是由雇主部分或全部资助的，这每年为顶尖商学院贡献了1亿至1.5亿美元的收入。这些雇主希望课程能传授一些实用技术。为此，哥伦比亚大学商学院的新任院长科斯蒂斯·玛格拉斯（Costis Maglaras，工科出身）等商学院负责人纷纷将数据、分析和编程之类的课程列入课表。随着受欢迎程度提升，这些课程可能会取代一些沉闷的传统课程。哥大商学院曾开设有几门有关债务市场的课程，而现在则可能每学年只开一门这类课程。与此同时，学生特别追捧编程课。玛格拉斯说，这并不是要把商业人才变为科技人员，而是方便他们日后与技术人员共事并管理他们。一家大型咨询公司的招聘人员承认，了解技术的MBA毕业生“非常有吸引力”。

加州大学伯克利分校哈斯商学院（Haas Business School）的前院长理查德·里昂斯（Richard Lyons）认为未来可以把终身职业教育作为一项服务来提供：“向校友按需提供专门知识的学习，且可以在线检索。”密歇根大学罗斯商学院的院长斯科特·德鲁（Scott DeRue）目前向校友提供免费的高管课程。曾在哈佛商学院任教的管理学大师高约翰（John Kao）认为：“新想法将来自创新的机构，而非大型MBA学院。”他希望行业内采用统一的培训基准及标准化成绩单，让技能方便展示并得到普遍认可。

哈佛商学院MBA学位的招牌也许是最响当当的。院长诺里亚也承认其传统课程的市场正在萎缩。为顺应变化，哈佛商学院已经冻结了学费水平。在他看来，把“知、行、成为”分离的在线教育“分拆式”课程正在剧增，而它们日后将与哈佛商学院这类“打包式”课程融合。他认为，管理学教育绝不会崩溃，反而会更加异彩纷呈。 ■



Trade finance

Time's up

The world's oldest, biggest and most intricate paper trail is about to be ripped up

EVERY DAY of the week thousands of visitors flow through Istanbul's fragrant Spice Bazaar. They are a varied collection, local shoppers mingling with camera-wielding tourists. So are the products on offer. While many delicacies on display are Turkish-grown, one trader gets his berries from Iran, his walnuts from Chile and almonds from California. Another, asked if she went all the way to China to buy her jasmine tea, says wryly: "Of course not. Importers ship it here."

Most commodities traded round the world still travel on merchant vessels. From Istanbul's hills you can see them placidly converging on Ambarlı, Turkey's largest port. Less visible is the liquidity that makes those journeys possible. Four-fifths of global trade transactions, worth \$15trn a year, rely on specialised loans or guarantees. This hidden world of trade finance is huge but poorly understood. It has long needed a shake-up, and a nascent revolution promises to unlock trillions in fresh capital. But trade wars are putting that Big Bang in peril.

Trade finance is one of the oldest jobs in banking. Millennia ago merchants in present-day Turkey exchanged cloth or copper for engraved tablets promising a later payment in silver. Trade credit today may be more sophisticated, but it still tackles the same problem: that exporters prefer being paid at the time of sale (so they can finance more production), whereas importers would rather settle up after receiving the goods (so they can first raise the cash by reselling them). Each side rarely trusts the other to keep its end of the bargain.

Trade finance places banks in the middle. Typically, the importer's bank, once presented with a shipping bill or other proof, issues a "letter of credit" to the exporter guaranteeing payment. This allows the exporter to obtain credit from a bank, and then to repay the lender when the ultimate customer pays up. The loans are short-term, usually less than four months. And they are safe. Annual default rates on letters of credit averaged 0.08% of transactions in 2008-17, compared with 1.6% for corporate lending. When loans do sour, recovery is quick.

The work is as unspeakably tedious—thousands of small, similar deals—as it is steady. Annual returns on trade-finance instruments have an average volatility of less than 0.30%, compared with 4.44% for investment-grade bonds. Four-fifths of global transactions are processed by just ten banks, mostly in London, New York or Singapore. Borrowers rarely switch providers. Graduates would rather work on initial public offerings or multi-billion mergers. Business cards change, but not the cast. "It's very incestuous," says a senior banker.

All this explains why an industry that is global by definition is parochial and antiquated. From banks and insurers to warehouses and customs, processing trade credit requires the exchange of 36 original documents and 240 copies, on average; each of the 27 parties involved spends hours if not days fact-finding and form-filling. Less than a quarter of banks use electronic documentation. It is not, as Andrew Colgan of Mizuho, a bank, notes, "a screen-based market". Standards and terminologies vary across the industry, and even within banks.

Since the financial crisis, regulators have made banks set aside more capital against risky or exotic lending. As a result trade finance is punished, because it often serves small firms in poor countries. Watchdogs also want lenders to stop dodgy flows of cash, and the cost of scrutinising customers makes small trade-finance deals unprofitable. So most lenders compete for

big clients, says Joon Kim of BNY Mellon, a bank. Low interest rates have also crushed margins, which have shrunk by a third since 2014.

In response, banks have retreated. The top ten earned 19% of their transaction-banking revenue from trade finance last year, down from 27% in 2010, according to Coalition, a data provider. The Asian Development Bank (ADB) reckons \$1.5trn of financing proposals were rejected in 2018. “Country risk” was cited as a reason by 52% of banks. Nearly half of applications by small firms got nowhere. As supply chains move from China to poorer countries, rejections could rise to \$2.5trn by 2025, says the World Economic Forum. That hurts even big multinationals: many rely on the niche suppliers shunned by banks.

Luckily transformation is coming—on three fronts. First, thanks to the internet and easier international travel, buyers and suppliers know more about each other, which boosts trust. Many blue-chip importers are also keen to lengthen payment terms beyond what exporters can bear. This has fed the rise of “supply-chain finance”(SCF). It usually involves cutting out several steps in the chain, with exporters filing their invoices directly with the importer’s bank, which pays them promptly minus a fee. Suppliers need not waste time and money amassing documents. They benefit from their patrons’ stronger credit rating (as it is the buyer who eventually pays the bank). Last year banks earned \$21bn from SCF, a 12% rise over 2017. It now represents 18% of trade-finance deals.

Second, banks are starting to sell tranches of the loans they originate to third parties, while also acquiring slices of debt from others. That helps to diversify portfolios and increase lending capacity. Surath Sengupta of HSBC, a bank, says it will sell over \$30bn-worth of trade assets in 2019, up from \$2bn three years ago.

Banks still account for over 95% of buyers in this secondary market. But

institutional investors are starting to be lured in—thanks to technology, the revolution's third prong. With its many transactions, trade finance is an ideal training ground for machine learning. Platforms like Tradeteq, a startup, allow banks to repackage short-dated invoices into rolling debt products. Algorithms crunch data to predict credit risks, so investors know what they buy.

More transparency and liquidity could lead data providers like Bloomberg to recognise trade finance as an asset class, bringing it onto the radar of big money managers. Fasanara Capital, a hedge fund with €750m (\$835m) of assets under management, has already invested in over 16,000 trade deals. Stenn International, another firm, aims to quadruple its trade-finance assets to \$2bn within 18 months.

Yet danger looms. Impeded by protectionism and an economic slowdown, the IMF predicts global trade will grow by just 1.1% in 2019, down from 3.6% in 2018. So far that has put only a minor dent in financiers' revenues, in part because supply chains are being reshuffled, bringing global banks new business. But smaller lenders are more exposed. And competition for a shrinking volume of deals could push all lenders to lower interest rates.

That pool may shrink further as the credit standing of borrowers worsens. This year corporate defaults are expected to rise. Meanwhile trade-credit insurance claims are picking up, says Alexis Garatti of Euler Hermes, a firm that insures payments to exporters. This will probably mean rising premiums and more lenders fleeing to the safest borrowers, hurting margins further. "We should expect a mild version of a credit crunch," says Francesco Filia of Fasanara.

The trade war between America and China threatens to erase other gains. Rising uncertainty in 2019, for instance, has led both traders and lenders to demand more paperwork. That feeds a resurgence in letters of credit, at

the expense of supply-chain finance. The shift could accelerate as the trade war leads importers to source their wares from riskier markets, says Sukand Ramachandran of BCG, a consultancy.

Technological progress, at least, cannot be undone. But it can harden emerging divides. The birth of a single global standard—the 20ft container—revolutionised shipping. But partly because of tariffs, partly because fleeting consumer tastes require shorter supply chains, commerce is splintering into regional blocs. If digital standards also develop in silos, rather than as part of a global effort, that may prove impossible to reverse. Trade finance may yet see its container moment float away. ■



贸易融资

时间到

世界上最古老、最庞大、最复杂的连串存根记录即将被撕碎

每天都有成千上万人涌入香气四溢的伊斯坦布尔香料市场。这些访客形形色色，既有当地买家，也有举着相机的游客。市场上摆出的产品也是如此。许多美味食材都是土耳其本地种植的，但一名商贩的浆果来自伊朗，核桃来自智利，杏仁来自加州。当另一个商贩被问到是否远赴中国采购茉莉花茶时，她语带讽刺地说：“当然不是。进口商运过来的。”

跨国贸易中的大多数商品仍然通过商船运输。站在伊斯坦布尔的山丘上，你可以看到这些船缓缓向土耳其最大的港口阿姆巴利（Ambarli）汇聚。而促成这些运输的资金流动却不那么显而易见。全球贸易交易中有五分之四依赖专门的贷款或融资担保，每年价值达15万亿美元。贸易融资这个隐藏的世界疆域广大，但人们对它所知甚少。这个世界早该发生一次剧变，而现在一场革命正在萌发，有望释放数万亿新资本。不过，贸易战却可能令这场“大爆炸”熄火。

贸易融资是银行业最古老的职责之一。几千年前，商人在今天的土耳其境内用小牌匾交换布料或黄铜，牌匾上刻的字保证日后会以白银支付货款。今天的贸易信贷可能更复杂了，但解决的问题还是同一个：出口商希望在售出货物时收到货款，这样就有资金扩大生产；进口商却希望在收到货物后再结算，这样就能通过转售来筹集货款。双方很少会信任对方能信守承诺。

贸易融资在买卖双方中间加上了银行。通常，进口商的银行在收到装运单据或其他证明后会向出口商签发“信用证”，保证付款。这样出口商就可以从银行获取信贷，等客户最终付款时再来偿还。这些贷款是短期的，通常不超过四个月，而且很安全。2008至2017年间，信用证的年度违约率平均仅占交易的0.08%，相比之下，企业贷款的违约率为1.6%。即便信用证贷

款出现违约，追偿也很快。

贸易融资四平八稳，也乏味无比——都是成千上万笔类似的小交易。贸易融资工具年回报的平均波动率小于0.30%，相比之下，投资级债券的平均波动率为4.44%。仅十家银行就处理了全球五分之四的交易，大部分位于伦敦、纽约或新加坡。借款人很少更换金融服务商。毕业生更愿意从事上市或价值数十亿美元的公司合并业务。名片会改，但人还是那些人。“这是个非常封闭、排外的小圈子。”一位资深银行人士说。

所有这些解释了为什么这个行业名义上是全球性的，却又如此的狭隘守旧。从银行、保险公司到仓库和海关，处理贸易信贷平均需要交换36份正本文件和240份副本；过程涉及的27方需要各自花数小时乃至数天时间核实事实和填写表格。只有不到四分之一的银行使用电子文档。正如瑞穗银行（Mizuho）的安德鲁·科尔根（Andrew Colgan）所说，这并非一个“基于屏幕操作的市场”。相关标准及术语在行业内甚至银行间都不尽相同。

自金融危机以来，监管机构已要求银行针对高风险或非常规的贷款留出更多资本拨备。结果贸易融资受到了打击，因为它们经常服务贫穷国家的小公司。监管机构还希望放贷机构阻止可疑的资金流动，而审查客户的成本令小型贸易融资交易无利可图。所以大多数银行都在争夺大客户，纽约梅隆银行的金俊（Joon Kim，音译）表示。低利率也压低了利润，自2014年以来，利润已缩水三分之一。

这让银行纷纷退出。数据提供商Coalition的数据显示，去年十大银行的交易性银行业务收入中，贸易融资占19%，低于2010年的27%。据亚洲开发银行（ADB）估计，在2018年，被拒的融资提案总值达1.5万亿美元。52%的银行以“国家风险”为由拒绝申请。小公司的申请有近半被拒。世界经济论坛表示，随着供应链从中国转移到更贫穷的国家，到2025年，遭拒的融资申请总值可能升至2.5万亿美元。甚至连大型跨国公司也因而受损：许多跨国企业都依赖被银行回绝的利基供应商。

所幸的是变革即将来临。这体现在三个方面。首先，得益于互联网及更便

捷的国际旅运，买家和供应商加深了对彼此的了解，增进了信任。许多蓝筹进口商也渴望把付款时限延长到出口商可承受范围之外，这促成了“供应链融资”的兴起。它通常会省去链条中的某些环节，出口商直接向进口商的银行提交票据，银行在扣除一定费用后立即向出口商支付货款。供应商无需浪费时间和金钱来收集单据。它们得益于其客户信用评级的提升，毕竟最终是买家向银行支付货款。去年，银行通过供应链融资获利210亿美元，比2017年增加了12%。供应链融资现在占到了贸易融资的18%。

其次，银行开始向第三方出售自己的部分贷款，同时也从其他机构购入部分债务。这有助于实现投资组合多样化并提升放贷能力。汇丰银行的苏拉特·圣古塔（Surath Sengupta）表示，汇丰将在2019年出售价值超过300亿美元的贸易资产，而三年前仅为20亿美元。

在这个二级市场上，银行仍占到买方的95%。但是，由于第三个方面的变革，即新技术的出现，机构投资者也开始被吸引进来。贸易融资交易量大，是机器学习的理想训练场。像创业公司Tradeteq这样的平台能让银行把短期票据重新打包为滚动债务产品。算法分析数据，预测信用风险，方便投资者了解所购买的产品。

透明度及流动性的提高可能会让彭博这样的数据供应商将贸易融资识别为一种资产类别，进而将之引入大型资本管理公司的视野。管理着7.5亿欧元（8.35亿美元）资产的对冲基金Fasanara Capital已经投资了超过16,000笔贸易融资交易。另一家公司誓腾国际（Stenn International）则力争在18个月内将其贸易融资资产翻两番，达到20亿美元。

然而其中也隐现风险。国际货币基金组织预测，受贸易保护主义和经济放缓的阻碍，2019年全球贸易将仅增长1.1%，低于2018年的3.6%。截至目前，这给银行的收入仅带来了轻微的损失，部分原因是供应链正在重组，为全球性银行带来了新业务。但是较小型贷款机构的风险敞口较大。而交易量萎缩也可能迫使所有贷款机构下调利率来争夺市场。

随着借款人信用状况恶化，资金池也可能进一步缩小。今年的公司违约预

计会上升。同时，贸易信贷保险的索赔也在增多，向出口商提供货款结算保险的裕利安宜（Euler Hermes）的亚历克西斯·加拉蒂（Alexis Garatti）表示。这可能意味着保费会上涨，贷款机构更多转向最安全的借款人，从而进一步损害利润。“未来可能出现一轮轻微信贷紧缩。”Fasanara Capital的弗朗西斯科·菲利亚（Francesco Filia）说。

中美贸易战也可能抵消其他收益。比如在2019年，不确定性增加导致贸易商和贷款机构都要求所涉各方提供更多单据。这推动信用证再度复兴，打击了供应链融资。波士顿咨询公司的苏坎德·拉马钱德兰（Sukand Ramachandran）认为这种转向可能会加速，因为贸易战迫使进口商从风险更高的市场采购商品。

至少技术进步是无法逆转的。但它可能加剧新的分歧。20英尺集装箱这一全球单一标准的出现在当年彻底改变了航运业。而如今，商业世界正分裂为区域集团，既有关税的因素，也是因为消费者口味多变而需要缩短供应链。假如数字标准也是由各区域集团独自制定，而非通过全球协作达成，分歧也许就无法逆转了。贸易融资可能会错失自己的“集装箱时刻”。■



Bartleby

Second thoughts

It pays companies to encourage a variety of opinions

THE STORY of the emperor's new clothes is one of Hans Christian Andersen's best-known fables. Conmen fool the monarch into believing they have made him a fabulous suit that the unworthy will be unable to see. Courtiers dare not say that the emperor is naked; it takes a child to point out the obvious.

The moral is that people are often too hidebound by social convention to state their views. How many companies have ploughed ahead with expensive projects that were favoured by the chief executive, even when other managers have had doubts? In his new book "Rebel Ideas: The Power of Diverse Thinking", Matthew Syed, a sportsman-turned-journalist, argues that the key to dealing with this problem is "cognitive diversity". In other words, assembling a team of people with different perspectives and intellectual backgrounds.

He begins with the striking example of the failure of the American authorities to prevent the terrorist attacks of September 11th 2001. An important reason, he argues, was that the CIA was dominated by white Christian males, who failed to grasp how Osama bin Laden was exploiting Islamic symbols to build support. Or take the British government team that introduced the poll tax in 1989-90, a disastrous policy that led to riots in Trafalgar Square. The policy's masterminds were all drawn from wealthy stock and did not appreciate quite how hard it would hit low-earners.

People from different backgrounds approach problems from different angles—that much should be blindingly obvious. It is not just about

selecting people for teams from both sexes and various ethnicities (though that, too). Hire only Cambridge politics graduates (or Harvard MBAs or Stanford software engineers) and they will have studied under the same professors and absorbed similar world views, regardless of their gender or skin colour.

In the modern world, with all its complexity, co-operation is essential if breakthroughs are to be made. In science and engineering, 90% of papers are now written by teams rather than individuals. Analysis of American patent filings since 1975 showed teams dominate in every one of the 36 defined categories.

There are two elements to selecting a good team. First, assemble people with diverse viewpoints. Second, ensure that those viewpoints are heard and respected. That may not happen if those in charge are overbearing. A study of over 300 projects by the Rotterdam School of Management found that those led by junior managers were more likely to succeed than those led by senior managers—maybe because other team members were less intimidated about pointing out potential pitfalls to someone lower down the pecking order.

The ability to speak up within an organisation, without fear of sanction, is known as “psychological safety” and was described by Amy Edmondson of the Harvard Business School in a book on the issue. Mr Syed cites a study of teams at Google, which found that self-reported psychological safety was by far the most important factor behind successful teamwork at the technology giant.

One way to overcome diffidence while brainstorming, for instance, is for everyone to write down their ideas but ensure they are anonymous. That way, opinions about thoughts are less closely tied to the seniority of the thinker and can be tested against each other with less fear or favour (though

some degree of second-guessing is probably unavoidable). Increasing the number and range of ideas on offer (within reason) may be the secret of success. As Mr Syed writes, the willingness to share knowledge pays off in a world of complexity.

Another advantage of diversity is that outsiders can spot profitable opportunities that insiders may miss. Immigrants account for 13% of the American population but 27.5% of those who start a new business. By their nature, migrants have more get-up-and-go than the average person—otherwise they wouldn't move. Some may start businesses because existing ones won't hire foreigners. But Mr Syed is probably right that experiencing more than one culture is a competitive advantage.

A fresh perspective may help existing firms, too. Studies show that firms with more diverse boards enjoy higher returns than ones with identikit directors. Correlation is not causation, of course; successful businesses may feel freer to appoint atypical board members. But a bit of variety can't hurt. ■



巴托比

集思广益

鼓励各抒己见于公司有利

《皇帝的新装》是安徒生最著名的寓言故事之一。骗子们愚弄了皇帝，让他相信他们为他做了一件不称职的人看不见的神奇衣服。朝臣都不敢说皇帝其实什么也没穿。最终还是一个小孩指出了这明摆着的事实。

这个故事的寓意是人们往往因社会习俗的束缚而难以直言想法。有多少公司在其他管理人员心存疑虑的情况下硬着头皮推进首席执行官倾心的昂贵项目？由运动员转型为记者的马修·赛义德（Matthew Syed）在新书《反叛想法：多元思维的力量》（Rebel Ideas: The Power of Diverse Thinking）中指出，解决这个问题的关键是“认知多样性”。换句话说，就是要组建一支拥有不同观点和知识背景的成员的团队。

他在书的开篇举了一个引人注目的例子——为什么美国当局未能阻止2001年的9·11恐怖袭击。他认为一个重要的原因是美国中情局的工作人员主要是信仰基督教的男性，他们未能理解本·拉登是如何利用伊斯兰教符号壮大自己的支持力量的。另一个例子是英国政府官员在1989至1990年推行的人头税，这一灾难性政策导致伦敦特拉法尔加广场发生骚乱。拟定这项政策的官员都来自富裕家庭，完全不明白这会对低收入者造成多大的冲击。

不同背景的人会从不同角度看待问题，这一点应该是极其明显的。组建多元化团队并不仅仅是从不同性别和种族中选拔人员（尽管这一点也很明显）。如果只聘用剑桥政治系的毕业生（或者哈佛的MBA或是斯坦福的软件工程师），不论性别肤色如何，他们都师从同样的教授、吸收了相似的世界观。

现代世界纷繁复杂，要取得突破，协作是必须的。在科学和工程领域，如今90%的论文都是由团队而非个人完成。针对1975年以来美国专利申请的分析表明，在所划分的全部36个类别中，团队申请都是主流。

组建优秀的团队讲究两个要素。首先，集合持不同观点的人。第二，确保听取并尊重这些不同的观点。如果主管专断霸道，这两点就难以做到。鹿特丹管理学院（Rotterdam School of Management）就300多个项目开展的研究发现，初级管理人员所负责项目的成功率比高级管理人员更高，可能是因为团队的其他成员更有胆量向职位较低的主管指出潜在的问题。

可在组织内大胆发表意见而不用担心被“秋后算账”，这被称为“心理安全感”，哈佛商学院的艾米·埃德蒙森（Amy Edmondson）在有关该问题的著述中做过详述。赛义德引用了对谷歌团队的一项研究，发现员工自述的心理安全感是这家科技巨头内部的团队能成功协作的最重要因素。

例如，在团队开展头脑风暴时，克服羞怯的一个办法是让所有人写下自己的想法，但确保匿名。如此一来，团队成员看待想法时就不会那么多地考虑提出者的资历，因而能较为不偏不倚地对比检验这些想法（尽管一定程度的猜测可能在所难免）。在合理范围内尽量增加想法的数量和丰富度可能是成功的秘诀。正如赛义德所写的，在一个复杂的世界里，愿意分享知识会带回来报。

多元化的另一个优势是局外人可以发现局内人可能错失的获利机会。移民占美国人口的13%，但占了创业人口的27.5%。从个性上讲，移民比一般人更干劲十足，不然他们也不会远走他乡。有些移民选择创业是因为现有公司不雇用外国人。但也可能真如赛义德所认为的那样，拥有多文化背景是一种竞争优势。

全新的视角同样可能有益于现有公司的发展。研究表明，比起董事背景较单一的公司，董事背景更为多元化的公司拥有更高的回报率。当然，相关并不代表存在因果关系。成功的企业也许能更自由地任命非典型的董事。但是，多一点多元化不会有害处。■



Schumpeter

The spirit of Carlos

What a great European car boss can teach a troubled industry

IN 2013 TWO Carloses sat atop the Renault-Nissan alliance. One was Carlos Ghosn, the Brazilian-born architect of the Franco-Japanese carmaking colossus. His protégé was Carlos Tavares, the Portuguese chief operating officer of Renault, who made sure that good cars rolled off the production line. But Mr Tavares, an engineer and racing driver, was not content trailing the fast-living Mr Ghosn. As he revealed in an interview that year, his ambition was to lead a big car company, such as General Motors. Mr Ghosn was horrified. Shortly afterwards, Mr Tavares quit Renault. A few months later he was boss of PSA Group, maker of Peugeot and Citroën, Renault's domestic rival. It was the start of a series of manoeuvres that have now made him the talk of the car industry, much like Mr Ghosn before and after his arrest in Japan last year on charges of financial misconduct (which Mr Ghosn denies).

On October 30th the boards of PSA and Fiat Chrysler Automobiles (FCA), an Italian-American company, said the two firms planned to merge. Mr Tavares would become chief executive of the combined group and John Elkann, FCA's chairman (who sits on the board of *The Economist's* parent company), would chair its board. It would create the world's fourth-biggest carmaker by vehicle sales, with a market value of around \$50bn. On-off discussions between the two firms were ruptured in early summer when FCA attempted to merge with Renault, a deal that was thwarted by Renault's biggest shareholder, the French government. The merged group would probably find most of the €3.7bn (\$4.1bn) of annual cost-savings they hope to achieve in Europe, a stagnant market where stringent environmental regulations are about to make carmakers' lives tougher still. Competition

issues in parts of Europe, feisty unions and messy politics could yet scupper any deal. Furthermore, it is not clear whether Peugeot is Fiat's preferred partner.

But the planned mega-merger puts the spotlight squarely on Mr Tavares. As Max Warburton of Bernstein, a broker, puts it: "Those of us who subscribe to the Great Man Theory will be fascinated to see what Tavares could achieve at FCA, were he given the chance."

The "Great Man Theory" Mr Warburton is referring to states that big car-industry mergers are a murderous task that only a true leader can hope to pull off. Fiat's revered late boss, Sergio Marchionne, managed this feat with Chrysler. Mr Ghosn succeeded in holding the Renault-Nissan alliance together for many years.

A corollary to the Great Man Theory is what could be called the "Big Firm Hypothesis". Typically attributed to Marchionne, it posits that huge challenges facing the industry, such as electric vehicles and self-driving cars, necessitate global consolidation. To an extent Mr Tavares embodies both doctrines, having swiftly turned around first Peugeot, after it was battered by the financial crisis of 2008-09, then Opel and Vauxhall, which he bought from GM in 2017. But what truly sets him apart is his ability to turn carmakers into, as he has put it, "psychopaths of performance". That tireless devotion to profits, even if it comes at the expense of personal greatness or corporate bigness, is a lesson most of the industry could learn.

The fraught Renault-Nissan tie-up is a case in point. In the wake of Mr Ghosn's fall from grace last November it has been an example of how not to run a car empire. Well before his arrest, the arrangement had serious flaws. Rather than being a global network built around strong brands and factory-wide economies of scale, it was more of a global car park. It filled different parts of the world with as many of each firm's cars as possible

(and those of Mitsubishi, the alliance's other Japanese partner), whatever their price and quality. It was riven with jealousies. Nissan had long chafed at a shareholding structure that gave it less sway than Renault. Worse, the Japanese firm resented the control that the French government, which owns barely 15% of Renault, exercised over the partnership. It also feared French ambitions to take it over.

Since Mr Ghosn's arrest things have gone from bad to worse. Renault's abortive merger with FCA showed what an irksome meddler the French state has become. It has obstinately refused to make any concessions to the wary Japanese, for instance by selling down Renault's stake in Nissan to rebalance the shareholding or by reducing its own stake in Renault. In the meantime the feud has distracted all three alliance members from the business of selling cars. Nissan's sales have shrunk. Profits are plunging. Renault's volumes are dropping, too. Its balance-sheet is coming under strain, especially since it will get less cash from its 43% stake in Nissan, which recently slashed its dividend.

In the eyes of the French government, the best answer is to double down on the alliance. Renault's chairman, Jean-Dominique Senard, has vowed to do just that, hoping that a recent change of leadership at the top of both Renault and Nissan will help. Investors would prefer a clearer break with the past. Some want Renault to sell some of its Nissan shares and use the money to strengthen its balance-sheet, as a prelude to a more equitable alliance. Others want a full merger of the two. The boldest had hoped for a grand bargain, in which a stronger Renault once again courts FCA, with Nissan in tow.

The talks between Peugeot and FCA have, for the time being at least, sent the grand-bargain idea careening off the road. It has left Renault and Nissan looking stranded. That makes it imperative for them to do what Mr Tavares has done with Peugeot, Opel and Vauxhall: put profitability front and centre.

As Mr Tavares has said, “there’s going to be chaos between now and 2030. Not all manufacturers will survive the Darwinism, not all will master the electric-vehicle track.” Some regard consolidation as the best way to navigate the disruption. Others see the need for a great leader, who can build and maintain alliances. One thing is certain—none will succeed without a Tavaresque focus on the bottom line. ■



熊彼特

卡洛斯精神

麻烦重重的汽车产业能从一个伟大的欧洲汽车公司老板那里学到什么

二〇一三年，有两位卡洛斯在雷诺-日产联盟身居高位。一位是出生于巴西的卡洛斯·戈恩（Carlos Ghosn），是这家法日汽车超大联盟的缔造者。一位是受他提携的葡萄牙人唐唯实（Carlos Tavares），是雷诺的首席运营官，负责确保从生产线上下来的车品质优良。但既是工程师又是赛车手的唐唯实并不满足于跟在风风火火、行事大胆的戈恩身后。他在那年的一次采访中透露，自己的志向是领导一家大型汽车公司，例如通用汽车。这让戈恩大为震惊。之后不久，唐唯实离开了雷诺。几个月后，他成了PSA集团的老板。PSA集团拥有标致和雪铁龙两个品牌，雷诺是其国内竞争对手。由此开始，唐唯实使出了一系列招数，成为了汽车行业当下的话题人物，就像戈恩去年因财务行为不当的指控在日本被捕前后一样（戈恩否认了指控）。

上月30日，PSA集团和意美联合企业菲亚特克莱斯勒（FCA）的董事会表示两家公司计划合并。合并后，唐唯实将出任新集团的首席执行官，FCA的董事长约翰·埃尔坎（John Elkann，为《经济学人》母公司董事）将出任新集团的董事长。按销售量计算，合并后的公司将成为全球第四大汽车制造商，市值约500亿美元。两家公司的谈判断断续续，初夏时还曾一度破裂——当时FCA试图与雷诺合并，不过雷诺最大的股东法国政府阻止了交易。合并后的集团希望每年能节省37亿欧元（41亿美元）的成本，其中大部分可能在欧洲实现。欧洲市场不景气，严格的环境法规将令汽车制造商的日子难上加难。考虑到欧洲部分地区的竞争问题、好斗的工会以及混乱的政治局势，任何交易都有可能泡汤。此外，尚不清楚标致是否为菲亚特的首选合作伙伴。

但是，这个计划中的大型合并交易将唐唯实直接放在了聚光灯下。正如经纪公司盛博的马克斯·沃伯顿（Max Warburton）所说：“我们当中认同‘伟

人理论’的人都会抱着极大的兴趣，等着看唐唯实能在FCA干成些什么——如果他有这个机会的话。”

沃伯顿提到的“伟人理论”认为大型汽车企业的合并极难成功，只有真正的领导人才有望成就大事。菲亚特备受尊敬的已故老板塞尔吉奥·马尔乔内（Sergio Marchionne）完成了与克莱斯勒合并的壮举。雷诺-日产联盟多年保持稳固不散则是戈恩的功劳。

从“伟人理论”可以推断出所谓的“大公司假说”，一般认为这是马尔乔内提出的。根据这一假说，汽车行业面临电动汽车和无人驾驶汽车等巨大挑战，必须展开全球整合才能应对。在某种程度上，这两种理论在唐唯实身上都有所体现，他先是在2008至2009年的金融危机重创了标致后迅速扭转乾坤，后来又成功拯救了2017年从通用汽车收购的欧宝（Opel）和沃克斯豪尔（Vauxhall）。但他真正的与众不同之处在于有能力把汽车制造商变成他口中的“绩效的变态追求者”。不懈追求利润，即使牺牲个人或企业的伟岸形象也在所不惜——这对行业内大多数公司来说都是可以汲取的经验。

雷诺与日产之间问题重重的联合就是一个很好的例子。去年11月戈恩身败名裂之后，雷诺-日产联盟已成为经营汽车帝国的一个反例。早在他被捕之前很久，这个联盟就已存在严重缺陷。它本应是一个围绕着强大品牌和生产上的规模经济而打造出的全球网络，实际上却更像一个全球停车场。它让世界各地尽可能多地充斥联盟公司的汽车（包括联盟的另一家日本合作伙伴三菱的汽车），而不管它们价格和质量如何。联盟因成员互相猜忌而陷于分裂。日产对股权结构的设置长期不满，认为这令它的影响力小于雷诺。更糟糕的是，日产怨憎拥有雷诺15%股份的法国政府对联盟的控制，同时还担心法国人野心勃勃地想要接管自己。

戈恩被捕后，局面更是每况愈下。雷诺与FCA合并计划的流产表明法国政府已成为一个令人讨厌的干预者。对于心怀戒备的日本人，它顽固地拒绝做出任何让步，例如让雷诺减持日产股份以重新平衡持股比例，或减持自己在雷诺的股份。同时，因股权结构而起的争执还让所有三个联盟成员都

无法专注于汽车销售业务。日产的销量下降，利润暴跌。雷诺的销量也在下降，资产负债表正面临压力，尤其是雷诺从所持的日产43%的股份中获得的现金将减少——日产近期大幅削减了股息。

在法国政府看来，最好的解决办法是加倍强化现有联盟。雷诺董事长让·多米尼克·塞纳德（Jean-Dominique Senard）誓言要做到这一点，他希望雷诺和日产近期的高层变动能有所帮助。投资者希望联盟能与过去更彻底地决裂。一些投资者希望雷诺出售所持日产的部分股份，并用这笔钱去强化其资产负债表，以此为起点建立更公平合理的联盟。其他投资者则希望两者完全合并。最大胆的投资者希望来一场“大交易”，由更强势的雷诺拉上日产再一次寻求与FCA合并。

至少就目前来看，标致与FCA间的谈判已经让展开大交易的想法落空。雷诺和日产看上去陷入了困境。这让它们必须效仿唐唯实对标致、欧宝和沃克斯豪尔的做法：一切以盈利为重。正如唐唯实所言，“从现在起到2030年将会是一片混乱。不是所有的汽车制造商都能生存下来，也不是所有制造商都能驾驭电动汽车的轨道。”有些人将整合视为应对行业洗牌的最佳方法。其他人则认为需要一个能建立和维持联盟的伟大领导者。可以肯定的是，如果不像唐唯实那样专注盈利，谁都不会成功。■



Trade war

Phase one, scene two

China tries to squeeze more out of a mini-deal with America

THE TRADE conflict between China and America has been a clash not just of giant economies but of utterly different public negotiating styles. In one corner are President Donald Trump's tweets, in which he veers between heaping praise on China and declaring that he has pummelled it. In the other is a Chinese bureaucracy that has stuck doggedly to the same message: tariffs must be removed for the two countries to reach a trade agreement. A mini-deal, hashed out last month, is shaping up to be a mini-test of their contrasting approaches.

The outline of the mini-deal—or, as Mr Trump put it, the “substantial phase-one deal”—seemed clear enough. China would buy American agricultural products, and America would hold back from slapping yet more tariffs on China. With this basic agreement under their belts, the two combatants would move onto weightier topics such as China’s support for its strategic industries. But two problems have since emerged: one predictable, one not.

As was foreseeable at the time, the lack of detail about the mini-truce concealed big differences. Mr Trump said that trade talks had been “a love fest”, and that China would buy \$40bn-50bn in farm goods from America, more than double the level before the trade war. But the more he gloated, the more China appears to have seen an opening to push for more. According to multiple reports, Chinese negotiators have demanded that to complete the mini-deal, America must remove some of its existing tariffs, not just refrain from new ones.

China’s gambit might just pay off. On November 4th a Trump administration

official reportedly said that a phase-one deal between America and China could roll back the 15% tariff imposed on September 1st, on \$112bn of goods. China could be offering some sweeteners such as a purchase of liquefied natural gas, which Wilbur Ross, America's commerce secretary, hinted at on November 5th. But the tariff reduction would be an American concession. The previous stance of Robert Lighthizer, America's chief trade negotiator, was that tariffs should remain until China proves that it is honouring whatever deal is struck.

The unpredictable complication was Chile's big protests. Mr Trump and Xi Jinping, his Chinese counterpart, had hoped to seal their mini-deal on neutral ground at a summit of Asia-Pacific countries in Chile in mid-November. But the organisers have cancelled the summit. That poses the question of where and when the leaders should meet, itself a matter of negotiation. Given Mr Trump's tendency to improvise, China wants to be sure there is a political win on the table before it agrees to meet.

The Chinese may yet include more juicy titbits for American businesses as part of the mini-deal. But even if it is signed without a hitch, the trade war will be far from over. Hundreds of billions of dollars of Chinese exports would still be affected by tariffs and companies would still have to live with the uncertainty of the old ones coming back. Mr Trump would still have the final word, and another one after that too. ■



贸易战

第一阶段，第二幕

中国试图从与美国达成的迷你协议中争得更多利益

中美贸易战不仅是巨型经济体之间的交锋，还是两种迥乎不同的政府谈判方式之间的角力。在擂台的一角，特朗普的推文来回转向，一时盛赞中国，一时又宣称自己痛击了中国。另一角，中国政府死守同一点：两国要达成协议，必须撤销关税。上月谈成的一项“迷你协议”逐渐成为检验双方迥异打法的迷你测试。

这一迷你协议（特朗普称之为“实质性第一阶段协议”）的大致内容似乎已很清楚。中国将购买美国农产品，美国将停止对中国加征新关税。在这一基本协议的基础上，角斗双方将转入更重量级的议题，例如中国政府对战略性产业的扶持。但两个问题已经显现，一个可以料想，另一个属意料之外。

当时就可以料想到的是，这一迷你休战协议缺乏细节，掩盖了双方的巨大分歧。特朗普此前表示，中美之间的连串贸易谈判是一种“惺惺相惜”，又说中国将从美国购买400到500亿美元的农产品，是贸易战之前的两倍多。然而他越是自鸣得意，中国似乎就越觉得有机会争取更大的利益。据多方报道，中国谈判代表已提出，要完善迷你协议，美国必须取消部分现有关税，而非仅仅停止加征新关税。

中国这一险着或许真能奏效。据称特朗普政府的一位官员在本月4日表示，依照中美第一阶段协议，美国可能会撤回自9月1日起对1120亿美元的中国出口商品征收的15%的关税。中国可能将报以一些甜头，例如像美国商务部长罗斯在5日暗示的那样，从美国进口液化天然气。但撤回关税对美国而言是个让步。美国首席贸易谈判代表罗伯特·莱特希泽（Robert Lighthizer）以往的立场是，在中国证明它切实履行所达成协议的要求之前，美国应维持已征关税。

意料之外的麻烦是智利发生了大规模抗议活动。特朗普和中国国家主席习近平之前希望，趁11月中旬亚太经合组织峰会在智利举行之时在这一中立地点签署迷你协议。但组织方已经取消了峰会。这样一来，双方又得就两位领导人该在何时何地会晤这一点先做一番磋商。鉴于特朗普喜欢临时起意，中方要确信自己能取得政治上的胜利才会同意和他会面。

作为这项迷你协议的一部分，中国可能还会给美国企业更多甜头。但是，即便双方顺利签署这项协议，贸易战也远未结束。数以千亿美元计的中国出口商品仍将受到美国关税的影响，企业也仍面对已取消的关税卷土重来的变数。特朗普仍然会在最后一锤定音，然后再加一锤。 ■



Alcohol and health

A sober brawl

Alcohol firms promote moderate drinking, but it would ruin them

OF ALL THE substances people intoxicate themselves with, alcohol is the least restricted and causes the most harm. Many illegal drugs are more dangerous to those who use them, but are relatively hard to obtain, which limits their impact. In contrast, alcohol is omnipresent, so far more people suffer from its adverse effects. In 2010 a group of drug experts scored the total harm in Britain caused by 20 common intoxicants and concluded that alcohol inflicted the greatest cost, mostly because of the damage it does to non-consumers such as the victims of drunk drivers.

No Western country has banned alcohol since America repealed Prohibition in 1933. It is popular and easy to produce. Making it illegal enriches criminals and starts turf wars. In recent years governments have begun legalising other drugs. Instead, to limit the harm caused by alcohol, states have tried to dissuade people from drinking, using taxes, awareness campaigns and limits on where, when and to whom booze is sold.

The alcohol industry has pitched itself as part of the solution. In Britain more than 100 producers and retailers have signed a “responsibility deal” and promised to “help people to drink within guidelines”, mostly by buying ads promoting moderation. However, if these campaigns were effective, they would ruin their sponsors’ finances. According to researchers from the Institute of Alcohol Studies, a think-tank, and the University of Sheffield, some two-fifths of alcohol consumed in Britain is in excess of the recommended weekly maximum of 14 units (about one glass of wine per day). Industry executives say they want the public to “drink less, but drink better”, meaning fewer, fancier tipplers. But people would need to pay

22-98% more per drink to make up for the revenue loss that such a steep drop in consumption would cause.

Health officials have taken note of such arithmetic. Some now wonder if Big Booze is sincere in its efforts to discourage boozing. In 2018 America's National Institutes of Health stopped a \$100m study of moderate drinking, which was partly funded by alcohol firms, because its design was biased in their products' favour. And this year the World Health Organisation and England's public-health authority banned their staff from working with the industry.

Producers are ready to fend off regulators. In 1999 alcohol firms invested half as much on lobbying in America as tobacco firms did. Today they spend 31% more. ■



酒精和健康

清醒的打击

酒类公司提倡适度饮酒，但这会毁了它们

在所有致醉物质中，酒精受到的限制最少，造成的危害最大。许多非法药物对使用者更危险，但相对较难获得，影响因而受限。相比之下，酒精无处不在，受其负面作用影响的人也就多得多。2010年，一组药物专家评估了最常见的20种麻醉品在英国造成的总伤害，得出的结论是酒精造成的损失最大，主要是因为它对非饮酒人造成的伤害，比如酒驾事故的受害者。

自1933年美国废除禁酒令以来，没有一个西方国家禁酒。酒既受欢迎又容易生产。把它定为非法只会养肥罪犯，引发地盘之争。近年来，各国政府已开始将其他药物合法化。而为了限制酒精带来的危害，各国尝试通过征税、开展宣传活动以及限制酒的销售地点、时间和对象来劝阻人们不要喝酒。

酒类行业将自己塑造成解决方案的一部分。在英国，一百多家生产商和零售商签署了一项“责任书”，承诺“帮助人们按指导方针饮酒”，主要是通过发布宣传适度饮酒的广告。但是，如果这些活动真的奏效，它们会损害赞助商的收入。据智库酒精研究所（Institute of Alcohol Studies）和谢菲尔德大学的研究人员所述，英国人喝掉的酒有约五分之二属于超出推荐饮酒量的部分——推荐饮酒量为每周不超过14个单位（大约相当于每天一杯葡萄酒）。酒业高管说，他们希望公众“少喝酒，喝好酒”，也就是说喝少点、喝贵点。但是，若要弥补消费如此急剧下降而损失的收入，需要人们为每一杯酒多花22%到98%的钱。

卫生部门的官员已经觉察到了这笔帐。有些人现在怀疑酒业巨头是否真的在努力阻止人们酗酒。2018年美国国立卫生研究院（National Institutes of Health）停止了一项耗资1亿美元、由酒类公司提供部分资金的适度饮酒研究，因为研究的设计偏袒这些公司的产品。今年世界卫生组织和英格兰

的公共卫生部门已禁止雇员与酒业合作。

生产商已准备好抵挡监管机构的进攻。1999年，酒类公司在美国的游说投入是烟草公司的一半。现在它们在这方面的花费比烟草公司多31%。■



Chinese demography

Old, not yet rich

Forget bad debts, the trade war, cronyism and autocracy. Demography may be the Chinese economy's biggest challenge

SHORTLY AFTER 9am the neighbourhood care centre for the elderly shuffles to life. One man belts out a folk song. A centenarian sits by his Chinese chessboard, awaiting an opponent. A virtual-reality machine, which lets users experience such exotic adventures as grocery shopping and taking the subway, sits unused in the corner. A bigger attraction is the morning exercise routine—a couple of dozen people limbering up their creaky joints. They are the leading edge of China's rapid ageing, a trend that is already starting to constrain its economic potential.

Since the care centre opened half a year ago in Changning, in central Shanghai, more than 12,000 elderly people from the area have passed through its doors. The city launched these centres in 2014, combining health clinics, drop-in facilities and old-people's homes. It plans to have 400 by 2022. "We can't wait. We've got to do everything in our ability to build these now," says Peng Yanli, a community organiser.

The pressure on China is mounting. The coming year will see an inauspicious milestone. The median age of Chinese citizens will overtake that of Americans in 2020, according to UN projections (see chart). Yet China is still far poorer, its median income barely a quarter of America's. A much-discussed fear—that China will get old before it gets rich—is no longer a theoretical possibility but fast becoming reality.

According to UN projections, during the next 25 years the percentage of China's population over the age of 65 will more than double, from 12% to

25%. By contrast America is on track to take nearly a century, and Europe to take more than 60 years, to make the same shift. China's pace is similar to Japan's and a touch slower than South Korea's, but both those countries began ageing rapidly when they were roughly three times as wealthy per person.

Seen in one light, the greying of China is successful development. A Chinese person born in 1960 could expect to live 44 years, a shorter span than a Ghanaian born the same year. Life expectancy for Chinese babies born today is 76 years, just short of that in America. But it is also a consequence of China's notorious population-control strategy. In 1973, when the government started limiting births, Chinese women averaged 4.6 children each. Today they have only 1.6, and some scholars say even that estimate is too high.

Fertility was bound to decline as China got wealthier, but the one-child policy made the fall steeper. Even though the country shifted to a two-child policy in 2016 and may soon scrap limits altogether, the relaxation came too late. The working-age population, which began to shrink in 2012, will decline for decades to come. By the middle of the century it will be nearly a fifth smaller than it is now. China will have gone from nine working-age adults per retired person in 2000 to just two by 2050.

The economic impact is being felt in two main ways. The most obvious is the need to look after all the old people. Pension payouts to retired people overtook contributions by workers in 2014. According to the Chinese Academy of Social Sciences, the national pension fund could run out of money by 2035. The finance ministry is taking small steps to shore the system up: in September it transferred 10% of its stakes in four giant state-owned financial firms to the fund. But far more is needed. Government spending on pensions and health care is about a tenth of GDP, just over half the level usual in older, wealthier countries, which themselves will have to

spend more as they get even older.

The second impact is on growth. Some Chinese economists—notably Justin Lin of Peking University—maintain that ageing need not slow the country down, in part thanks to technological advances. But another camp, led by Cai Fang of the Chinese Academy of Social Sciences, has been winning the argument so far. A shrinking labour pool is pushing up wages and, as firms spend more on technology to replace workers, pushing down returns on capital investment. The upshot, Mr Cai calculates, is that China's potential growth rate has fallen to about 6.2%—almost exactly where it is today. The labour shortage is hitting not just companies but entire cities. From Xi'an in the north to Shenzhen in the south, municipalities have made it easier for university graduates to move in, hoping thereby to attract skilled young workers.

China could, in theory, mitigate the downside from its ageing by boosting both labour-force participation and productivity—that is, getting more people into work and more out of them. Neither is easy. Retirement ages are very low in China (in many jobs, 60 for men and 50 for women), but the government has resisted raising them for fear of a backlash. And a return to state-led growth under Xi Jinping appears to be hurting productivity. As George Magnus, an economist, writes in “Red Flags: Why Xi’s China is in Jeopardy”, demography is not destiny, and China has time to change course. “The bad news, though, is that the time that is available is passing by rapidly,” he says.

One piece of good news is that China is thinking creatively about how to look after the swelling ranks of pensioners. Traditionally, children have been expected to care for their elderly parents, which helps explain why public investment in old-age homes has been minimal. But most families now have just one child, and that child is working. Suzhou, a wealthy city near Shanghai, shows how China can take advantage of its scale. In 2007

Lu Zhong, an entrepreneur, founded Jujiale as a “virtual retirement home”, dispatching helpers to private homes on demand. It now has 1,800 employees serving 130,000 retired people. Mr Lu says that it needs to grow by about 15% a year to keep up with demand.

Yet that is a silver lining in a grey-haired cloud. On October 1st China celebrated the 70th anniversary of the People’s Republic. By the centenary in 2049, Mr Xi has vowed, China will have developed to the point that its strength is plain for the world to see. But as Ren Zeping, a prominent economist, tartly noted in a recent report, the median age in China in 2050 will be nearly 50, compared with 42 in America and just 38 in India. That, he wrote, raised a question: “Can we rely on this kind of demographic structure to achieve national rejuvenation?” ■



中国人口

未富先老

先别管什么坏账、贸易战、任人唯亲和专制统治。人口结构可能是中国经济面临的最大挑战

上午九点刚过，社区老年护理中心开始热闹起来。一个大爷高声唱着民歌。一名百岁老人坐在象棋盘边等人开局。一台模拟购物、乘地铁等新奇体验的虚拟现实机器闲置在角落里。人气较旺的活动是日常晨练——几十名老人活动着不太灵活的关节，做着热身运动。他们处于中国快速老龄化的前沿。而老龄化趋势已经开始束缚中国的经济发展潜力。

这家护理中心位于上海市中心的长宁区，自半年前开业以来已接纳区内老年人超过1.2万人次。2014年，上海推出了这些集健康诊所、开放设施和养老院于一体的护理中心，并计划到2022年发展到400家。“我们不能再等了。现在我们必须尽力建造这些护理中心。”社区工作人员彭艳丽（音译）表示。

中国背负的压力越来越大。明年它将迎来一个不祥的里程碑。据联合国预测，到2020年，中国人的年龄中位数将超过美国人（见图表）。但中国的富裕程度却远远不及美国，其收入中位数仅为美国的四分之一。“未富先老”这一备受热议的担忧不再只是一种理论上的可能性，而是正迅速变成现实。

根据联合国的预测，未来25年，中国65岁以上人口的比例将增长逾一倍，从12%增加到25%。相比之下，按目前的趋势，美国要过近一百年才会完成同样的转变，欧洲则要60多年。中国老龄化的速度与日本相当，略低于韩国。但日韩两国当年开始迅速老龄化的时候，人均财富约相当于中国的三倍。

从一个角度看，老龄化是中国成功发展的体现。1960年出生的中国人的预

期寿命是44岁，低于同年出生的加纳人。而现在出生的中国婴儿的预期寿命是76岁，略低于美国。但它同时也是中国臭名昭著的计划生育政策造成的后果。1973年政府开始限制生育时，中国妇女平均每人生育4.6个孩子，而今天她们平均只生育1.6个孩子。一些学者表示，即便是1.6这个数字也是高估了。

中国的生育率必然随富裕程度的提高而下降，但独生子女政策让下降变得更迅猛。尽管中国在2016年转而实行了二孩政策，而且可能很快会全面取消生育限制，但政策放宽来得太晚。中国的劳动适龄人口自2012年开始萎缩，未来几十年还将继续减少，到本世纪中叶将比现在少近五分之一。2000年，中国劳动适龄人口和退休人口的比例为9:1，而到2050年将只有2:1。

老龄化对经济的冲击主要体现在两个方面。最显著的便是需要照顾所有的老年人。2014年，给退休人员的养老金支出超过了在职人员的缴费。根据中国社会科学院的数据，国家养老基金可能将在2035年耗尽。财政部正在采取一些小举措来稳定养老金体系：9月，财政部将自己在四大国有银行所持股份的10%划转到养老基金。但这远远不够。中国政府在养老和医疗保健方面的支出约占GDP的十分之一，只略高于那些老龄化程度和富裕程度都更高的国家通常水平的一半，而这些国家随着老龄化程度的进一步提高还将不得不再增加支出。

其次是对经济增长的影响。以北京大学的林毅夫为代表的一些中国经济学家坚持认为，老龄化不一定就会拖慢增长，科技进步可以在一定程度上解决问题。但到目前为止，以社科院的蔡昉为首的另一阵营赢得了这场争论。不断萎缩的劳动力资源正在推高工资水平，同时随着企业为取代劳动力而加大在技术上的投入，资本投资回报率也在下降。结果就是，据蔡昉计算，中国经济的潜在增长率已经下降到6.2%左右——几乎就是当前的增长水平。劳动力短缺不仅给企业带来冲击，还对整个城市造成严重影响。从北方的西安到南方的深圳，各个城市都出台了优惠政策方便高校毕业生迁入，希望借此吸引到有一技之长的年轻劳动力。

从理论上讲，中国可以通过提高劳动力参与率和生产率来缓解老龄化带来的负面影响，也就是说，让更多的人就业，同时让他们产出更多。但两者都非易事。中国的退休年龄很低（在许多岗位中为男性60岁、女性50岁）。但为了避免引发强烈反弹，政府一直不肯提高退休年龄。在习近平的领导下，中国回到了由国家主导的发展模式，这似乎正在损害生产率。正如经济学家乔治·马格纳斯（George Magnus）在《示警的红旗：习近平领导下的中国为何危机四伏》（Red Flags: Why Xi's China is in Jeopardy）一书中所写道的，人口问题并非命运主宰，中国还有时间调转航向。“然而，坏消息是，留给中国的时间正在迅速流逝。”他说。

也有一个好消息，那就是中国正在开动脑筋，想办法照料日益庞大的养老人群。养老历来被认为是子女的事，这在一定程度上解释了为什么在养老院上的公共投资一直很少。但如今中国以独生子女家庭居多，而且这名独生子或独生女还在工作。中国能够利用其规模来解决养老问题，毗邻上海的富裕城市苏州便提供了这方面的范本。2007年，企业家路忠创建了“虚拟养老院”居家乐，向有需要的家庭派遣服务人员。现在居家乐有1800名员工，为13万退休人员提供服务。路忠说，居家乐要以每年15%的速度增长才能满足需求。

但这只是灰暗中的一点慰藉。10月1日，中国庆祝了中华人民共和国成立70周年。习近平誓言，到2049年百年华诞，中国的强大将令世界瞩目。但著名经济学家任泽平在最近一份报告中尖锐地指出，到2050年，中国人口的年龄中位数将接近50岁；而美国是42岁，印度是38岁。他写道，这引发了一个问题：“中国能够依靠这样的人口结构实现民族复兴吗？”■



Social media

TikTok time-bomb

A popular app for silly video clips raises some serious questions

IF THIS ARTICLE were a TikTok video, it would already be almost over—and you would be smiling. TikTok's 15-second clips are all the rage among teenage netizens. The app was downloaded more than 750m times in the past 12 months, more than Facebook plus its sister services, Instagram and WhatsApp, combined. Fun aside, TikTok raises serious questions—about data geopolitics, the power of internet incumbents and who sees what online.

TikTok is YouTube on steroids. It bombards users with self-repeating clips. It forms a genre of quick-hit entertainment: a prank, a dare, a teenager looking pretty. Most are produced by adolescents, with easy-to-use editing tools. The app makes money from adverts and commissions on digital tips. It may one day generate revenue from e-commerce, like its Chinese sister app, Douyin. Both are owned by ByteDance, a Beijing firm valued at \$75bn, more than any other private startup.

The China connection has Washington in a tizzy. On November 1st it emerged that America's government has opened a national-security review of ByteDance's takeover in 2017 of Musical.ly, an app developed in China, which later became TikTok. On November 5th congressmen lambasted ByteDance for not showing up to a hearing.

Hawks argue that TikTok gives the government in Beijing access to data on millions of Americans and that it censors content the regime does not like. If America's sanctions on Huawei, a maker of telecoms gear, are about disentangling electronics supply chains, its assault on ByteDance is an

attempt to keep the data flows of America and China separate. ByteDance rejects these accusations, saying that non-Chinese user data sit on non-Chinese servers, and that decisions about what not to show American users are made in America.

For his part, Mark Zuckerberg is less worried about data sovereignty and more about competition from TikTok, China's first runaway web success in America. Facebook is pulling out the big guns it deploys against fast-growing upstarts. In late 2018 it launched Lasso, a TikTok clone. An independent developer recently unearthed a feature hidden in Instagram's code that apes TikTok's editing tools. It is cold comfort to Mr Zuckerberg that should his defences fail, Big Tech's critics will have to concede that digital monopolies are not that invincible after all.

Critics of artificial intelligence are also watching the Chinese app closely. What users see on Facebook and other Western social media is in part still down to who their friends are and what they share. TikTok's main feed, called "For You", is determined by algorithm alone: it watches how users behave in the app and uses the information to decide what to play next. Such systems create the ultimate filter bubble.

All these worries would be allayed if TikTok turns out to be a passing fad. In a way, the app is only riding on other social networks. It relies on people's Facebook or Twitter accounts for many sign-ins. TikTok owes part of its success to relentless advertising on rival services. According to some estimates, it spent perhaps \$1bn on social-media ads in 2018. At the same time, many who download TikTok quickly tire of its endless digital sugar-rush.

Slowing growth may not stop politicians from hobbling the app. They could decide to bar it from America altogether. For once, Mr Zuckerberg would be cheering them on. ■



社交媒体

TikTok定时炸弹

一款大热的搞笑短视频应用引发了一些严肃议题

这篇文章如果是一条TikTok（抖音国际版）短视频，到这里差不多就结束了，而你面带笑容。TikTok的15秒短视频正在青少年网民中风行。过去12个月来，这款应用的下载次数超过7.5亿，比Facebook加上其姐妹服务Instagram和WhatsApp的总和还多。撇开趣味性不谈，这款应用引发了一些严肃议题，包括数据地缘政治、老牌互联网企业的势力，以及网民会看到什么样的内容。

TikTok就像是打了兴奋剂的YouTube。它用循环播放的短视频轰炸用户，形成了一种短平快的娱乐类型：恶作剧、大冒险、看起来很漂亮的少男少女。这些视频大多是由青少年使用简便的编辑工具制作的。TikTok靠广告和从打赏中抽成赚取利润，日后还可能像它的中国版应用抖音一样通过电子商务产生收入。这两个应用都隶属北京公司字节跳动。这家公司估值750亿美元，比其他任何私有创业公司都高。

TikTok的中国血缘令华盛顿心慌意乱。11月1日，美国政府就字节跳动在2017年对Musical.ly的收购案启动了国家安全审查。Musical.ly是一款在中国开发的应用，是TikTok的前身。11月5日，美国国会议员严厉谴责字节跳动公司未派人员出席听证会。

美国鹰派政客称中国政府可借由TikTok访问数百万美国人的数据，并审查屏蔽中国当局不喜欢的内容。如果美国制裁电信设备制造商华为是为了在电子设备供应链上断绝与中国的联系，这次攻击字节跳动则是想让两国的数据流划清界线。字节跳动否认这些指控，称非中国用户的数据存储在海外服务器上，而对美国用户屏蔽哪些内容的决定也是在美国做出的。

对于扎克伯格来说，他更担心的不是数据主权问题，而是TikTok带来的竞争，这是中国网络产品首次在美国大获成功。Facebook正在使出它用以对

付快速增长的新贵企业的强大武器。2018年末，它推出了模仿TikTok的Lasso。不久前，一位独立开发者发现了隐藏在Instagram代码中一项模仿TikTok编辑工具的功能。假如Facebook防御失利，科技巨头的批评者将被打脸，不得不承认数字垄断终究并非坚不可摧，但对扎克伯格来说，这可算不上什么安慰。

人工智能的批评者也在密切关注这一来自中国的应用。在Facebook和其他西方社交媒体上，用户看到的内容在一定程度上仍取决于其好友是谁，以及好友们发布了什么。而TikTok的主信息流“推荐”完全由算法决定：它监视用户在应用中的行为，并运用这些信息来决定后续播放的内容。这样的系统会形成信息同质化的终极过滤气泡。

假如TikTok到头来只是风行一时，所有这些忧虑自然会消除。从某种意义上说，这个应用不过是搭乘其他社交网络的便车而已。它很多时候都需要人们使用Facebook或Twitter帐户登录。TikTok的成功部分归功于不懈地在对手的服务平台上投放广告。据估计，2018年TikTok花费了约10亿美元在社交媒体上投放广告。与此同时，许多下载了TikTok的人很快就厌倦了上面没完没了、热闹得让人上头的内容。

增长放缓也许并不能阻止政客出手限制该应用。他们有可能会决定在美国全面禁用TikTok。这次，扎克伯格会站在政客这边为他们拍手鼓劲。 ■



Schumpeter

The stuff paradox

Can business tread more lightly on the planet?

ALMOST 50 YEARS before Extinction Rebellion, a British-born protest movement, exported its brand of climate activism to the world, young Americans did so on Earth Day, April 22nd 1970. The youth then was more bell-bottomed than nowadays but felt no less “bamboozled and cheated” (as *The Economist* put it at the time) that their elders were bequeathing them a wrecked planet.

Their main concern was different from today’s: unbridled economic growth and consumerism would, they warned, swiftly exhaust the world’s resources. Their Malthusian concerns proved misguided. Raw materials have never come close to running out. Now the focus has turned from scarcity to excess—specifically, of carbon dioxide in the air. In the past 50 years the burning of fossil fuels has more than doubled its concentration, accelerating global warming with its potentially calamitous consequences. Andrew McAfee of the MIT Sloan School of Management thinks that these fears, too, are overblown. Humankind, he posits in a new book, “More From Less”, is reaching “peak stuff”—though people consume more, businesses use fewer resources to make it. With an anti-capitalist crusade focused on a surfeit of stuff once again gathering steam among eco-socialists, it is a timely assertion. Sadly, it is an oversimplification.

Mr McAfee builds on “The Second Machine Age”, the bible of techno-optimism he co-authored with Erik Brynjolfsson in 2014. This time he mines data on America’s resource use since the first Earth Day to argue that the world is moving beyond the “industrial era” of resource-heavy goods. The latest computer age is making things so much lighter and less material-

intensive that it promises to decouple economic growth from environmental degradation.

A look at the physical building blocks of the American economy—metals, minerals, wood, paper, fertiliser, water and energy—indeed suggests that in many cases their absolute usage has peaked in recent decades, even as GDP has soared. Everything from farms (the average American cow produces more than four times as much milk as in 1950) to iPhones (each one contains a calculator, camera, tape recorder, map and other gizmos) have, as Mr McAfee puts it, gradually “dematerialised”. Some rich European countries are on a similar path. India and China may follow.

This is down to two pairs of factors. First, technology and capitalism, blamed for many of the ravages of industrialisation, are now reinforcing each other in favour of dematerialisation. Hardware, software and networks enable goods to be slimmed down, optimised, even eradicated, as Google Maps has rendered useless the likes of London’s A-Z. Competition in free (albeit regulated) markets encourages companies to lower costs by using fewer materials or substituting expensive ones for cheaper alternatives.

A second pair of factors, Mr McAfee contends, has accelerated the trend of late. Public awareness and responsive governments are helping rectify the shortcomings of free markets, such as the failure to price in the cost of pollution. Global environmental governance is getting better—a bold claim, the author concedes, but not completely outlandish even in America, where many cities and states are setting carbon-reduction goals at odds with the climate-sceptic-in-chief in the Oval Office.

Mr McAfee’s focus on corporate use of resources is refreshing. Too often, businesses are caricatured as rapacious predators of Earth’s bounty. In fact, since the dawn of capitalism, they have produced products that become lighter on the ground and on the wallet because profit-hungry bosses see

advantage in thrift. No company has thrived in the long term by using resources less sparingly. Likewise, cutting emissions involves using less power per unit of output and more renewable power. The first helps the bottom line. As solar and wind energy get cheaper, so does the second.

Producing less overall is a different matter, however. Sceptics about the extent of dematerialisation, Mr McAfee's central contention, go back to William Jevons, a British economist who argued in "The Coal Question", an essay from 1865, that more efficient use of the fossil fuel inevitably leads to higher total consumption. "Jevons was wrong," Mr McAfee claims confidently, citing the recent decline in coal use in America even as it has become cheaper.

Not so fast. Some of the West's purported dematerialisation may be down to more of the goods it buys being manufactured abroad, not at home. Mr McAfee thinks that this is negligible. It probably isn't. And though the coal question may have been extinguished, at least in America, its modern-day version—call it the carbon question—remains burning.

In a book published nearly 150 years after Jevons's treatise, Vaclav Smil, a Czech-Canadian scientist (and a favourite of Bill Gates), argued that as goods become lighter and cheaper the market for them explodes and, as Jevons predicted, increases demand for resources. The weight of the average mobile phone in 2011 was one-sixth what it had been in 1990. But the number of phones ballooned from 11m to 6bn. So the total mass of phones globally went from 7,000 tonnes to about 700,000 tonnes. Less, Mr Smil writes memorably, is "an enabling agent of more".

For businesses, the "Jevons paradox" is not merely academic. Fearing a backlash from eco-conscious consumers, firms are striving to lower their carbon intensity. So long as this brings down costs, CEOs happily oblige and society reaps the benefits of higher efficiency and better resource allocation.

But if that leads to higher sales, companies' overall environmental impact may rise.

They should not be shamed—or required to urge customers to buy less of their wares, as some activists who glued themselves to corporate headquarters in London seem to demand. Governments can make citizens want less by making consumption pricier, with carbon taxes or other regulations. Until they do, firms will try to sell more stuff—because most people want more of it. ■



熊彼特

物质悖论

企业能放轻它们在地球上的脚步吗？

发端于英国的“反抗灭绝”抗议运动（Extinction Rebellion）将气候激进主义传遍全球，而在近50年前，美国年轻人在1970年4月22日“地球日”这天就已经在这么做了。那时的年轻人比现在更加桀骜不驯，但同样感到“被蒙蔽和欺骗了”（本刊当时所言），因为他们从先辈那里继承的是一颗千疮百孔的地球。

他们最大的担忧和今天不同。他们警告称，无节制的经济增长和消费行为会很快耗尽地球上的资源。这种马尔萨斯式的担忧实则是误判。原材料从未接近枯竭过。如今，关注的焦点已经从短缺转向了过量——特别是空气中过多的二氧化碳。过去50年来，化石燃料的使用导致二氧化碳浓度增加了一倍多，加速了全球变暖，可能带来灾难性的后果。麻省理工学院斯隆管理学院（MIT Sloan School of Management）的安德鲁·麦卡菲（Andrew McAfee）则认为，这种担忧同样言过其实。他在新作《以少造多》（More From Less）中提出，人类即将步入“物质见顶”阶段——尽管人们消费增多了，但企业在生产时对资源的利用效率也提高了。一场聚焦物质过剩的反资本主义运动已在生态社会主义者中声势再起，因此，这种主张提出得非常及时。遗憾的是，它过于简单化了。

麦卡菲在2014年出版了与埃里克·布莱恩约弗森（Erik Brynjolfsson）合著的《第二次机器革命》（The Second Machine Age）。他在这本堪称技术乐观主义的“圣经”的著作上进一步发展了自己的观点。这一次他收集了美国自第一个地球日以来资源使用情况的数据，并据此提出世界正在走出资源消耗型商品的“工业时代”。最新的计算机时代让产品更轻量化、使用的材料大大减少，这有望让经济增长不必再付出环境恶化的代价。

纵观美国经济的物质构成要素——金属、矿物、木材、纸张、化肥、水和

能源等，的确可以发现在很多情况下它们的绝对用量都已在近几十年触顶，尽管同期GDP猛增。用麦卡菲的话说，从农场（美国奶牛的平均产奶量是1950年时的四倍多）到iPhone（每一台都具备计算器、相机、录音机、地图和其他功能）的万事万物都在逐渐“去物质化”。欧洲一些富裕国家的情况也类似。印度和中国可能也会如此。

两对因素造成了这种情况。首先是技术和资本主义，它们被指为工业化带来的诸多破坏的罪魁祸首，如今正在相互促进以实现去物质化。硬件、软件和网络让商品得以精简、优化，甚至被淘汰，就像谷歌地图让纸质的伦敦A-Z地图之类的东西变得毫无用处一样。自由（尽管受到监管）市场里的竞争推动企业使用更少或更便宜的原材料来降低成本。

麦卡菲认为，第二对因素加快了去物质化的趋势。公众意识和积极应对的政府正在帮助纠正自由市场的缺点，比如未能将污染成本纳入定价考量。全球环境治理正在改善——作者承认这种说法过于大胆，但即使在美国也并非完全荒诞不经，因为许多城市和州都在制定减排目标，与白宫那位首席气候变化怀疑论者的论调相悖。

麦卡菲对企业利用资源的关注令人耳目一新。太多时候，企业都被丑化成地球资源的疯狂掠夺者。事实上，自资本主义萌芽以来，企业生产的产品用料更少，成本也更低，因为贪求利润的老板们尝到了俭省的甜头。而从长远来看，没有哪家公司是靠挥霍资源而蓬勃发展的。同样，减排还包括减少每单位产量的电力消耗以及更多地使用可再生能源。减少用电有助于盈利。随着太阳能和风能价格降低，增加新能源的使用也有助于盈利。

不过，总体产量下降却是另外一回事了。作为麦卡菲核心论点的“去物质化”，其程度究竟如何？对这一点的质疑可追溯到英国经济学家威廉·杰文斯（William Jevons）。他在1865年一篇题为《煤炭问题》（The Coal Question）的文章中提出，对化石燃料更高效的利用势必导致总消耗量的增加。麦卡菲指出，美国煤炭价格下跌了，但近年的使用量却在减少，他因而自信地宣称：“杰文斯错了。”

且慢。西方国家一些所谓的去物质化可能是因为它们购买的商品更多是在国外而非国内制造的。麦卡菲认为这一点的影响微不足道。但事实可能并非如此。尽管煤炭问题至少在美国可能已经不复存在，但它的现代版，也就是碳排放问题，仍是当务之急。

在杰文斯的论文发表近150年之后，捷克裔的加拿大科学家瓦茨拉夫·斯米尔（Vaclav Smil，比尔·盖茨也是他的拥趸）在他的著作中指出，随着商品用料变少、价格降低，市场对它们的需求就会激增，且如杰文斯所料，对资源的需求也会增加。2011年手机的平均重量是1990年的六分之一，但数量却从1100万部激增至60亿部，全球手机的总重量也因此从7000吨增加到约70万吨。斯米尔的一句话令人印象深刻：“少”是“多”的促成因素”。

对企业而言，“杰文斯悖论”不止停留在理论层面。由于担心遭到有环保意识的消费者的抵制，企业正努力降低碳排放强度。只要这样做能降低成本，CEO们乐于采纳，社会也能从更高的效率和更好的资源配置中获益。但如果这带来销量上升，企业对环境的整体影响可能就会随之增大。

企业不应该感到羞愧，人们也不应该要求企业力劝客户减少购买它们的商品——一些拿胶水把自己粘在伦敦多家公司总部门口的激进人士似乎就是这样要求的。各国政府可以通过征收碳排放税或出台其他监管措施来提高消费价格，从而降低民众的购买欲。在此之前，公司都会设法卖出更多商品——因为大多数人都想要更多。 ■



The Economist film

The Yield Curve

Does this line predict America's next recession? The yield curve has predicted America's last eight recessions. In March this year it inverted again.



经济学人视频

收益率曲线

这条曲线预告了美国的下一次衰退吗？美国过去八次经济衰退前都出现了收益率曲线倒挂现象。今年三月，这种现象又一次出现了。



Japan Inc in China

Neighbourly love-in

Japanese companies have thrived in China of late. Can it last?

IN 1977, FIVE years after China and Japan re-established diplomatic relations, Miyakoshi, an electronics manufacturer, became the first Japanese firm to receive a business permit from the Communist Party, to make cassette-tape recorders. In 2017 around 32,000 Japanese companies had investments worth \$117bn on the mainland, one of the biggest foreign corporate footprints. Last year they poured close to \$11bn into China, up by half since 2010 and not far off America's long-stagnating tally. Big listed Japanese firms derived 17% of their overseas profits from China, according to calculations by Jesper Koll, a fund manager in Tokyo.

The rapport between the world's second- and third-biggest economies has never been better. Last year Chinese officials paid a visit to Panasonic, Canon and Toyota in Japan to meet executives and lure their firms to new free-trade zones. A year ago Shinzo Abe, Japan's prime minister, travelled to China, to a forum attended by 1,000 businesspeople. During the trip the two countries announced 500 deals worth more than \$18bn. Yet for all the bonhomie, it is also an unusually delicate time for Japanese businesses in the People's Republic.

The first reason is the changing nature of commercial relations between an enriched China and the world. Japan's firms have navigated this shift well, displaying none of the overconfidence which bedevilled their gung-ho American misadventure in the 1980s. As Chinese labour has grown pricier, many have moved manufacturing to cheaper places in the region. UNIQLO, a Japanese garment-maker, is one of a clutch to decamp to South-East Asia.

At the same time, many of the same companies have successfully turned themselves into desirable brands in China. Chinese shoppers covet UNIQLO'S well-made clothes. Fed up with safety scandals at local producers, they prefer Japanese-branded snacks and beverages from Asahi or Yoshinoya or medical products made by Kobayashi. Kao, a Japanese consumer-goods firm, recently started making a premium version of its Merries nappies for the Chinese market only. This summer Toyota invested \$600m in Didi Chuxing, a Chinese ride-hailing giant. Miyakoshi, which now sells property rather than cassette-players, generates all of its sales in China. Chinese consumption has gone “beyond the point of no return”, says Takeshi Niinami, the boss of Suntory, a giant Japanese distiller.

Japanese wares appeal not only to China's consumers but also to its corporations. In April Toyota agreed to sell electric-car technology to Singulato, a Chinese builder of low-emissions vehicles. In June it announced partnerships to build batteries with China's CATL, a technology company, and BYD, a carmaker. When in 2015 JD.com decided to erect China's largest hydroponics factory on the outskirts of Beijing, the Chinese e-commerce giant looked as far afield as Israel and the Netherlands for the right technology to regulate the temperature of its seedling rooms and soil-free vegetable beds. In the end, it settled for Mitsubishi Chemical. The Japanese firm has already helped build close to 20 factories like JD.com's in China and aims to break ground on ten a year.

Japanese firms run into the same hurdles as others trying to do business in China. Bosses in Tokyo echo Western gripes about woolly, haphazardly enforced rules, a tax system skewed towards Chinese companies, unreliable courts and theft of intellectual property. But Japan's government and industry groups may be doing more to help them than America's or Europe's do for theirs. Its embassy in Beijing and the Japan External Trade Organisation, an independent government agency, have employed IP experts to assist firms. Japanese advertisers have set up shop in China to

help compatriots market to local tastes. Having had its fingers burned in China a few years ago, in May Rakuten, a Japanese e-commerce giant, opened an office in Dalian, a Chinese coastal city now home to some 1,500 Japanese companies.

For all its recent success in China, Japan Inc must still tread carefully there. One reason is ghosts of the past. In 2005 a controversial change to Japanese history textbooks, seen to whitewash Imperial Japan's sins, led to riots in China and boycotts of Japanese businesses. In 2012, during a political row over the disputed Senkaku Islands, which Japan controls but China claims (and calls the Diaoyu), Toyota and Honda dealerships, as well as a Panasonic plant, were set on fire.

Japanese firms have got better at dealing with Chinese grievances over Japan's failure to atone for its wartime occupation of parts of China, when firms such as Mitsubishi Materials forced Chinese labourers to toil in Japanese mines. Three years ago Mitsubishi even issued a rare formal apology and has been setting up a compensation fund. But resentment simmers—and could easily boil over if China's self-confidence continues to find expression in an assertive nationalism.

Then there is the spectre of Sino-American rivalry. Japanese firms have long benefited from geopolitical proximity to America and geographical closeness to China. The two are the most important markets for many Japanese companies, whose supply chains criss-cross both. As the superpowers jostle over everything from trade to technology, this blessing looks ever more like a curse. Because Japan's firms are more exposed to China than American ones are—China is Japan's largest trading partner—they would find it harder to give up on the Chinese market. It would be “a nightmare” to have to choose between Japan's biggest neighbour and its chief strategic ally, says Ichiro Hara of Keidanren, a Japanese business lobby. As geopolitics impinges on globalised commerce,

the choice may become inevitable. ■



在华日企

睦邻友好

日本公司近年在中国蓬勃发展。能持久吗？

中日两国邦交正常化五年后的1977年，电子产品制造商宫越（Miyakoshi）成为第一家获得共产党颁发营业执照的日本企业，开始在中国生产卡带录音机。2017年，中国大陆约有3.2万家日本企业，总投资1170亿美元，是在华投资最多的外企队伍之一。去年，它们向中国地区投资近110亿美元，比2010年增加了一半，与美国长期停滞不前的投资额已相距不远。东京一位基金经理杰斯珀·科尔（Jesper Koll）估算，日本大型上市公司的海外利润中有17%来自中国。

世界第二和第三大经济体之间的关系从未如此融洽。去年，中国官员赴日访问了松下、佳能和丰田公司，与高管见面，想吸引他们的企业进驻新的自由贸易区。一年前，日本首相安倍晋三访问中国，出席了一个有1000名商界人士参加的论坛。安倍访华期间，两国宣布了500个合作协议，总额超过180亿美元。然而，尽管看起来一团和气，对于在华日企来说，这也一个异常微妙的时期。

第一个原因是富裕起来的中国与世界之间的商业关系正在发生变化。日本公司很好地应对了这一转变。这一次它们没有自信过头——上世纪80年代它们的自负让它们在狂热进军美国时吃了不少苦头。随着中国劳动力成本上涨，许多日本公司将生产转移到了亚洲成本更低廉的地方。日本服装制造商优衣库是撤离到东南亚的日企之一。

与此同时，许多撤走生产线的公司已成功地将自己变为受中国消费者欢迎的品牌。中国购物者喜欢优衣库制作精良的服装。他们厌倦了本国生产商的安全丑闻，更喜欢朝日或吉野家等日本品牌小吃和饮料，或者小林制药生产的医药用品。日本消费品公司花王最近开始生产仅针对中国市场的妙而舒纸尿裤高端系列。今年夏天，丰田汽车向中国网约车巨头滴滴出行投

资了六亿美元。宫越公司现在改卖房地产，不卖卡带录音机了，它的全部销售额都来自中国。日本大型酿酒公司三得利的老板新浪刚史说，中国对日本产品的消费量已经“走上了一条只升不降的不归路”。

日本商品不仅吸引了中国消费者，也吸引着中国企业。4月，丰田同意将电动汽车技术出售给中国低排放汽车制造商奇点汽车。6月，它先后宣布与中国科技公司宁德时代及汽车制造商比亚迪合作生产电池。2015年，中国电商巨头京东决定在北京郊区建立中国最大的水培蔬菜工厂。为了寻找合适的技术来调节苗室温度和无土蔬菜水培床，它曾把目光投向遥远的以色列和荷兰。最后它选择了三菱化学。这家日本公司已帮助京东等企业在中国建立了近20家工厂，目标是每年破土建设10家工厂。

其他国家的企业进军中国遇到的障碍，日企也都遇到了。东京的老板们和西方的同行一样，也抱怨这里的规则模糊不清又变来变去、税收制度偏向中国企业、法院不可靠、知识产权被窃。但是，和美国或欧洲相比，日本的政府和行业组织或许为它们的企业提供了更多的帮助。日本驻中国大使馆和独立政府机构日本贸易振兴机构（Japan External Trade Organisation）雇用了知识产权专家来协助企业。日本广告公司在中国开设了分公司，以帮助日企针对当地口味开拓市场。几年前在中国遭遇挫折的日本电商巨头乐天（Rakuten）5月在大连设立了研发中心，如今这座中国沿海城市已入驻了约1500家日本公司。

尽管日本企业近年在中国取得了成功，但它们仍必须谨慎行事。一则出于历史原因。2005年，日本对历史教科书的修订引发争议，被认为意图粉饰日本帝国主义的罪行，导致中国发生反日运动，抵制日本企业。2012年，两国就钓鱼岛问题（日本称之为尖阁列岛，实际为日本控制，但中国主张有领土主权）发生政治争议期间，丰田和本田的经销店以及松下的一家工厂都曾遭到纵火。

日本并未弥补自己在侵华期间犯下的罪行，这令中国人不满。面对这种情绪，日本企业的应对已经有所进步。当年三菱综合材料（Mitsubishi Materials）等企业曾强迫中国劳工在日本的矿井中工作。三年前，三菱甚

至罕见地正式道歉，并设立了赔偿基金。但是，中国人的怨恨积蓄已久，如果中国的自信继续以强硬的民族主义表达出来，反日情绪还是很容易一触即发。

另一个原因是中美竞争的影响。日本与美国地缘政治关系紧密，与中国是邻邦，日本企业长期以来两头受益。中美两国是许多日本企业最重要的市场，它们的供应链在这两个国家纵横交错。而当两个超级大国陷入从贸易到技术等方方面面的争端时，这种优势似乎越来越像一个诅咒。日本企业比美国企业更加依赖中国（中国是日本最大的贸易伙伴），因而更难放弃中国市场。日本企业游说组织日本经济团体联合会（Keidanren）的原一郎说，要日本在其最大的邻国和首要战略盟友之间做出选择将是“一场噩梦”。随着地缘政治不断冲击全球化贸易，这种选择可能终将无法避免。





Saudi Aramco

To the last drop

The message from the world's biggest and wildest IPO is that the oil industry may decline, but it won't go quietly

THE DRILLING of the first modern well in Pennsylvania in 1859 set oil on a path that led to the heart of economics and geopolitics. Oil fuelled the rise of the West's consumer culture; it helped determine who won the second world war and prompted a global economic crisis in the 1970s. Over the past 20 years China has become the second-biggest consumer of crude, while America's fracking revolution has meant it is close to being a net energy exporter for the first time since the 1950s. Now a new chapter in oil's story is unfolding: the prospect of stagnating or falling demand as the world shifts to cleaner energy. As in the past, this era promises startling economic and geopolitical change.

Consider the imminent stockmarket flotation of Saudi Aramco, which produces 10m barrels of oil a day, or 11% of the global total. As well as Arabian super-light, Aramco pumps out superlatives and controversy. Worth well over \$1trn, it could, once listed, be the world's most valuable public firm, squeezing past Apple. The initial public offering has been delayed several times; a big Aramco processing plant was hit by a missile strike in September and the firm is ultimately controlled by Muhammad bin Salman, an autocratic royal with blood on his hands. But take a moment to look beyond this. Aramco's underlying strategy is to be the last oilman standing if the industry shrinks, pointing to the upheavals to come.

The term "peak oil" was coined in 1956 by M. King Hubbert, a geologist worried about the stuff running out. Today the phrase is back but for the opposite reason: the prospect of dwindling demand. That may seem odd

given that this has grown by 1.4% a year since 2008. But the people running energy companies have long horizons, and on that timescale the picture for oil is darkened by urban pollution and climate change. Oil is responsible for a third of global energy use and a similar share of carbon emissions.

Many oil firms still say that production will creep up over the next decade, to slightly above today's level of 95m barrels per day (b/d), and then plateau. But output will need to drop to 45m-70m b/d by 2050 if the world is to stop temperatures rising more than 1.5-2°C above their pre-industrial level. It would help, too, if there was a shift to cleaner oilfields, whose crude emits a fifth less than the dirtiest ones. Though oil bosses insist, in public at least, that oil remains the planet's indispensable fuel, they can feel the growing stigma. Public opinion is shifting in the West, heralding tighter rules on emissions. And, in a sign of jumpiness, some Western firms have favoured short-term projects rather than sink their capital in decades-long bets on oil's future.

If demand does fall, some products and producers are more vulnerable than others. Over a third of all oil is used in cars and lorries which could eventually be fitted with electric engines. It is harder to find a substitute for the oil in petrochemicals and plastics. Common sense suggests that the highest-cost and dirtiest oil firms will tend to go out of business first. If so, an industry that has become gargantuan over 160 years will shrink to a core of producers that fulfil the world's residual demand at the lowest financial and environmental cost.

Many environmental activists fear this energy transition will never happen. But, in fact, it fits with Aramco's strategy and pitch to investors. The firm spends just \$3 to lift a barrel from beneath the desert, less than almost anyone else. The emissions from extracting Saudi oil are rock-bottom, too. Aramco is expanding in petrochemicals and locking in customers in Asia—in August it bought a \$15bn stake in the chemicals arm of Reliance,

an Indian giant. Saudi Arabia has promised investors they will get steady dividends whatever the weather. Implicit in the kingdom's approach is that, if and when oil demand falters, Aramco will be the producer of last resort.

A cleaner planet is in everyone's interests. But a shrinking oil industry could mean more, not less, turbulence for energy markets and geopolitics. Take energy markets first. The optimistic case is that supply and demand will taper down in tandem, and that the price of oil will fall along with the cost of producing the last barrel needed to satisfy ebbing demand. But downsizing an industry with \$16trn of capital and at least 10m employees is never going to be smooth. Because oilfields naturally deplete, a drought in capital spending could cause a price spike. Each firm and country, including Saudi Arabia, will face a choice between holding back supply so as to bolster profits and tax revenues and opening the taps to grab market share and use up reserves, whatever the price, before it is too late. The OPEC cartel, which combines high- and low-cost producers, could implode. And as production focuses on fewer fields, the risk of disruption from terrorism or accidents will rise.

The political implications are just as big. Twenty-six countries rely on oil income for 5% or more of their GDP, says the World Bank (the average for them is 18%). If economic logic prevails, producers with the dearest and dirtiest oil—including Algeria, Brazil, Canada, Nigeria and Venezuela—should wind down output, but that would be painful and, for some, devastating. America, meanwhile, remains wedded to oil, which meets 40% of its energy needs. Its thirst has been satisfied by the fracking boom, especially in the Permian basin in Texas. Yet fracking is dirty and new projects need an oil price of \$40-50 a barrel to break-even, at least twice the level Aramco requires. For the sake of the climate and efficiency, the fracking industry should eventually shrink. That, though, would make America more reliant on foreigners, just as its politics have turned inward.

And then there is Saudi Arabia itself. Aramco's pitch to investors will boast of its abundant, cheap and relatively clean oil. That much is true. But it will not dwell on the country's jobless youth or opaque court politics. Perhaps the proceeds of the IPO will help modernise the Saudi economy; perhaps not. Investors betting on Aramco as the last oil major standing in 30 years' time will have to consider the risk of revolution or invasion. Aramco's flotation is a sign that the end of oil could be in sight. But it is also a reminder that the black stuff's capacity to cause economic and political havoc will be undiminished for decades to come. ■



【首文】沙特阿美

一滴不剩

全球规模最大、最动荡的IPO传递的信息是，石油产业可能会衰落，但过程不会平静

世界上第一口现代油井于1859年在美国宾夕法尼亚州开始钻探，自此，石油逐渐成为经济和地缘政治的核心。石油推动了西方消费文化的兴起，影响了第二次世界大战的结果，并在上世纪70年代引发了全球经济危机。过去20年，中国成为世界第二大原油消费国，与此同时美国发生了页岩油技术革命，使得该国自1950年代以来首次几近成为能源净出口国。如今，石油的故事正翻开新的篇章：随着世界转向清洁能源，对石油的需求将面临停滞或下降。与过去一样，这个时代昭示着惊人的经济和地缘政治变革。

看一看即将上市的沙特阿美（Saudi Aramco）。这家公司日产一千万桶石油，占全球总产量的11%。除阿拉伯超轻质原油之外，它还制造了赞誉与争议。估值超过一万亿美元的沙特阿美一旦上市，可能会压过苹果成为全球市值最高的上市公司。它的IPO已经多次延后。一座大型炼油厂在9月遭导弹袭击，而公司的最终控制权也掌握在双手染血的独裁沙特王储穆罕默德·本·萨勒曼（Muhammad bin Salman）手中。暂且把这些放一边。沙特阿美寻求IPO背后的战略是，假如石油行业萎缩，它要成为坚持到最后的一家石油公司。这预示着一场剧变来临。

“石油峰值”是地质学家金·哈伯特（M. King Hubbert）在1956年提出的说法，他担心石油终将耗尽。现在，这个名词再次被提起，原因却与当年相反：石油需求面临萎缩。这听起来可能有些奇怪，毕竟自2008年以来石油需求以每年1.4%的速度增长。但能源企业的经营者必须放眼长远，而从长期来看，城市污染和气候变化问题将导致石油业前路黯淡。石油占全球能源使用量的三分之一，占碳排放的份额也差不多。

许多石油公司还是认为未来十年石油产量会缓慢上升，达到略高于如今日产9500万桶的水平，然后保持稳定。但如果全球要阻止气温较工业化前水

平上升超过 1.5°C 到 2°C ，那么到2050年石油日产量就须降至4500到7000万桶。转向开发更清洁的油田也是一种办法，这类油田的排放量比污染最严重的油田要少五分之一。尽管石油公司的老板们坚称（至少在公众场合）石油仍是地球上不可或缺的燃料，但他们也感到自己身上的恶名在加重。西方舆论逐渐转向，预示排放法规将收紧。一些西方公司已经显露出不安，它们转向了短期项目，而不是押注在周期达数十年的石油项目上。

如果石油需求真的下降，那么某些产品和生产商受到的影响会更大。超过三分之一的石油用于汽车和卡车，而这些车辆最终可能会安装上电动发动机。相比之下，石化和塑料行业更难找到石油的替代品。一般来说，成本最高、污染最严重的石油公司往往是最先倒闭。如果是这样，在160年里发展到如今庞大規模的石油行业将萎缩到只剩一些核心生产商，以最低的财务和环境成本满足世界对石油的剩余需求。

许多环保主义者担心这种能源过渡永远不会发生。但事实上，这种过渡与沙特阿美的发展战略及它向投资者宣传的卖点是契合的。该公司从沙漠地底下开采一桶石油的成本仅为三美元，几乎低于任何对手。沙特石油开采的排放量也是最低的。沙特阿美正在扩大石化业务，锁定亚洲客户——8月它购入了印度巨头信实工业公司（Reliance）化工业务150亿美元的股份。沙特政府已承诺，无论情势如何，投资者都将获得稳定的股息。沙特的做法意味着，石油需求如果真的下降，沙特阿美将成为坚持到最后的生产商。

让地球变得更清洁符合全世界的利益。但石油行业萎缩可能会增加而非减少能源市场和地缘政治的动荡。先看能源市场。乐观的情况是，供给和需求会同步下降，而随着满足萎缩的市场需求的生产成本降低，石油价格也会降低。但是，一个拥有16万亿美元资本、至少一千万名员工的行业要缩减规模，定然不会一帆风顺。由于油田会自然枯竭，缺乏资本投入可能导致价格飙升。每家公司和包括沙特阿拉伯在内的各国政府都将面临一个抉择：是抑制供应以提高利润和税收，还是趁还来得及，放开产能抢占市场、用尽储量，而不管价格如何。成员中既有高成本又有低成本产油国的垄断集团欧佩克可能会瓦解。随着生产集中在更少的油田里，恐怖袭击或

事故造成供应中断的风险将会增加。

政治影响同样巨大。世界银行表示，全球有26个国家的石油收入占自身GDP比重达到或超过5%（它们的平均水平为18%）。如果按经济逻辑行事，价格和环境成本最高的石油生产商（包括阿尔及利亚、巴西、加拿大、尼日利亚及委内瑞拉）应该会减产，但过程将是痛苦的，对某些生产商来说甚至是毁灭性的。同时，美国仍高度依赖石油——石油满足了其40%的能源需求。页岩油热潮（尤其是在德克萨斯的二叠纪盆地）满足了美国对能源的渴求。但水力压裂技术有污染，且新项目需要油价达到每桶四五十美元才能回本，是沙特阿美这一数字的至少两倍。出于气候及效率的考虑，页岩油行业终将萎缩。但这又会使美国更依赖外国供应，而此时美国政治却已转向封闭。

然后就是沙特阿拉伯本身的问题了。沙特阿美将会向投资者自夸石油储量丰富、价格低廉、相对清洁。这也不假。但它不会多谈该国年轻人失业的问题和不透明的宫廷政治。沙特阿美IPO的收益也许能帮助推动沙特经济迈向现代化，也可能不会。投资者若要押注它在未来30年成为最后一家屹立不倒的石油巨头，就必须考虑沙特发生国内革命或外敌入侵的风险。沙特阿美的上市标志着石油之路尽头已现。但它也提醒我们，这种黑色物质的经济和政治破坏力在未来几十年里并不会衰减。 ■



Lifts

Ascending scale

A mega-deal and new technology may sustain an enduring oligopoly

MODERN CITIES owe their shape to two 19th-century revolutions in personal transportation. For urban sprawl, blame the car. The skyscrapers that shape many of the world's most recognisable cityscapes would not exist without fast and safe lifts. Whereas the four biggest carmakers sell two-fifths of road vehicles, liftmakers have the market sewn up far more tightly. The top four firms provide over two-thirds of all lifts (see chart). More concentration may be arriving shortly.

The potential for consolidation comes courtesy of Thyssenkrupp. The struggling German industrial conglomerate needs to raise money as it restructures radically after years of dwindling profits and strategic missteps. Elevator Technology (ET), its lift business, could be worth €15bn-18bn (\$17bn-20bn), roughly equivalent to Thyssenkrupp's market value (including net debt). It plans to sell either a stake in the business or the whole thing.

There are, it appears, plenty of takers willing to jump on Thyssenkrupp lifts. Groups that submitted bids before a deadline on November 8th are said to include some of the world's biggest private-equity firms, such as 3G, Blackstone and Carlyle. Finland's Kone, another lift-industry giant, has long coveted ET. Japan's Hitachi is also likely to have put in a bid.

Whoever they turn out to be, the bidders are attracted by an industry that has more ups than downs. The global lift market was worth \$73bn in 2018 and the share prices of lift companies have comfortably outperformed the capital-goods industry as a whole for years, according to Morgan Stanley,

a bank. Lifts are a “great business”, explains Klas Bergelind of Citi, another bank, because half of all revenues are recurring. The cyclical business of selling and installing new lifts is complemented by a steady stream of income from maintaining and modernising existing lifts.

That part of the business looks poised to gain in importance. Citi expects annual sales of new lifts to grow by around 1% for the next few years. But that still leaves plenty that need maintenance, including the 900,000 or so installed in 2018, double the number a decade earlier. Over 60% of these were built in China, despite its cooling property boom.

China’s vast servicing market may provide a long-term opportunity that helps the big liftmakers weather the global slowdown in new equipment sales. At the moment maintenance of a worldwide installed base of 16m lifts is a far less concentrated business, largely thanks to a bevy of small Chinese competitors. But as lifts become connected devices, bigger manufacturers could replicate their dominance in the market for new lifts. They have more money than smaller rivals to invest in technologies to diagnose problems remotely in real time, predict failures and prevent breakdowns.

Which way will ET fall? A sale to a private-equity firm would quickly raise the cash Thyssenkrupp urgently needs. But it would yield none of the economies of scale that a tie-up with another liftmaker could produce. Hitachi, strong in its home market, will see this as its one opportunity to elevate itself into the global big league. And as Jefferies, another bank, observes, Otis and Schindler may not be content to “watch from the sidelines”.

The firm that has courted ET the longest is Kone. Together the pair would create a firm as towering as the skyscrapers their products make possible. The businesses are geographically complementary: ET is stronger in America, Kone does better in China. Combining their service networks,

research and development and the like might save €1bn a year. But overlap in Europe will trouble competition authorities. Thyssenkrupp may prefer a deal with fewer potential regulatory complications.

Bringing together the world's two most innovative liftmakers would certainly lift architects' spirits. ET is testing MULTI, a ropeless system that uses linear motors to allow its lifts to travel up, down and sideways. Kone has developed a carbon-fibre-composite cable that allows ever longer travel heights—and so taller structures. Together these two technologies could reshape the city once again. ■



电梯

升级

巨型并购和新技术可能让一家经久不衰的寡头屹立不倒

十九世纪发生的两次个人运输工具革命塑造了现代城市的形态。城市四处扩张依靠的是汽车。而如果没有安全快速的电梯，世界许多城市的标志性景观也不会存在。如今道路上的车辆有五分之二产自全球四大汽车制造商，而电梯行业的市场集中度还要高得多。前四大公司提供了全球超过三分之二的电梯（见图表）。这个市场很快可能还会变得更加集中。

进一步整合的前景要归因于蒂森克虏伯（Thyssenkrupp）。这家陷入困境的德国工业集团在经历了多年的盈利萎缩和战略失误后，正在彻底重组，因而需要筹集资金。其电梯业务蒂森克虏伯电梯（Elevator Technology，以下简称ET）的价值可能在150亿至180亿欧元（170亿至200亿美元）之间，与蒂森克虏伯集团的市值（包括净债务在内）大致相当。集团计划出售该业务的部分或全部股权。

看起来有不少公司愿意搭乘蒂森克虏伯的电梯。据称，在11月8日截止日前提出报价的包括一些全球最大的私募股权公司，如3G、黑石集团（Blackstone）和凯雷集团（Carlyle）。另一电梯巨头芬兰通力（Kone）对ET觊觎已久。日本的日立公司很可能也出了价。

不管出价者究竟都有谁，它们看中的都是这个行业的上升期多过衰退期。摩根士丹利的数据显示，2018年全球电梯市场价值730亿美元，而多年来电梯公司的股价轻松超过资本产品行业的整体水平。花旗银行的克拉斯·贝格林德（Klas Berglind）分析，电梯业是一门“好生意”，因为其总营收中有一半为经常性收入。除了销售和安装新电梯的周期性业务营收外，还有维护和升级现有电梯的稳定收入作为补充。

后者看起来已变得越来越重要。花旗银行预计，未来几年，新电梯年销售

额的增速将在1%左右。但仍有大量旧电梯需要维护，包括2018年安装的约90万台电梯，是十年前数字的两倍。其中超过60%是在中国安装的，尽管当地的房产热正在降温。

中国广阔的电梯维护市场也许会提供一个长期机会，帮助大型制造商经受住全球新设备销售放缓的冲击。相比新电梯市场，目前全球1600万台已安装电梯的维护业务远没有那么集中，很大程度上是因为中国有一批小型竞争企业。但随着电梯变成联网设备，大型制造商可能会复制自己在新电梯市场上的主导地位。相比小型对手，它们拥有更充裕的资金来投资于新技术，实现实时远程诊断问题、预测及防范故障。

ET将何去何从？若出售给私募股权公司，蒂森克虏伯将迅速筹集到急需的资金，但这无法形成与其他电梯制造商联合所产生的规模经济。在日本国内市场强势的日立会视收购ET为跻身全球电梯巨头行列的机会。而正如另一家投行杰富瑞（Jefferies）观察到的，奥的斯（Otis）和迅达（Schindler）也不大可能会安于“置身事外”。

通力向ET“示爱”的时间最久。如果两者联姻，缔造出的公司将有如其产品造就的摩天大楼那样一览众山小。两家公司在地理上互补：ET在美国实力较强，通力在中国更具优势。整合两者的服务网络及研发等资源，每年可能节省十亿欧元。但是它们在欧洲的业务有重叠，这将引起竞争管理机构的关注。蒂森克虏伯可能更愿意选择监管风险低的交易。

世界最锐意创新的两大电梯制造商若连珠合璧，无疑会令建筑师们精神一振。ET正在测试运用线性电机使电梯上下和横向移动的无绳系统MULTI。通力已开发出一种碳纤维复合材料电缆，便于电梯运行更长的距离，建筑物因而也可冲击新高度。这两种技术结合起来，将再次令城市面貌焕发新姿。 ■



Financial crime

Land of the tax-free

Will America go from hunter to hunted in cross-border tax evasion?

AMERICA HAS launched brutal assaults over the past decade on countries, such as Switzerland and Liechtenstein, where banks have helped American citizens hide money and thereby evade tax. Forced to clean up, these erstwhile havens have seen much tainted capital flow elsewhere—not least to America itself. Now it is the former aggressor's turn to be on the defensive. Other countries are using similar tools to those America once employed to reveal untaxed money stashed by their own citizens in the world's largest economy.

As well as fining and prosecuting the enablers of tax-dodging—Swiss banks alone coughed up at least \$5.5bn—America passed a law in 2010 known as FATCA that required foreign financial firms to spill the beans on American clients. Stung into action, more than 100 other countries signed up to the “Common Reporting Standard” (CRS), and now swap tax-relevant financial information with each other.

America, however, did not join the CRS. Instead it shares information on the foreign clients of American banks under FATCA's reciprocal provisions. But sharing is patchy; a lot of countries get nothing. Combine that with the high level of anonymity offered by American shell companies, and it is hardly surprising that America has become the destination of choice for many tax evaders. One tax expert reckons that “over 90% of assets avoiding the CRS have been herded into the USA”.

America does not have to worry about the sort of bludgeoning that it doled out to Switzerland—no other country has anything like the same extra-

territorial financial power. But other countries are finding that there are legal tools at their disposal, all the same. One is the so-called John Doe summons. This American provision assists tax authorities going after “a particular person or ascertainable group or class of persons” whom they suspect of financial wrongdoing, but whose identities are unknown. If approved by a court, the summons forces banks to hand over names.

Until now the biggest user of such summonses in tax cases has been America, which, for instance, used the procedure in 2008 to prise open Swiss bank secrecy. That resulted in UBS handing over the names of around 4,500 account-holders. In April the tables were turned when a request from Finland prompted America’s Internal Revenue Service to petition a federal court in North Carolina for leave to serve John Doe summonses on three banks in America. Heavy use at Finnish ATMs of payment cards issued by the banks, and linked to American accounts, had led the Finnish tax authority to conclude that they were being used by Finnish taxpayers who had hidden untaxed income across the Atlantic. The court has since granted approval.

Other countries suffering tax leakage will be looking more closely at this procedure. Any of the 90 with a ratified bilateral tax treaty with America can use it, though some seem unaware of the option. (By contrast, America has agreed to exchange information with only 47 countries under FATCA.) Experts say it could help to break open not only dodgy bank accounts but also trusts and insurance policies, which are also commonly used to hide capital.

There could still be obstacles, for instance if an account is owned by an entity rather than an individual. But banks issued with a summons are required to investigate who stands behind account-holding shell companies. Due-diligence rules designed to curb money-laundering and the financing of terrorism, issued by FinCEN, a federal agency, already

require banks to know the identity of such “beneficial” owners (though not all seem to do so). A shell-cracking bill picking up momentum as it passes through Congress would also help improve corporate transparency.

If more countries take the John Doe route, it would help balance the unequal relationship America enjoys in matters of financial transparency. For too long it has got away with demanding much while offering little in return. Tax dodgers stashing cash in America, says Mark Morris, an international tax consultant, should “prepare to be smacked open like a *piñata*”. ■



金融犯罪

免税热土

美国会从跨境逃税的猎人变为猎物吗？

过去十年里，美国对瑞士和列支敦士登等国家发起了冷酷无情的打击，因为它们的银行帮助美国公民隐藏资金，从而逃避纳税。在这些国家被迫开展治理之后，大量可疑资金从这些昔日的避风港流向了其他地区，尤其是美国自身。现在，轮到昔日的进攻者来做防御了。其他国家正在拿起美国曾用过的那类武器，挖掘出本国公民藏匿在全球最大经济体中的逃税资金。

美国除对协助逃税的金融机构处以罚款和发起诉讼外——仅瑞士的银行就被罚了至少55亿美元，还在2010年通过了一项名为《海外账户税收合规法案》（FATCA）的法律，要求外国金融机构提供其美国客户的账户信息。这促使100多个其他国家行动起来，签署了《共同申报准则》（CRS），如今它们互相通报涉税金融信息。

然而美国并没有加入CRS，而是根据FATCA的对等条款与他国分享美国银行中的外国客户的信息。但分享的情况参差不齐，许多国家一无所获。再加上美国的空壳公司高度匿名，美国成了许多逃税者的首选目的地也就不足为奇了。一位税务专家估计“超过90%规避CRS的资产已经转移到了美国”。

美国不必担心会遭到自己先前对瑞士使出的那种穷追猛打——没有其他国家拥有美国那样的域外金融权力。但其他国家发现自己也有可以利用的法律工具。其中一个是所谓的佚名传票。美国的这项法律程序可协助税务机关追查涉嫌金融违规但身份不明的“某个人或可确定的某一群或一类人”。一经法院批准，佚名传票可强制要求银行交出涉嫌人员姓名。

到目前为止，美国在税务案件中使用的佚名传票最多，例如它在2008年就利用这种传票撬开了瑞士银行的保密信息，瑞银（UBS）因此交出了约

4500名账户持有人的姓名。今年4月，角色反转了。在芬兰的要求下，美国国家税务局（IRS）提请北卡罗来纳州的一个联邦法院向三家美国银行发出佚名传票。在发现由这三家银行发放的、与美国账户关联的支付卡在芬兰的自动取款机上大量使用后，芬兰税务机构认为使用这些卡的是在大西洋彼岸隐藏了未纳税收入的芬兰人。法院已批准了传票。

其他遭受税收流失的国家将会更加密切关注这一法律工具。与美国签订了双边税收协定的90个国家都可以使用它，尽管有些国家似乎还不知道可以这样做。（相比之下，根据FATCA，美国仅同意与47个国家交换信息。）专家表示，佚名传票不仅可以帮助获取可疑的银行账户信息，还可以获取常被用来藏匿资金的信托和保单信息。

要获得相关信息可能仍然存在障碍，比如帐户的持有方可能是实体而非个人。但是，收到传票的银行需要查明持有账户的空壳公司背后的控制人。由联邦机构金融犯罪执法局（FinCEN）发布的旨在遏制洗钱和资助恐怖主义的尽职调查规则已经要求银行了解这些“实益”所有者的身份（尽管似乎并非所有银行都在按要求去做）。一项正在国会推进的“破壳”法案获得了越来越多支持，它也将有助于提高企业透明度。

如果更多国家使用佚名传票，这将有助于平衡在金融透明度方面由美国占优势的不对等关系。很长一段时间以来，美国一直要求很多，回报很少。国际税务顾问马克·莫里斯（Mark Morris）表示，在美国藏匿资金的避税者应该“做好小金库被撬开的准备”。 ■



The media business

The \$650bn binge

Creative destruction in the entertainment business has had blockbuster results

AMERICA HAS seen some spectacular investment booms: think of the railways in the 1860s, Detroit's car industry in the 1940s or the fracking frenzy in this century. Today the latest bonanza is in full swing, but instead of steel and sand it involves scripts, sounds, screens and celebrities. Last week Disney launched a streaming service which offers "Star Wars" and other hits from its vast catalogue for \$6.99 a month, less than the cost of a DVD. As the business model pioneered by Netflix is copied by dozens of rivals, over 700m subscribers are now streaming video across the planet. Roughly as much cash—over \$100bn this year—is being invested in content as it is in America's oil industry. In total the entertainment business has spent at least \$650bn on acquisitions and programming in the past five years.

This binge is the culmination of 20 years of creative destruction. New technologies and ideas have shaken up music, gaming and now television. Today many people associate economic change with deteriorating living standards: job losses, being ripped-off, or living under virtual monopolies in search and social networks. But this business blockbuster is a reminder that dynamic markets can benefit consumers with lower prices and better quality. Government has so far had little to do with the boom, but when it inevitably peaks the state will have a part to play, by ensuring that the market stays open and vibrant.

The entertainment business is fast-moving by its very nature. It has few tangible assets, it relies on technology to distribute its wares and its customers crave novelty. The emergence of sound in the 1920s cemented

Hollywood as the centre of the global film business. But by the end of the 20th century the industry had grown as complacent as a punchline in a repeat episode of “Friends”. It relied on old technologies—analogue broadcasting, slow internet connections and the storage of sounds and sights on fiddly CDs, DVDs and hard drives. And the commercial approach was to rip off consumers by overcharging for stale content packaged into oversized bundles.

The first shudder came in music in 1999, with internet services soon putting established music firms such as EMI and Warner Music under pressure. In television Netflix broke the mould in 2007 by using broadband connections to sell video subscriptions, undercutting the cable firms. When the smartphone took off it tailored its service to hand-held devices. The firm has acted as a catalyst for competition, forcing the old guard to slash prices and innovate, and sucking in new contenders. The boom has seen star writers paid as if they were Wall Street titans, sent rents for Hollywood studio lots into the stratosphere and overtook the 20th century’s media barons, including Rupert Murdoch, who sold much of his empire to Disney in March.

Amid the debris and deals the outlines of a new business model are becoming clear. It relies on broadband and devices, not cable-packages, and overwhelmingly on subscriptions, not advertising. Unlike in search or social media, no firm in television and video streaming has more than a 20% market share by revenues. The contenders include Netflix, Disney, AT&T-Time Warner, Comcast and smaller upstarts. Three tech firms are active, too—YouTube (owned by Alphabet), Amazon and Apple, although their collective market share is still small. The music industry is also contested, with the biggest firm, Spotify, having a 34% market share in America.

Disruption has created an economic windfall. Consider consumers, first.

They have more to choose from at lower prices and can pick from a variety of streaming services that cost less than \$15 each compared with \$80 or more for a cable bundle. Last year 496 new shows were made, double the number in 2010. Quality has also risen, judged by the crop of Oscar and Emmy nominations for streamed shows and by the rising diversity of storytelling. Workers have done reasonably well. The number of entertainment, media, arts and sports jobs in America has risen by 8% since 2008 and wages are up by a fifth. Investors, meanwhile, no longer enjoy abnormally fat profits, but those who backed the right firms have done well. A dollar invested in Viacom shares a decade ago is worth 95 cents today. For Netflix the figure is \$37.

Many booms turn to bust. Unlike, say, WeWork, most entertainment firms have a plausible strategy, but too much cash is now chasing eyeballs. Netflix is burning \$3bn a year and would need to raise prices by 15% to break even—tricky when there are over 30 rival services. It hopes that its fast-growing international markets will create economies of scale. As well as saturation, the other danger is debt. Deals and high spending have caused American media firms to build up \$500bn of borrowing.

When the shake-out comes, history offers two dispiriting examples of how a consumer-friendly boom can turn into a stitch-up. Telecoms and airlines in America saw a riot of competition in the 1990s only to become financially stretched and then reconsolidated into oligopolies that are known today for poor service and high prices.

This is why government has a role in keeping the entertainment business competitive. First, it should prevent any firm—including the tech giants—from acquiring a dominant share in the content business. Second, it should require the companies that own the gateways to content, such as telecoms firms or handset providers such as Apple that can control what screens show—to have an open-access policy and not discriminate against

particular content firms. Last, it should make sure subscribers can move their personal data from one firm to another, so they do not become locked in to one service.

Few people look to Hollywood for economics lessons. But the entertainment epic has featured vibrant capital markets. Buy-out firms, stockmarkets and junk bonds have all financed the industry's reinvention. The stars have been billionaire entrepreneurs such as Reed Hastings, Netflix's boss. And open borders have set the scene, since talent comes from around the world and a majority of streaming subscribers now live outside America. Across the economy, these elements are at risk as politicians and voters veer away from open trade and free markets. For a reminder of why they matter, turn on your screen and press play. ■



【首文】媒体生意

6500亿美元的狂欢

娱乐产业的创造性破坏产生了轰动效果

美国出现过多次投资狂潮：想想19世纪60年代的铁路业、上世纪40年代底特律的汽车工业，或者本世纪的页岩油开发潮。今天，最新一轮“淘金热”正热火朝天地展开，但它挖掘的宝藏不是钢铁和砂石，而是脚本、声效、屏幕和明星。迪士尼上周推出了一项流媒体服务，依赖其庞大的影片库向订户提供《星球大战》等热门影片，订阅费为每月6.99美元，不到一张DVD的价格。这一由Netflix率先推出的商业模式被数十家竞争对手仿效，如今全球流媒体订阅用户已超过七亿人。今年有超过1000亿美元被投入到娱乐内容的开发，与美国石油产业的投资额不相上下。过去五年里，娱乐产业在收购和节目制作上至少共花费了6500亿美元。

这番投资狂潮是20年来娱乐产业内创造性破坏的巅峰。继音乐和游戏之后，电视行业如今也因新技术和创意而发生了变革。现在许多人认为经济转型导致生活水平下降：人们失业，挨宰，受到搜索引擎和社交网络等虚拟垄断集团的操控。但是，眼前这部商业大片提醒我们，有活力的市场能以更低的价格及更高的质量令消费者受惠。迄今为止，政府与这一繁荣关系不大，但当这场繁荣无可避免地触顶下调之际，政府就要发挥作用，确保市场保持开放和活力。

娱乐产业本质上就是个快速变化的行业。它的有形资产不多，依赖技术分销产品，其顾客渴求新鲜感。上世纪20年代，有声电影的出现巩固了好莱坞作为全球电影业中心的地位。但到上世纪末，这个行业已经变得固步自封，就像反复重播的《老友记》里的经典段子。当时它依赖的是一些陈旧的技术——模拟广播、慢速互联网，以及CD、DVD、硬盘等使用不便的音像存储工具。它的商业模式是把陈旧内容打包成超大套餐，再以高价出售，盘剥消费者。

第一个被冲击的领域是音乐。1999年，互联网服务很快就给百代唱片和华纳音乐等老牌音乐公司带来了压力。2007年，Netflix打破了电视行业的常规，利用宽带网络销售视频订阅服务，以低价打击了有线电视公司。到智能手机流行时，Netflix又针对手持设备的特点升级了服务。这家公司在市场竞争中发挥了催化剂的作用，不仅迫使老牌娱乐企业大幅降价并推陈出新，还引来了新的竞争者。这场热潮令名编剧的收入堪比华尔街巨头，让好莱坞电影制片厂的租金收入飙升天际，超过了鲁伯特·默多克等20世纪的媒体大亨。今年3月默多克将其媒体帝国的一大部分卖给了迪士尼。

在一片废墟和拆分重组之中，新的商业模式已逐渐轮廓分明。它依赖宽带和电子设备而非有线电视套餐，而且基本靠订阅而非广告来创收。有别于搜索引擎及社交媒体的市场，以营收计，目前仍未有哪家电视和视频流媒体公司的市场份额超过20%。场上的选手包括Netflix、迪士尼、AT&T-时代华纳、康卡斯特及其他规模较小的新贵公司。另有三家科技公司也很活跃，分别是YouTube（隶属Alphabet）、亚马逊及苹果，但三者加起来的市场份额仍很小。音乐产业也迎来了竞争，规模最大的Spotify在美国的市场份额为34%。

此中的破旧立新带来了意外的经济收益。先来看消费者。他们的选择变多，价格却变得更低，一众流媒体服务的价格都不到15美元，而有线电视的套餐价格至少要80美元。去年新制作的节目共有496套，是2010年的两倍。节目质量也有所提升，从流媒体节目获得连串奥斯卡和艾美奖提名可见一斑，而且故事类型也愈加多样化。另外，从业者的待遇不俗。自2008年以来，美国娱乐、媒体、艺术及体育行业的就业岗位增加了8%，工资增长了五分之一。与此同时，投资者不再享有异常丰厚的利润，但那些眼光独到、押对了公司的投资者还是收获不菲。十年前投资维亚康姆（Viacom）股票的一美元今天价值95美分，投资Netflix的话就有37美元。

许多热潮最终以泡沫破裂收场。与WeWork之流不同，大多数娱乐公司都有合理的战略，但现在它们为争夺眼球花费过度。Netflix每年烧钱30亿美元，需要提价15%才能平衡收支，而面对30多家对手的竞争，要提价难乎其难。Netflix希望其增长迅速的国际市场有助形成规模经济。除了面临市

场饱和，另一个风险是债务。并购交易和高额支出已令美国的媒体公司累计负债5000亿美元。

当大洗牌的时刻来临，两个让人丧气的例子可为前车之鉴，它们显示了原本有利于消费者的热潮可能变为消费者的陷阱。上世纪90年代，美国电信业和航空业掀起一轮激烈竞争，后来陷入财务困境，最终重新整合成了一些寡头企业，如今以价格高、服务差闻名。

有鉴于此，政府必须发挥作用，令娱乐业保持竞争。首先，政府应阻止包括科技巨头在内的任何公司在内容业务上获取主导份额。其次，应要求拥有内容入口的公司（比如可控制屏幕显示内容的电信公司或苹果等手机供应商）采取开放访问策略，不得歧视某家内容供应商。最后，应确保订户可以在服务商之间自由转移个人数据，这样就不会被锁定在某家公司。

很少会有人向好莱坞寻求经济学启示。但这一娱乐产业传奇之地的一大特色就是活跃的资本市场。收购型公司、股市和垃圾债券都为该行业的重塑提供了资金。其中的明星是Netflix的老板里德·哈斯廷斯（Reed Hastings）等亿万富翁企业家。而开放的边境搭好了舞台，因为这个行业里的人才来自世界各地，而现在大多数流媒体用户也都居住在美国以外。随着政客和选民逐渐舍弃开放贸易和自由市场，上述元素在美国经济的各行各业都受到威胁。要看看它们为何重要，请打开屏幕按下播放键。■



Bartleby

Khan-do attitude

A titan of Silicon Valley draws lessons from warriors of the past

IT SEEMS OBVIOUS that, for a company to succeed, it needs the right products. But many people believe the right culture is just as important. Creating that culture has been the holy grail for managers ever since Tom Peters and Robert Waterman focused on the issue in their book “In Search of Excellence”, published back in 1982. While the idea has never disappeared completely, it has come back into fashion today.

A prime example is a new book called “What You Do Is Who You Are: How to Create Your Business Culture” by Ben Horowitz, of the venture-capital firm Andreessen Horowitz (playfully known, because of the length of its name, as a16z). Mr Horowitz uses some unexpected examples as his case studies—Genghis Khan, Japanese samurai, Toussaint Louverture (who led a slave revolt in Haiti) and a reformed gang leader called Shaka Senghor.

It is easy to sense some wish fulfilment in these archetypes: the Silicon Valley tycoon, armed only with an iPhone, seeing himself as the modern equivalent of a historical warrior. That sense is heightened when Mr Horowitz talks of the contrast between “wartime” and “peacetime” chief executives, an analogy seemingly drawn from “The Godfather”, a movie about the mafia.

Thankfully, the book is not the orgy of macho chest-thumping that these examples might suggest. Mr Horowitz draws some thoughtful lessons from each of his case studies. Take Genghis Khan. He is best known for his rapid conquests and bloody massacres but the leadership lesson that the author draws relates to Genghis’s meritocratic approach. He was willing to promote

people from conquered tribes and allowed religious freedom in his empire. The only condition was allegiance to his rule.

Toussaint Louverture was notable for his clear ethical code and his willingness to forgive his enemies; he even let slave owners on Haiti keep their land, provided they agreed to reward their workers properly. Shaka Senghor also imposed a strict code of behaviour on his prison gang.

The underlying principle is that culture cannot just be a pious-sounding mission statement in the annual report. It has to be expressed in the form of actions on a daily basis. Indeed, the culture must be applied consistently. As Mr Horowitz writes “You can’t pat yourself on the back for treating your employees ethically if you’re simultaneously lying to your customers because your employees will pick up on the discrepancy and start lying to each other”. The goal is to embed the culture so deeply that employees will behave in the right way even when no one is looking.

Leaders set the tone. If they lie, shout or swear, then others will do the same. The corollary is that, if they want to encourage good behaviour, they have to get involved.

Companies may want a diverse staff but all too often, Mr Horowitz says, they try to achieve this by appointing a “head of diversity” or hiring consultants. At Andreessen Horowitz they insist that managers consult more widely by asking, for example, African-Americans what talents they would look for in a new candidate. The firm’s staff is now 55% female and 22% African-American.

But of course, some cultures can have bad effects. At Uber, a ride-hailing giant, the group’s values included such messages as “champion’s mindset” and “always be hustlin’”. The effect was to create a highly competitive culture that eventually had malign consequences in a series of scandals,

leading to the departure of Travis Kalanick, Uber's founder. Mr Horowitz argues that the board should have realised that the company's aggressive culture would eventually lead it into difficulty.

The examples chosen by the author are certainly colourful but they seem just as likely to have inspired Mr Kalanick as they might a modern, culturally sensitive chief executive. Running a business is not like conducting a war where casualties suffered on the road to victory are often regarded as little more than collateral damage.

It is also worth remembering that Genghis Khan's empire disintegrated within a generation of his death and that the Japanese economic miracle occurred only after the country had thrown off the rule of the samurai class.

Great leaders in history have not all been men of violence; some of them, indeed, have been women. Managers looking to set the right corporate culture might want to choose their role models from a more diverse group. ■



巴托比

可汗精神

一位硅谷巨头从过去的战士身上吸取经验

很明显，一家公司要想成功，得有对的产品。但很多人相信对的文化同样重要。自汤姆·彼得斯（Tom Peters）和罗伯特·沃特曼（Robert Waterman）在1982年出版的《追求卓越》（In Search of Excellence）一书中聚焦这一问题以来，创造这样的文化一直是经理人追寻的圣杯。这一想法从未完全消失，如今又再度流行起来。

一个典型的例子就是新书《你做什么，你就是谁：如何创造你的企业文化》（What You Do is Who You Are: How to Create Your Business Culture），作者是风投公司安德森-霍洛维茨（Andreessen Horowitz）（因为公司名的长度而被戏称为a16z）的本·霍洛维茨（Ben Horowitz）。霍洛维茨运用了一些出人意料的例子来做案例分析：成吉思汗、日本武士、领导了海地奴隶起义的杜桑·卢维杜尔（Toussaint Louverture）和一个改过自新的黑帮头目沙卡·桑戈尔（Shaka Senghor）。

在这些原型中，我们很容易感受到作者的某种美好愿望：这位硅谷大亨只有一部iPhone傍身，却将自己视为某位青史留名的勇士的现代版。当霍洛维茨将“战时”与“和平时期”的首席执行官做对比（似乎是借鉴了描写黑手党的电影《教父》）时，这种感觉就更加强烈了。

幸好，这本书并不像这些例子可能让人感觉的那样，满篇都是大男子气的拍胸脯打包票。霍洛维茨从他的每一个案例分析中都得出了一些经过深思熟虑的教训。比如成吉思汗。他以闪电征服和血腥杀戮闻名，但作者从他的任人唯才上吸取到了领导经验。他愿意从自己征服的部落里提拔人才，在他的帝国里允许宗教自由。唯一的条件是拥护他的统治。

杜桑·卢维杜尔以道德准则明晰、愿意宽恕敌人闻名于世。他甚至允许海

地的奴隶主保留他们的土地，只要他们同意给予劳工合理的报酬。沙卡·桑戈尔也用严格的行为准则管束他在监狱里的团伙。

这里反映出的一个原则是，文化不能只是年度报告中一个冠冕堂皇的使命宣言。它必须体现在日复一日的行动上。实际上，它必须始终保持一致。正如霍洛维茨所写的：“如果你对客户说谎，你就不能因为自己同时对员工讲道义而自鸣得意，因为你的员工会发现这种差异，进而开始互相说谎。”目标是将企业文化深植在员工心中，这样即使无人在旁，他们也能正确行事。

基调是领导定下的。如果他们说谎、大喊大叫或者骂人，其他人也会这么做。结论就是，如果他们想鼓励良好行为，就必须以身作则。

霍洛维茨表示，企业可能希望员工构成多样化，但它们往往想通过任命一位“多样化主管”或聘用顾问来实现这一点。在安德森-霍洛维茨，公司坚持要求主管们更广泛地征求意见，比如，问问非裔美国人期望新同事具备怎样的才能。现在该公司员工中55%是女性，22%是非裔美国人。

当然，有些文化会产生负面影响。网约车巨头优步的集团价值观包括“冠军意识”（champion's mindset）和“披荆斩棘”（always be hustlin'）等信息。结果创造出了一种激烈竞争的文化，最终以一系列丑闻显现了负面后果，导致创始人特拉维斯·卡兰尼克（Travis Kalanick）离职。霍洛维茨认为，这家公司的董事会应该意识到公司激进的企业文化最终会让它陷入困境。

作者选择的例子可谓丰富多彩，但看起来，它们带给卡兰尼克的启发和带给一位新式的、对文化敏感的首席执行官的也许并无不同。经营企业不同于指挥一场战争，在战争中，为获得胜利而遭受的伤亡往往只被看作附带损害。

同样值得记住的是，成吉思汗的帝国在他死后不过一代就瓦解了，而日本的经济奇迹是在摆脱了武士阶级的统治之后才出现的。

历史上伟大的领袖并不都是暴力男；有一部分其实是女性。管理者想要建立正确企业文化，可能得从一个更多样化的群体中选择自己的榜样。 ■



Buttonwood

Chinese whispers

Why the dollar is looking peaky

NOBODY WANTS to be called an unthinking optimist. Prospects for the riskier sort of investments are cloudy. The global economy faces numerous threats. Being even mildly bullish can seem a bit unreflective.

So whisper it, don't shout it, but the mood has changed recently for the better. Since the start of October, global equity prices are up by around 7%. Bond yields have risen. There has been a move away from the safe or defensive assets that hold up in bad economic times, towards those that do well in an upswing. Hopes for a preliminary trade deal between America and China pushed the yuan briefly below seven to the dollar two weeks ago.

At times like these, thoughts naturally turn to the outlook for the dollar more generally. A weaker dollar would be both a signal and a driver of a broader improvement in risk appetite. The dollar's fortunes have not yet shifted decisively. But the conditions for it to weaken are starting to fall into place.

To understand why, consider the forces behind the dollar's ascendancy since 2014. America's economy, though sluggish by historical standards, has benefited from an ever-reliable engine: the American consumer. The euro-zone, by contrast, responded to its sovereign-debt crisis by saving more. Its surplus savings, together with those generated in Asia, must find a home. America's high-yielding bonds and modish technology stocks have made it the go-to place for global savers. Capital inflows drove up the price of dollar assets. America's net investment position—the foreign assets its residents own abroad minus what they owe to foreigners—went deeper into the red

(see chart).

As industry slumped and trade faltered this year, America still looked the best of a bad lot. But the scales are tilting against the dollar. Global manufacturing may have bottomed out. The purchasing managers' index for industry compiled by the global economics team at JPMorgan Chase rose for a third month in October. Growth in output is barely positive, but an improving trend in new orders alongside falling stocks is a sign of a turn in the manufacturing cycle. The improvement is halting. Jobs-rich service industries are still slowing, so it is too early to expect better GDP growth. But hopes are growing of a pickup in 2020, driven by economies beyond America's shores.

This matters for the dollar. Synchronised global GDP growth opens the door for investors to move capital out of America's expensive dollar assets to where assets are cheaper, says Hans Redeker, a currency strategist at Morgan Stanley. Moreover, interest-rate cuts this year by the Federal Reserve mean that the dollar is now receiving less support from elevated bond yields. Central bankers in other places are disinclined to relax policy further. The European Central Bank's governing council, for instance, was divided on the decision in September to cut interest rates and restart quantitative easing.

A shift in global capital away from America would be a particular boon to emerging markets. A fall in the dollar would make it easier to service their foreign-currency debts. It would also ease local credit conditions, thus helping GDP growth. For investors, emerging markets are where the value is. Equity markets are cheaper. Bond yields are higher. Currencies have scope to make up the ground they lost earlier this year and in the slump of 2013-16.

Apart from such trouble spots as Argentina, Chile and Turkey, emerging-market currencies have started to rally against the dollar. Still, the euro is

the gauge by which many people judge the dollar's vigour, or lack of it. And it has been stubbornly weak. Sentiment is coloured by the travails of Germany, the currency zone's largest economy, which only narrowly avoided a technical recession (two quarters of declining GDP) in the six months to the end of September. But the euro at least seems to have found a floor. And if the world economy gathers strength the euro will eventually rally.

That is still a big if. Another breakdown in trade talks between America and China could lead to a renewed slump in global manufacturing and business spending, and kill off any incipient dollar weakness. Other political risks—the protests in Hong Kong; the Democratic primaries in America—are looming larger. And after a longish expansion, the world economy is lacking vigour. But the dollar's stint at the top of the currency pile is looking tired, too. People are already whispering. The noises may soon get a lot louder. ■



梧桐

耳语传话

美元为何显现疲态

谁都不愿被说成是盲目乐观者。高风险投资前景晦暗。全球经济面临诸多威胁。即使略表乐观也可能会稍显思虑不周。

那么还是悄悄耳语，不要声张。不过最近市场情绪已经开始向好。自10月初以来，全球股价上涨了约7%。债券收益率有所上升。人们的投资对象已不再是经济低迷时收益稳定的避险或防御型资产，而是转向在经济回暖期表现不俗的资产。两周前，中美达成初步贸易协定的希望让人民币兑美元汇率一度跌回7以下。

在这种时候，人们自然会关注美元更广泛的前景。美元走弱既是风险偏好普遍提升的信号，同时也是推动风险偏好提升的因素。美元走势尚未发生决定性的转变，但它走弱的条件已经开始就位。

想要知道原因，不妨看看自2014年以来美元霸主地位背后的推动力量。美国消费者一直是拉动美国经济增长的可靠引擎——虽然以历史标准衡量，当前美国经济增长缓慢。而欧元区则是靠增加储蓄来应对主权债务危机。欧元区的过剩储蓄，以及亚洲的过剩储蓄，必须找到一个归宿。美国的高收益债券和时兴的科技股使其成为全球储蓄者的首选之地。资本流入推高了美元资产的价格。美国的净国际投资头寸，也就是其居民的海外资产减去他们的海外负债后的净值，在负值区内越陷越深（见图表）。

尽管今年工业衰退、贸易动荡，美国似乎仍是“矬子里头的将军”。但天平正朝着不利于美元的一方倾斜。全球制造业可能已经触底。截至10月，摩根大通全球经济团队编制的制造业采购经理指数已经连续三个月上升。虽然产出增长勉强达到正值，但新订单呈增长势头，库存也在下降，这些都显示制造业周期迎来了转折。但这种改善仍然磕磕绊绊。能提供大量就业

岗位的服务业仍在放缓，因此现在就指望GDP增长提速还为时过早。但在美国以外的其他经济体的推动下，2020年经济好转的希望越来越大。

这对美元很重要。摩根士丹利的货币策略师汉斯·雷德克（Hans Redeker）表示，全球GDP的同步增长可能会方便投资者将资本从美国昂贵的美元资产转移到资产相对廉价的地方。此外，美联储今年的降息行动也使得美元现在从高企的债券收益中获得的支撑减少。其他国家的央行不大乐意进一步放松货币政策。比如，欧洲央行管理委员9月在降息和重启量化宽松的决策上就出现了分歧。

全球资本从美国转出对新兴市场尤其是福音。美元贬值不仅更利于它们偿还外币债务，还能缓解它们的信贷状况，从而助力GDP增长。对投资者来说，新兴市场是价值所在。这里的股市价格更低，债券收益率更高。各国货币有机会收复在今年早前以及2013到2016年低迷期的失地。

除阿根廷、智利和土耳其等动荡国家外，新兴市场货币相对美元已开始回升。不过，欧元仍是很多人判断美元强劲与否的标尺。而欧元一直疲软。在截至9月底的六个月里，欧元区最大的经济体德国仅勉强避免了一次技术性衰退（即GDP连续两个季度下降），它带来的阵痛影响了市场情绪。但欧元至少似乎已经探底。而且，如果世界经济积聚力量，欧元最终会走强。

这个“如果”仍是个很大的疑问。中美贸易谈判如果再次破裂，可能会导致全球制造业和商业支出再次下滑，并掐灭美元疲软的所有苗头。其他政治风险——香港的抗议、美国的民主党初选——越来越令人忧虑。在长期扩张之后，世界经济如今后劲不足。但美元相对各国货币的强势地位也已显现疲态。人们已经在窃窃私语了。他们的声音说不定很快就会响亮起来。





The markets

Sentimental journey

Investors are feeling a bit more chipper

IT HAS BEEN a year of mood swings in financial markets. In the spring and summer, anxious investors piled into the safety of government bonds, driving yields down sharply. Yields have recovered in recent weeks (see chart 1). This is not the only sign that investor sentiment has improved.

In general, safe assets have been sold in favour of cyclical ones. The Australian dollar, a cyclical currency, is up against the yen, a haven for the fearful. Something similar is happening in commodity markets, where the price of copper, a barometer of global industry, has risen against the price of gold (see chart 2).

Equity prices in America have reached a new peak. But what is more striking is the performance of cyclical stocks relative to defensive ones. Within America's market the prices of industrial stocks, which do well in business-cycle upswings, have risen relative to the prices of utility stocks, a safer bet in hard times. In Europe the stocks of financial firms, the fortunes of which are tied to the business cycle, have risen relative to those of firms that make consumer staples—food, beverages, household goods and so on—which are more resilient in bad times (see chart 3).

Investors have also begun to embrace assets at the riskier end of the spectrum. A host of emerging-market currencies have gained against the dollar since the start of October (see chart 4). ■



金融市场

感性之旅

投资者情绪略有好转

今年是金融市场情绪波动的一年。春夏两季，焦虑的投资者蜂拥购入安全性高的政府债券，导致收益率骤降。最近几周收益率有所回升（见图表1）。这是投资者情绪开始好转的迹象之一。

一般来说，出售安全资产是为了投资周期性资产。周期性货币澳元对避险货币日元汇率走强。大宗商品市场也出现了类似的情况，作为全球工业晴雨表的铜价相比金价走势更强劲（见图表2）。

美国的股价创历史新高。但更引人注目的是周期性股票相对于防御性股票的表现。在美国金融市场，相比在经济困难时期表现更稳健的公用事业股票，在经济周期上升阶段表现良好的工业股票价格已经上扬。在欧洲，相比在经济不景气时更具韧性的消费必需品（食品、饮料、家居用品等）股票，业绩与经济周期息息相关的金融公司的股票上涨了（见图表3）。

投资者也开始接受风险更高的资产。自10月初以来，多种新兴市场货币兑美元的汇率上升（见图表4）。■



Tech recruitment

Egghead-hunting

How Silicon Valley woos clever Stanford students

CONGRATULATIONS, YOU got into Stanford University. You beat 22 other candidates vying for each coveted place. For you, competition doesn't quite stop there: being best in class boosts your prospects. But the real fighting now will be over 7,100 undergraduates and 9,400 graduate students, not between them. Technology giants and sexy startups all want this brainpower. So do venture capital (VC) funds. All go to sometimes absurd lengths to get it.

Accelerator programmes, such as StartX or Alchemist Accelerator, court budding entrepreneurs with burritos, desk space and thousands of dollars in earliest-stage funding. They hope to ferret out the next HP, Cisco, Google, PayPal, Netflix or other tech success story that can trace its roots to Stanford's campus in sleepy Palo Alto, Silicon Valley's spiritual epicentre.

To beat others to top talent, some deep-pocketed investors take on teaching appointments. Venture capitalists from Floodgate teach a course in how to evaluate startups. Many wannabe founders attend—and are evaluated in turn. Those who sparkle in final exams, which look a lot like startup pitch days, are invited to meet investors. Many such meetings turn into funding rounds. One student recounts how a Silicon Valley luminary who sometimes teaches at Stanford's Graduate School of Business has funded students on the spot.

Partners from VC firms like Accel, Threshold Ventures and Mayfield sponsor fellowships for entrepreneurial students—and host regular soirees and annual weekend getaways to Lake Tahoe. With such opportunities about,

gushes Patty Sakunkoo, a PhD-student-turned-entrepreneur who has created multiple photo and video apps, “you can’t help but catch the startup bug while at Stanford.”

Some VCs hope at least some students can resist—and come to work for them instead. They hang out with other company recruiters—from technology giants and small startups alike—at one of Palo Alto’s half-dozen Coupa Cafés, a local coffee-shop chain. They treat prospective hires to lattes—and promises of a rich career.

Now that stock options are falling out of favour as one tech initial public offering after another fizzles, for smaller startups the richness relies more on the emotional appeal of founders’ missions. Either that, or they offer dibs on their product: Josh Wolff, a computer-science and bioengineering undergraduate, recalls being repeatedly approached by someone on LinkedIn who wanted to contract him as a consultant—and pay with his own cryptocurrency (Mr Wolff wisely declined). In the end, though, “it is so hard to compete with Big Tech,” sighs one founder.

The giants, many with headquarters nearby, rule the roost at Stanford. They, too, play up their mission and the importance of each job. But mostly, they shower students with goodies. The annual job fair in October is an “insane arms race of free corporate swag”, says Ashwin Siripurapu, a computer-science graduate. Students exchange résumés for trinkets (USB sticks, Rubik’s cubes) or, occasionally, heftier gifts (bluetooth speakers, tablets). Within days offers start flooding in, including from firms that students never approached.

Once they identify a keeper, cash-rich firms—be they listed behemoths or multibillion-dollar unicorns—spare no expense. They wine and dine students at glitz Palo Alto restaurants like Reposado or Il Fornaio and put them up in five-star hotels on visits to offices in places like New York. One

Stanford graduate recalls a big unicorn paying for an Uber Copter to fly him from Manhattan to JFK airport.

When all is said and done, it is hard to resist a starting salary of \$150,000-200,000, great health insurance, wellness reimbursements and unlimited vacation time (including at company retreats)—and a signing bonus of \$10,000-20,000, for good measure. A job at today's conglomerates—Alphabet, Apple, Amazon or Facebook—increasingly resembles one at General Electric in the 1980s: making up in perks what it lacks in sizzle. ■



科技业招聘

捕猎天才

硅谷如何追逐聪明的斯坦福学生

恭喜，你被斯坦福大学录取了。你击败了22个竞争对手才得到这一炙手可热的入学名额。不过对你来说，竞争并未就此结束：如果能在班上名列前茅，将会提升你的毕业前景。但现在真正的比拼并不发生在你和同学之间，而是一场对斯坦福7100名本科生和9400名研究生的争夺战。科技巨头和光彩夺目的创业公司都想要这些顶尖头脑。风投基金也一样。它们为此不遗余力，有时还用力过猛。

StartX或炼金术士（Alchemist Accelerator）等创业加速器以墨西哥卷饼、工位空间和成千上万美元的早期融资来吸引崭露头角的创业家。它们希望发现下一个惠普、思科、谷歌、贝宝（PayPal）、奈飞（Netflix），或其他起源于斯坦福校园的科技创业成功故事。斯坦福所在的寂静的帕洛阿尔托（Palo Alto）是硅谷的精神中心。

为了抢先争取到顶尖人才，一些财大气粗的投资机构通过授课来促进招聘。Floodgate的风险投资人开设了一门评估创业公司的课程。许多想要创业的学生参加了这门课——继而也就接受了评估。结课考试看起来很像创业公司的推介日活动，在考试中脱颖而出的人将受邀与投资者见面。许多此类会面都变成了融资会议。一名学生讲述了一位硅谷大佬当场投资了一些学生的故事，这位大佬有时会到斯坦福大学商学院授课。

来自Accel、Threshold Ventures和Mayfield等风投公司的合伙人为创业的学生设立了奖学金，还定期举办晚宴，并每年安排一次太浩湖（Lake Tahoe）周末之旅。面对这样的机会，“在斯坦福读书你会情不自禁地加入创业大流。”帕蒂·萨库古（Patty Sakunkoo）难掩激动地说道。他由一名博士生变身为企业家，创建了多个照片和视频应用。

一些风投公司希望至少有一些学生能抵制创业的诱惑，来为它们工作。它

们和其他公司（科技巨头和小型创业公司都有）的招聘人员一起在Coupa Café（这个本地咖啡连锁店在帕洛阿尔托有五六家分店）里闲坐，招待未来可能加入自己公司的学生喝拿铁，向他们许诺报酬丰厚的职业生涯。

随着一家又一家科技公司上市失利，股票期权逐渐失去吸引力，对小型创业公司而言，“钱途”更多地依赖创始人的使命感召力。要不然就是用自己的产品作酬劳。计算机科学和生物工程专业的本科生乔什·沃尔夫（Josh Wolff）回忆，曾有人通过领英多次与他联系，想聘请他担任顾问，并用他自己创建的加密货币来支付报酬（沃尔夫明智地拒绝了）。不过说到最后，“和大科技公司竞争太难了。”一位创始人叹息道。

在斯坦福称雄的还是科技巨头，其中许多公司的总部就在附近。它们也极力鼓吹自己的使命和每个工作岗位的重要性。但它们主要还是用大把的好东西笼络学生。计算机科学专业毕业生阿什温·西里普拉普（Ashwin Siripurapu）说，每年10月举行的招聘会就是一场“丧心病狂的公司赠品军备竞赛”。学生递简历可以拿到小礼品（U盘、魔方等），偶尔也会有更大件的礼物（蓝牙音箱或平板电脑）。学生在几天之内便会收到大量的工作邀请，其中有些公司他们从未接触过。

无论是已上市的巨头还是价值数十亿美元的独角兽，那些现金充裕的公司一旦锁定了可造之材就不惜成本志在必得。它们在Reposado或Il Fornaio等帕洛阿尔托的豪华餐厅里用美酒佳肴款待自己看中的学生，邀请他们参观纽约等地的办公室并入住五星级酒店。一名斯坦福毕业生回忆到，一家大独角兽公司曾花钱租了一架Uber Copter直升机把他从曼哈顿送到肯尼迪国际机场。

说到底，15至20万美元的起薪、完备的医保、健身等报销福利和无限假期（包括公司团建），再加上一笔一万至两万美元的签约奖金，任谁都很难拒绝。在今天的大企业集团——Alphabet、苹果、亚马逊或Facebook——工作与上世纪80年代在通用电气供职的情形越来越相似：豪情不够，福利来凑。 ■



Buttonwood

VC after SoftBank

What happens when the wellspring of the best business ideas meets too much money

DEALMAKERS ARE smooth talkers. They need to be. But which branch of finance has the slickest ones? Consider the polished, public-school manner of the City investment banker—or the high-velocity spiel of the Wall Street bank boss. Both have a strong claim. But the venture capitalists, or VCs, of Silicon Valley have a stronger one. They spend their time either being pitched to by, or pitching on behalf of, entrepreneurs who hope to be the next Zuck or Larry-and-Sergey. Peddlers of such extravagant dreams have to have silver tongues.

They certainly have some catchy phrases. They speak of “vanity metrics” (misleading measures of a startup’s progress); of the importance of “product-market fit” (how well a piece of software meets the customer’s needs); and “deal heat”, the fever that causes investors to overpay. After a while even a normally buttoned-up Buttonwood is asking to “double-click” on a topic when he wants more detail from a voluble VC.

A subject guaranteed to get them talking is the flood of capital into Silicon Valley. In the popular metaphor, the VC business used to consist of a flotilla of small boats fishing in a well-stocked lake. It was all very collegial. Now the lake is an ocean. Trawlers are out there—big institutions, such as sovereign-wealth funds and pension-fund managers, that increasingly invest directly in technology firms before they reach public markets. The abundance of capital has made the VC game more competitive. It has also distorted the market for privately held firms.

That new firms are staying private for longer is both a cause and a

consequence of this change. The deeper reasons for the shift are debated. Some VC types put it all down to regulations that made it costlier to become a public company and easier to remain a private one. Others place more weight on the changing nature of new firms, which need less capital than they once did, both to start and to grow. The building blocks for business software or smartphone apps are freely available as open-source code. Computing power can be leased. The result is a shift in the balance of power from suppliers of capital towards entrepreneurs, who want to be spared the scrutiny of public markets.

Perhaps a more important shift than the fall in demand for capital has been a steady rise in its supply. The secular slump in long-term interest rates, caused in part by abundant savings, was given an extra shove after the financial crisis by central banks' easy-money policies. Yields on listed stocks have fallen, too. The venturesome, noting the boom in the share prices of tech stocks, moved into pre-IPO financing in search of higher returns. Sums that not so long ago could only be raised through a stock-exchange listing are now routinely raised privately.

One consequence has been a fall in the number of listed companies. By the time a tech startup goes public, its days of supercharged revenue growth may be over. This fear only fuels desperation to get in on the act sooner. There is much shaking of VC heads about the participation of institutions based back East in even the early funding rounds for new tech firms. VCs pride themselves on pastoral care: the support, expertise and contacts they provide to fledgling firms. What do "tourists" from Boston and New York bring, apart from their big cheques?

As more and more money crams into Silicon Valley, valuations inevitably become inflated. Last month WeWork, an office-sharing firm, was forced to pull its IPO when public investors balked at the price tag. A bail-out by SoftBank, WeWork's main backer and a writer of big cheques more generally,

valued the firm at \$8bn. Yet a funding round in January put the firm's value at \$47bn. "The damage done by SoftBank is incalculable," says one Silicon Valley bigwig. "If you make a firm go faster, it does unnatural things." There is a growing sense that capital is being wasted. "Businesses that shouldn't be funded are getting funded," says another VC. Sales and marketing budgets are swollen. Firms lose track of whether their product is any good.

Nevertheless a general view is that it will take something dramatic—a meltdown in tech stocks or a sharp rise in interest rates—to scare the money from Silicon Valley. Big dreams are part of venture capitalism. Everyone fishing in these crowded waters still hopes to land a whale. Look at it another way, says a VC. In 2012 Facebook paid \$1bn for Instagram, a firm that had 13 employees and was not yet two years old. That seemed profligate, he says. But with the benefit of hindsight, Facebook underpaid. ■



梧桐

软银之后的风投

当最佳商业创意的源泉遇到太多钱之后

做交易的人都能说会道。他们需要这样。但金融业哪个分队的人最伶牙俐齿呢？想想伦敦金融城里的投资银行家们优雅的公学范儿，再想想华尔街银行老板滔滔不绝的高谈阔论。两方都堪称顶级了。但硅谷的风险投资家还是更胜一筹。他们要么在听那些想要成为下一个扎克伯格和谢尔盖双人组的创业者自我推销，要么在代表他们推销。兜售如此宏伟梦想的人必须得舌灿莲花。

他们当然有一套动听的术语。他们谈论“虚妄指标”（衡量创业公司进展的误导性指标），“产品-市场匹配”（一款软件满足客户需求的程度）的重要性，以及“交易热”——导致投资者出价过高的狂热。片刻后，就连通常都沉默聆听的本专栏作者也得请求面前口若悬河的风险投资家“双击”某个主题，以了解更多细节。

有个话题一定能让他们打开话匣子，那就是涌入硅谷的大量资本。有一个流行的比喻，说风投行业过去是一群小船在一个鱼储量丰富的湖上打渔。大家分工协作，气氛融洽。现在湖变成了海洋。海上来了拖网渔船，也就是像主权财富基金和养老金管理公司这样的大型机构，它们越来越倾向于在科技公司进入公开市场之前就直接向它们投资。充足的资本让风投领域竞争更加激烈。它也扭曲了私有企业市场。

新公司如今保持私有状态的时间更长了，这既是资本大量涌入的原因也是其结果。这种转变的深层次原因还在争论中。一些风投公司将它全部归结于监管，因为监管使得公司上市的成本更高，保持私有更加轻松。另一些风投公司则认为这更多是由于新企业特质的改变造成的一——它们启动和成长所需的资本都比以前少。商业软件或智能手机应用的构件都是可以免费获得的开源代码。计算能力可以租用。结果是权力的天平从资本供应者向

希望避开公开市场审视的企业家倾斜。

或许比资本需求下降更重要的转变是资本供应的稳步增长。大量的储蓄在一定程度上导致长期利率不断下滑，而金融危机后央行实施的宽松货币政策进一步加剧了这一趋势。上市公司股票的收益也下降了。风投公司注意到了科技股大涨，于是进入IPO前融资以寻求更高的回报。不久以前还只能通过在股票交易所上市融到的资金现在频繁地通过私人融资获得。

后果之一是上市公司数量减少。等到一家科技创业公司上市时，它收入高速增长的日子可能已经结束了。这种担忧只会加剧人们要尽快参与进去的急切心情。对于来自美国东岸的机构早早参与新科技公司的早期融资，风投资本家大摇其头。风投公司一向对自己提供的悉心照料引以为豪：他们为羽翼未丰的新公司提供支持、专业能力和人脉。除了大额支票，这些来自波士顿和纽约的“游客”还能带来什么？

随着越来越多的资金涌入硅谷，估值不可避免地被夸大。上个月，共享办公公司WeWork因为公众投资者对它的高估值望而却步而被迫取消IPO。软银是WeWork的主要投资方，本身也是经常签出大额支票的投资者，它出手救助WeWork时对其估值80亿美元。但在1月份的一轮融资中，对该公司的估值高达470亿美元。“软银造成的损失是无法估量的，”硅谷的一位大亨表示，“如果你让一家公司走得更快，它就会做出不自然的事情来。”人们越来越感到资本正在被浪费。“不该被资助的企业正在得到投资。”另一位风投业者说。销售和营销预算膨胀。公司已经弄不清楚自己的产品到底好不好。

不过，人们普遍认为，除非发生科技股暴跌或利率飙升这样戏剧性的变化，才可能吓退硅谷的资金。宏大梦想是风险资本主义的一部分。在这些拥挤的水域里捕鱼的每一个人仍然希望捕到鲸鱼。一位风投人士说，换个角度来看吧。2012年，Facebook斥资10亿美元收购了Instagram，当时这家公司只有13名员工，成立还不到两年。看起来Facebook真是挥霍无度，他说。但回过头去看，它实则是给了少。 ■



Corporate China

Fake it till you break it

Some firms have lied about their state pedigree, as investors are learning

IT CERTAINLY SOUNDS pretty powerful: China Nuclear Engineering Construction Group. Once controlled by the People's Liberation Army, it is now, it says, part of a “central state-owned enterprise (SOE)”, an elite class of firms belonging to the Chinese government. Its website is full of pictures of its executives signing deals around the country. Like any good state-run giant, it is politically correct, its statements echoing Communist Party slogans. There is just one snag: China Nuclear Engineering Construction Group is not a central SOE.

As China’s economy slows, defaults have risen sharply. Such failures, though painful, separate strong companies from also-rans, a process other countries know well. In China there is an extra wrinkle: the downturn is also exposing fake SOEs. These are companies that misled creditors about their state connections to suggest they would be supported if they ran into trouble. But when trouble arises, the government is nowhere to be found.

Last month Huarong, a firm that handles non-performing loans, put 610m yuan (\$87m) of China Nuclear Engineering Construction’s assets up for sale, consisting of property in the province of Anhui. Despite its name, China Nuclear focused on property, like several other fake SOEs. It also benefited from confusion with a real SOE, China Nuclear Engineering and Construction Corporation (eagle-eyed readers will spot two differences in their names).

It has plenty of peers. China Huayang Economic and Trade Group claimed to be one of China’s first SOEs, but a subsidiary said in a recent filing that it

is in fact a non-state entity. Huayang has defaulted on 7bn yuan in bonds. China City Construction sold 99% of its shares in 2016 to a private investor, but kept calling itself an SOE. It has since had a string of defaults. Other firms have embellished their connections. China Energy Reserve and Chemicals Group Overseas Capital Company reassured rating agencies with its structure, supposedly traceable to a powerful SOE. It defaulted on a \$350m bond last year.

Such stories have become common enough that Gelonghui, a financial-information company, published a tongue-in-cheek guide on how to become a fake SOE. Find a long-forgotten government institution; target an official with no hope of promotion; then “be a shameless toady” to get the institution’s seal to register your company. Finally, build a maze of subsidiaries.

Fake SOEs are only a small part of China’s economic landscape. But they highlight two pathologies. First, private firms struggle to get financing. Banks are more willing to lend to (real) SOEs, knowing that they are less likely to go bust.

The second is poor due diligence. The belief that the government will prop up SOEs is a substitute for assessing their true value. Chinese investors are not the only ones who fall prey to this. When China Energy Reserve defaulted, South Korean brokerages made large losses. Barclays, a British bank, was one of its underwriters.

Red flags are often obvious. A recent visit to the registered address of the state firm listed as the owner of China Nuclear revealed another, apparently unrelated company. “Ultimately the problem is that investors aren’t sufficiently rational,” says Zhang Licong of CITIC Securities. “They have their natural biases, and some firms take full advantage of them.” ■



企业中国

装不下去了

一些企业假扮国有血统，投资者交学费

名字听起来着实挺威风：“中核工建设集团”（下文简称中核工建）。它曾经隶属人民解放军，现在自称是一家央企（国企中的上层集团）控股公司。公司的官网上满是其高管在全国各地签定协议的照片。和任何正经的国有巨头一样，它政治立场正确，言论与共产党的口号相呼应。不过有一个小问题：中核工建并不是一家央企。

随着中国经济放缓，企业违约率急剧上升。这种麻烦固然令人头疼，却也把优秀企业与其他实力不济的企业区分开来。其他国家对这一过程非常熟悉。在中国，它还发挥了一个额外的作用：经济下滑期也让假国企浮出水面。这些企业在它们与政府的关系上误导债权人，暗示如果它们遇到麻烦，会有政府扶持。但当麻烦真的出现时，却不见政府出面。

上个月，处理不良贷款的华融公司出售中核工建6.1亿元的资产，都是在安徽省的房地产。中核工建尽管打着“核”的名头，却和其他几家假国企一样，专注于房地产。它与真正的国企中国核工业建设集团（简称中国核建，眼尖的读者会发现两家企业的名字仅两字之差）易被混淆，也凭此钻了空子。

这样的假国企不在少数。中国华阳经济贸易集团号称是中国首批国企之一，但它的一家子公司在近期一份文件中表示，它实则是非国有实体。华阳经贸已经对约70亿元的债券违约。中国城市建设控股集团于2016年向一家私人投资机构出售了其99%的股份，但仍自称国企。此后它出现连串违约。其他一些公司也粉饰了它们与政府的联系。中国国储能源化工集团海外资本公司（CERCG Overseas Capital）从组织架构上看似乎源自一家大型国企，这打消了评级机构的疑虑。该公司去年对3.5亿美元的债券违约。

这样的故事已是屡见不鲜，金融信息公司格隆汇甚至调侃地发布了一篇假

国企包装指南。先找一家非主流事业单位；瞄准一名升迁无望的领导；然后再“软磨硬泡”求个章注册公司。最后，建立一堆关系错综复杂的子公司。

假国企只是中国经济版图中的一小部分，但它们凸显了两种病状。首先，私营企业融资困难。银行更愿意向（真正的）国企放贷，因为它们知道国企破产的可能性更小。

第二是尽职调查不力。相信政府会扶持国企就忽略了对企业真实价值的评估。并非只有中国投资者才会上这种当。国储能源违约后，韩国券商蒙受了巨大的损失。英国银行巴克莱也是国储能源的承销商之一。

有问题的迹象往往显而易见。笔者最近去了显示为中核工建股东的一家国企的注册地址，却发现办公的是另一家无甚关联的公司。“问题的症结在于投资者不够理性，”中信证券的章立聪表示，“他们天生带有偏见，而一些公司充分利用了这一点。”■



Inequality

The broken ladder

In the past, America was not as unequal as it has become—and as it might be in the future

FOR MOST of its history, America has been a more egalitarian place than Europe—at least, so long as you exclude the abomination of slavery. White migrants to the New World found it less class-bound than the old. Inherited wealth cast a shorter shadow. In 1810, according to Thomas Piketty, a French economist, the richest 10% of Americans controlled less than 60% of national wealth, compared with more than 80% in Europe. When industrialisation threatened to establish an aristocracy like those across the Atlantic, the social backlash was prompt and decisive. Reforms extended the vote to women and protected workers' rights, busted powerful monopolies and introduced an income tax. Franklin Roosevelt's New Deal finished the work begun in the late 19th century. By the 1950s, the American economy was not only the most advanced in the world, but was once more a bastion of egalitarianism.

The evolution of inequality since that time thus represents a significant departure from American history. The incomes of the rich have grown much faster than those of the poor. From 1979 to 2016, the income of the top 1% of Americans grew by a cumulative 225%, compared with just 41% for the middle-class. Wealth inequality, too, has risen. Over the same period, the share of the country's wealth controlled by the top 0.1% more than doubled, to 20%. In continental Europe, meanwhile, the gap between rich and poor has widened only slightly. The share of total national income earned by the richest 1% of Europeans has increased by two percentage points over the past 40 years, compared with ten percentage points in America.

Political momentum is building for a response; several Democratic candidates for the presidency promise to introduce new wealth taxes. Even now, though, the origins of the malaise are poorly understood. Analysis tends to focus on proximate causes, such as globalisation or the impact of technology on the job market. These matter, but have also affected other rich countries. The source of America's troubles lies deeper.

Part of the problem is that American policy has exacerbated the effect of economic pressures. In their new book, "The Triumph of Injustice", Emmanuel Saez and Gabriel Zucman pin the blame for rising inequality squarely on the American tax system. The authors—both economists at the University of California, Berkeley—argue that taxation in America has become less progressive over the past four decades. In the 1970s the rich paid twice as much in tax, as a share of their income, as the working poor (taking into account all taxes, including those at the state and local level). After President Donald Trump's tax reform in 2018, by contrast, the very rich paid a smaller share than many Americans in the bottom half of the income distribution. The 400 richest Americans paid an average tax rate of about 23% of income in 2018, according to the authors' estimates. Low-income Americans paid roughly 25%, the authors say, although this excludes transfer payments made to the very poorest households: a misleading omission, some critics reckon. Personal taxation is only part of the story, as the authors cursorily allow. Even so, the decline in the tax burden on the very rich, at a time of extraordinary growth in their incomes, is startling.

This analysis poses a question: why has American tax reform been so heedless of inequality? Messrs Saez and Zucman suggest a rationale. Economic injustice (as they see it) is a result of a simple cycle. The rich try to avoid tax, then win concessions from politicians who argue that attempts to get more from the wealthy are doomed to failure. This gambit foundered in the past, they say, because of a shared conviction of the value of collective, state-funded action. Erosion of that belief led to complacency in the face

of avoidance and acceptance of widening chasms in wealth and power. The pair do not press their analysis further; economists, Mr Saez says, are “ill-equipped” to take on questions of values, important as they may seem.

Others are willing to try. In “The Meritocracy Trap”, Daniel Markovits, a legal scholar at Yale, blames the loss of social solidarity, and much else besides, on the slow corruption of American meritocracy, which has ossified into a formidable caste system. As the economic premium on education rose, he explains, competition for places at elite institutions of higher education grew. That struggle has become an obstacle to success for all but the cognitive elite. The gap in academic achievement between the children of rich and poor families is now larger than that between black and white pupils in the era of segregation, Mr Markovits notes.

In theory, this is a fixable problem, as “Unbound”, a new book by Heather Boushey, makes clear. Ms Boushey is the director of the Washington Centre for Equitable Growth, a left-leaning think-tank. Her book is a detailed account of the obstacles to a more egalitarian American future. Social cleavages described by Mr Markovits pop up repeatedly. The conditions into which children are born drastically influence their economic prospects as adults, Ms Boushey observes—from how likely they are to be arrested to the chance that they will be an inventor or entrepreneur.

But those effects can be countered. Health at birth, for instance, has been shown to sway educational performance and employment prospects—suggesting that better access to pre- and post-natal health care could help. So could improved access to early childhood education. Studies of high-quality pre-kindergarten programmes find enduring benefits to recipients from poor backgrounds. High-income parents read to their children more and spend more time and money on intellectually enriching activities than do poorer parents. Higher wages at the bottom, as well as more predictable work schedules, could narrow the gap. Research finds that

rates of upward mobility are higher in some places than others; zoning reforms or subsidies that encourage migration to thriving areas could loosen up America's class-bound hierarchy.

Ms Boushey frames her proposals as ways to reduce inequality while also aiding economic growth. For example, because highly unequal economies seem to rely more on credit booms to propel growth, redistributing income from rich to poor would make the economy less crisis-prone. Raising American test scores to the average across developed economies would boost output by an estimated \$2.5trn—or 12% of 2017 GDP—over the next 35 years.

This two-sided argument is persuasive, but is also an acknowledgment that the power to implement change rests with the winners. As Ms Boushey notes, the priorities of the rich receive more legislative attention than those of the poor. Political spending by the rich has risen alongside inequality, as has political polarisation; the resulting dysfunction suits the wealthy, given the popularity of redistributive tax and spending measures.

Convincing the well-off of the benefits of a less lopsided society may be necessary to remedy it. And perhaps, by couching their manifestos as a means to boost growth, and by reminding the rich that Americans are in it together, thinkers like Ms Boushey could begin to re-establish a lost sense of solidarity.

If Mr Markovits is right, however, that is a remote prospect. Subtly but corrosively, he thinks, the idea of meritocracy has validated inequality, because rich and poor alike “earn” their position. Success depends on educational achievement beyond the reach of many, but winners feel they deserve their spoils, while losers are asked to accept their fate. Restoring dignity to workers at the bottom may require the sort of organisation and activism that improved their lot a century ago. For some Americans, that

upheaval could prove uncomfortable. ■



不平等

垮掉的梯子

过去的美国不像现在这般不平等，将来还可能更不平等

在美国历史的大部分时间里，它都比欧洲更平等，至少不算罪恶的奴隶制时期的话是这样。来到新世界的白人移民发现，这里比旧世界的阶级束缚更少。财富继承的影响更小。根据法国经济学家托马斯·皮凯蒂的说法，在1810年，美国最富有的前10%的人群控制着不到60%的国民财富，而在欧洲则是80%以上。当工业化可能促使美国出现欧洲那样的贵族阶层时，社会迅速而果决地展开了反对行动。改革让妇女获得了投票权，保护了工人的权利，打破了强大的垄断机构，并开征了所得税。罗斯福新政完成了始于19世纪后期的改革。到上世纪50年代，美国不仅是世界上最发达的经济体，也再次成为了平等主义的堡垒。

因此，自那以后的不平等的演进明显背离了美国的历史。富人的收入增长远快过穷人。1979年到2016年间，美国最富有的1%人群的收入累计增长了225%，而中产阶级的收入仅增长了41%。财富不平等也在加剧。在同一时期，最富有的0.1%人群控制的财富增长了一倍以上，达到20%。而在欧洲大陆，贫富差距仅略有扩大。过去40年中，欧洲最富有的1%人群在国民总收入中所占的份额增加了两个百分点，在美国则增加了10个百分点。

想要对此采取措施的政治势头在增强。几位民主党总统候选人承诺推出新的财产税。但即使到现在，人们对美国财富差距扩大的病根仍知之甚少。分析往往集中在全球化或技术对就业市场的影响等近因上。这些因素诚然重要，但其他富裕国家同样受其影响。美国的问题有着更深的根源。

部分问题是美国的政策加剧了经济压力的影响。在他们的新著《不公正的胜利》中，伊曼纽尔·塞斯（Emmanuel Saez）和加布里埃尔·祖克曼（Gabriel Zucman）明确地将不平等加剧归咎于美国的税收制度。这两位加州大学伯克利分校的经济学家认为，美国的税收制度在过去40年中已经

变得没有那么进步了。上世纪70年代，富人纳税占收入的比重是贫穷劳动人口的两倍（算上包括州和地方的所有税项）。而到了2018年特朗普实施税改后，极富美国人纳税占收入的比重却比收入排在后50%的众多美国人小。作者估计，2018年，美国最富有的400人纳税占收入的平均比重约为23%，而低收入美国人的这一比重约为25%，虽然这没有计入对最贫困家庭的转移支付——一些批评者认为这一忽略不计具误导性。个税政策只是问题的一部分——两位作者草草地提到了这一点。但即便如此，在极富人群收入呈现非凡增长的同时，他们税负的下降还是令人吃惊。

这番分析呈现出一个问题：为什么美国的税改如此不顾及不平等问题？塞斯和祖克曼给出了一种解释。经济不公正（他们的提法）是一个简单周期循环的结果。富人试图避税，然后赢得了政客的让步；这些政客辩称，要从富人那里收更多的税注定失败。两位作者说，这种说法过去站不住脚，因为人们对于国家资助的集体行为的价值有着共同的信念，而这种信念遭到侵蚀后，人们就会在财富和权力的鸿沟日益扩大之时回避问题并接受现状，且对此并无不满。两位作者没有再做进一步分析。塞斯说，经济学家在应对价值观问题方面“手段欠缺”，尽管这些问题看起来很重要。

其他人愿意一试。耶鲁大学的法学家丹尼尔·马科维茨（Daniel Markovits）在《精英主义陷阱》（The Meritocracy Trap）一书中将社会凝聚力的丧失以及其他许多问题归咎于美国精英主义的缓慢腐化——它已经僵化成了强大而森严的等级制度。他解释说，随着教育的经济溢价不断上升，争夺精英高等学府席位的竞争也日渐激烈。这种竞争已经成为除智识精英以外的所有人成功的障碍。马科维茨指出，如今贫富家庭的孩子之间的学业成就差距已经超过种族隔离时代黑人和白人学生之间的差距。

从理论上讲，这个问题是可以解决的，希瑟·鲍什伊（Heather Boushey）的新书《解脱束缚》（Unbound）明确了这一点。鲍什伊是左倾智库华盛顿公平发展中心（Washington Centre for Equitable Growth）的主任。她在书中详述了未来要在美实现平等的种种障碍。马科维茨描述的社会鸿沟在书中反复出现。鲍什伊指出，孩子的家境极大地影响了他们成年后的经济前途——是可能锒铛入狱还是成为发明家或企业家。

但是这些影响是可以被消减的。例如，已证明一个人出生时的健康状况会影响其未来的学业表现和就业前景，这表明普及产前和产后保健能发挥一定的作用。同样，普及早期儿童教育也能抵消一定的负面影响。对高质量的幼儿园前教育课程的研究发现，家境较差的孩子可因此持久受益。与较贫穷的父母相比，高收入父母亲子阅读的时间更多，在益智活动上投入的时间和金钱也更多。提升底层劳动人口的工资及让工作时间更规律可能会缩小这一差距。研究发现，某些地方的向上流动性比其他地方高；鼓励居民迁往繁荣地区的区划改革或补贴可能会令美国的阶层固化有所松动。

鲍什伊提出的建议希望在减少不平等的同时有助经济增长。例如，由于高度不平等的经济体似乎更多地依靠信贷繁荣来推动增长，因此通过财富再分配将富人的收入转移给穷人将降低经济体发生危机的可能性。将美国学生的考试成绩提高到发达经济体的平均水平能在未来35年中让美国的经济产出增加2.5万亿美元，相当于2017年GDP的12%。

这种两面兼顾的观点具有说服力，但也承认实施变革的力量掌握在赢家的手中。正如鲍什伊所指出的那样，在立法机构中，富人关心的问题能比穷人的获得更多关注。不平等现象加剧的同时，富人在政治方面的投入也在增加，政治也变得更加两极分化。考虑到实现再分配的税收和支出措施的受欢迎程度，这种政治失灵对富人有利。

要纠正这种情况，可能必须得说服富裕阶层相信一个更平等的社会所能带来的益处。也许，鲍什伊这样的思想者可以把他们的观点宣传为促进经济增长的办法，并提醒富人在这一点上所有美国人利益一致，由此重建美国社会失去的凝聚力。

但如果马科维茨是对的，这一前景将遥不可及。他认为，微妙但具腐蚀性地，精英主义的思想认可了不平等的存在，因为富人和穷人的地位都是自己“挣来的”。成功有赖于许多人无法企及的教育成就，但胜者认为自己配得上胜利的果实，而败者则被要求认命。恢复底层劳动者的尊严可能需要一个世纪前曾改变过他们命运的那种组织和积极行动。对一些美国人而言，那种巨变可能会让他们不安。 ■



Visegrad economies

Along the beautiful blue Danube

Central Europe has boomed; but as Germany weakens, will the four Visegrad economies slow down too?

FIFTEEN YEARS after they joined the EU, the four “Visegrad” states of central Europe (the V4) can be prouder of their economic achievements than of their patchy record on political reform. The Czech Republic, Hungary, Poland and Slovakia have increased their levels of GDP per head dramatically, and are converging with their mighty neighbour Germany. The Czechs are the richest, with a GDP per head that is 73% of Germany’s, followed by Slovakia with 63% and Hungary and Poland with around 57% each—and the gap continues to close, as their growth outpaces that of the behemoth (see chart).

Four main external forces have driven the remarkable successes of the four extremely open V4 economies. The first is their access to generous subsidies from the EU, which make up a sizeable chunk of their respective national incomes. Second is the munificent flow of remittances from millions of expat V4 citizens who now live and work in the EU, especially in Germany, Austria or Britain. A benevolent recent economic environment has also helped, especially the success of the German economy, by far their most important trading partner and the biggest or second-biggest investor in each country. And lastly, the four all started from a low base, enabling them to serve as cheap workshops for more developed economies. The danger is that all four of these factors are now petering out.

A great boon of EU membership is the V4’s access to substantial “cohesion” funds, which are financing colossal upgrades of public infrastructure in the region. Hungary in particular has loaded up on EU cash, pocketing €3bn

(\$3.3bn) a year, some 2.5% of its GDP. The bonanza will not last. The V4 stand to lose up to 25% of their EU funds in the next seven-year budget starting in 2021. The union is peeved by the populist governments in the region, and funds will be redirected away from the comparatively booming central Europeans. Moreover, the EU is losing one of its biggest net contributors because of Brexit.

The most popular destination of emigrants from Hungary, Poland and the Czech Republic has generally been Germany in recent years (for Slovaks, it is the Czech Republic). Eleven percent of Poles and 9% of Czech citizens live abroad. But remittances from the diaspora may now face decline. Germany's economic golden age seems to be coming to an end amid uncertainty over global trade. In the second quarter of this year its economy contracted by 0.1%, and is unlikely to have fared much better in the third quarter. In August its central bank warned that the German economy could slip into recession (usually defined as two consecutive quarters of negative growth). Businesses are losing heart. The Munich-based Ifo institute revealed that business confidence fell during August to its lowest level since November 2012.

Germany's economic woes will hit the V4 countries directly too, and harder than other EU countries. Slovakia and Hungary are the most dependent on German trade, and investment in their factories. A single plant in the north-west Hungarian city of Gyor belonging to Audi, a German carmaker, accounts for 9% of Hungarian exports. Alarm bells started ringing when *Handelsblatt*, a German daily, reported recently that two other big carmakers, BMW and Daimler, are putting investments in Hungary on ice. BMW has since confirmed that it remains committed to building a new factory in Debrecen, in eastern Hungary, but Daimler has postponed plans to expand its compact-car plant in Kecskemet in the centre of the country. Exports of goods and services amount to 97% of Slovakia's GDP, 86% of that of Hungary, 78% of the Czech Republic's and 55% of Poland's. A good chunk

of all these goes to Germany.

Finally, the catch-up effect may also be withering. Poor countries tend to grow faster than rich ones, largely because imitation is easier than invention. Yet once they reach a certain stage of economic development, they tend to get stuck—in the notorious “middle-income trap”. This may become the fate of some of the V4 economies. They sorely lack innovative companies; Hungary and Poland in particular spend only 1% of their GDP on research and development, much less than the EU average. Richard Grieveson at the Vienna Institute for International Economic Studies (WIIW) is pessimistic about all of the V4 economies’ ability to escape the middle-income trap. It is, admittedly, hard to do. According to the World Bank, among 101 middle-income economies in 1960 only 13 had become high-income ones by 2008.

But perhaps the biggest catch-up-related headache for the V4 economies is labour shortages. These have a positive effect as they are driving up wages, which in turn raises consumption; but they may also lead foreign investors to outsource to other countries where labour remains cheap. In January the 13,000 workers at Audi’s Györ plant received an 18% pay rise, thought to be the highest raise ever negotiated by Hungarian unions. Most countries in the region will reach a tipping-point at which the lack of workers will start to limit economic growth within the next five years, according to a recent study by the WIIW. It could happen within the next two years in Poland and the Czech Republic. Some industries, such as construction, might have already reached it.

Visegrad policymakers have come up with several policies to address the labour shortage. One is to increase fertility rates with financial incentives, a policy pursued at great cost but with little effect in Poland and Hungary. Another is to make it easier for women to participate in the workforce, by offering them free or highly subsidised child care. Poland and Slovakia are

trying that one, though with only limited success. Immigration would be the quickest way of easing the problem; but the nativist governments that run the V4 countries are wary of that. Indeed, Poland's Ukrainian workers, who find it hard to get citizenship, are increasingly turning their eyes to Germany, which is more welcoming. For the V4, the next 15 years could be a lot tougher than the last 15. ■



维谢格拉德经济体

美丽的蓝色多瑙河畔

中欧经济蓬勃发展；但随着德国经济转弱，维谢格拉德四国的步伐会不会也将放缓？

中欧的维谢格拉德集团四国（简写为V4）加入欧盟已有15年，相比在政治改革方面参差不齐的表现，它们取得的经济成就更值得引以为傲。捷克、匈牙利、波兰和斯洛伐克的人均GDP水平大幅提高，正在接近强大的邻国德国。其中捷克最富裕，人均GDP是德国的73%，其次是斯洛伐克（63%）、匈牙利和波兰（都在57%左右），而且由于它们的增长速度比经济大国德国要快，差距还在继续缩小（见图表）。

推动这四个极为开放的经济体取得非凡成就的外部力量主要有四个。首先是它们从欧盟那里获得的慷慨补贴，这在四国各自的国民收入中占了很大一部分。其次是数百万在欧盟（尤其是在德国、奥地利或英国）生活和工作的V4侨民向本国汇回的大量资金。近年良好的经济环境，尤其是德国经济的成功，也有一定的推动作用。德国绝对是V4各国最重要的贸易伙伴，而且是它们每一个的最大或第二大的投资国。最后，这四国的起点都低，这让它们得以充当较发达经济体的廉价工厂。但问题是，这四个推动力都在逐渐减弱。

V4加入欧盟的一大福利是可以获得大量的“凝聚”（cohesion）基金，这些基金用于资助欧盟境内公共基础设施的大规模升级。匈牙利得到的欧盟资金尤其多，每年累计入账30亿欧元（33亿美元），约为其GDP的2.5%。这种好事不会一直有。从2021年开始的未来七年的预算中，给予V4的欧盟资金将减少多达25%。欧盟备受区域内民粹主义政府的困扰，将减少对相对蓬勃发展的中欧国家的资助。此外，由于英国脱欧，欧盟将失去其最大的财政净贡献国之一。

近些年，来自匈牙利、波兰和捷克的移民最喜欢前往的目的地国通常是德国（斯洛伐克人首选捷克）。11%的波兰人和9%的捷克人在海外居住，

但来自海外侨民的汇款如今可能要下降了。在全球贸易的一片迷雾之中，德国经济的黄金时代似乎即将结束。今年第二季度，德国经济萎缩了0.1%，第三季度的情况也不太可能有很大的改善。8月，德国央行警告称德国经济可能陷入衰退（通常定义为连续两个季度出现负增长）。企业正在失去信心。慕尼黑的Ifo研究所透露，8月商业信心降至2012年11月以来的最低水平。

德国的经济困境也将直接打击V4国家，而且比对其他欧盟国家的影响更甚。斯洛伐克和匈牙利两国最依赖与德国的贸易和德国对其工厂的投资。仅德国汽车制造商奥迪在匈牙利西北部城市杰尔（Gyor）的一家工厂就占了匈牙利出口额的9%。而据德国的日报《商报》（Handelsblatt）近期报道，宝马和戴姆勒这两家大型汽车制造商正在暂缓对匈牙利的投资，警钟由此敲响。自那之后，宝马已确认将继续在匈牙利东部的德布勒森（Debrecen）投资建设一座新工厂，但戴姆勒推迟了在该国中部的凯奇凯梅特（Kecskemet）扩建其紧凑型汽车工厂的计划。商品和服务出口占斯洛伐克GDP的97%，匈牙利的86%，捷克的78%和波兰的55%，其中很大部分都出口到德国。

最后，追赶效应可能也在减弱。贫穷国家往往比富裕国家增长更快，主要是因为模仿比发明容易。然而，一旦它们进入经济发展的某个阶段，往往就会卡在众所周知的“中等收入陷阱”中。某些V4国家可能也将面临这样的命运。它们非常缺乏创新企业，特别是匈牙利和波兰，这两个国家的研发投入仅占其GDP的1%，远低于欧盟平均水平。维也纳国际经济研究所（WIIW）的理查德·格利弗森（Richard Grieveson）对所有V4经济体摆脱中等收入陷阱的能力都持悲观态度。这本来确实也很难。根据世界银行的数据，1960年的101个中等收入经济体中，到2008年进入高收入经济体行列的只有13个。

但是，对于V4各国而言，追赶过程中最大的问题可能是劳动力短缺。劳动力短缺会推高工资水平，进而又推动消费，这是它的积极影响。但劳动力短缺也可能促使外国投资者将生产外包到其他劳动力成本仍然较低的国家。1月，奥迪杰尔工厂的1.3万名工人获得涨薪18%，这被认为是匈牙利

工会有史以来谈判争取到的最高涨幅。WIIW近期的一项研究显示，欧盟大多数国家都将在未来五年内达到一个临界点，届时劳动力短缺将开始限制它们的经济增长。波兰和捷克可能在未来两年内就会出现这种情况，建筑业等一些行业可能已经到达了这个临界点。

维谢格拉德四国的政策制定者已经为应对劳动力短缺提出了一些政策。一是通过财政激励措施提高生育率，这项政策代价高昂，但在波兰和匈牙利却收效甚微。另一个办法是向妇女提供免费或高补贴的托儿服务，让她们更容易加入劳动力市场。波兰和斯洛伐克正在尝试这一做法，不过成果有限。移民将是缓解问题的最快方法，但V4国家的本土主义政府对此有所戒备。确实，在波兰很难获得公民身份的乌克兰工人正越来越多地将目光转向更欢迎移民的德国。对于V4各国来说，未来的15年可能要比过去的15年艰难许多。■



Schumpeter

Tomato catch-up

Ocado wages a grocery war against Amazon, Walmart and Alibaba

PANIC IS SWEEPING through supermarket aisles. Profits are meagre, convenience is king, discounters are rife. Even Amazon, Walmart and Alibaba, the world's three biggest retailers, are trembling. No one has fully mastered the art of selling groceries online. The business represents just 2.3%, or \$160bn, of a worldwide grocery market of \$7trn. As that share rises, as it will surely continue to, it could be life or death for some in the industry.

In the midst of this mêlée is a fast-talking Brit, Tim Steiner. The firm he co-founded, Ocado, has shaken up the British online retail market, and it is trying to do the same internationally. By selling expertise from almost 20 years as a pioneering online grocer to supermarkets in America and elsewhere, he wants to help them become a fourth force in the industry—able to resist the big three.

His patter is honed by a career battling doubters (an analyst once put him down with the quip: “Ocado begins with an ‘o’, ends with an ‘o’, and is worth zero”). Sceptics still harbour deep reservations. Though Ocado has more than tripled in value in the past two years to £7.5bn (\$9.6bn), its share price has plunged recently. But his insurgency shows how the battle to dominate online groceries remains wide open. Ocado has as good a chance as anyone.

Grocery is a sadomasochistic business. Sellers can count on stable revenues but have little margin for error on sourcing, price and waste. Shoppers suffer from a retail version of Stockholm syndrome. They are lured by grocers with the promise of savings, only to be fleeced. Shops make them do the work of picking the produce and bagging it. They set traps in the aisles—in the form

of strategically placed celebrity magazines or freshly baked doughnuts—to slow shoppers down. Yet customers continue to return for more, despite having ever more options to order online and have groceries delivered to their doorstep. In China and America, online grocery shopping is a miserly 3.8% and 1.6% of the total, respectively.

Mr Steiner, a former Goldman Sachs bond trader, has pulled off the rare feat of making home-delivery both tolerable for shoppers and profitable for sellers. He knows how to squeeze the last farthing out of a tomato and has turned the sorting of groceries in warehouses into a science—specifically, clever robotics—which has kept costs competitive. Partly thanks to Ocado, Britain trails only South Korea and Japan in its embrace of online grocers.

Earlier this year Mr Steiner persuaded Marks & Spencer, a British retailer, to pay £750m for a half of Ocado's domestic online-grocery business. The money is helping develop his firm's newer, more lucrative international venture, which licenses the know-how to build modular high-tech warehouses that can be scaled up as needed. The biggest deal, struck in 2018, has been with Kroger. The American supermarket chain aims to order 20 Ocado customer fulfilment centres (CFCs, or, as Kroger calls them, sheds) by 2021, far more than the four that Ocado has so far erected in Britain (the newest burned down this year). Despite their recent slide Ocado's shares still trade like a software firm's, not a supermarket's. JPMorgan Cazenove, a broker, said in October that the firm would need to announce 126 CFCs to justify a recent valuation of £9bn, three times the number it has planned.

Kroger's sheds, which may take up to five years to complete, already give a sense of the emerging grocery battle lines. They will be big, up to about 33,000 square metres (350,000 square feet), though they can be flexed up and down. They will sit on the edge of cities. Ocado aims to make up for the long drives to deliver groceries by speeding up its robots, packing crates of 50 items in six to seven minutes. There will be no time-pressed “pickers”

elbowing shoppers aside to fill an online order, as in other supermarkets.

But the Ocado model, which works well in urban Britain, is as yet untested in more sparsely populated places. In America and China others are moving in a different direction—and in a hurry.

In 2017 Amazon sent shivers down American grocers' spines by buying Whole Foods. On November 11th it confirmed that it was opening its first grocery store in California that is not part of that upscale chain. In October it launched free delivery of Amazon Fresh, a grocery service, to its Prime members. So far its bark has been worse than its bite. By one estimate only 6% of its sales are perishables, compared with 65% at a traditional grocer.

Amazon's domestic rivals are making existing supermarkets the kernel of their online operations, either for picking up orders or delivering them. Close by will be micro-fulfilment centres, which will seek to emulate Ocado's efficiency, but cut down on travel times. The model is Walmart, which cited sharp growth in online grocery from its supercentres in America as a reason for higher sales this summer. In October it launched a service in which employees in three American cities can deliver groceries directly to customers' fridges when no one is home, using smart-entry technology and wearable cameras. It also promises same-day delivery under a membership programme like Amazon Prime.

Alibaba's high-tech Hema supermarkets in China are more cutting-edge still. They use QR codes on fish to validate freshness, enable app-based shopping, have robots aplenty (naturally) and offer 30-minute delivery within a small radius. Yet it is unclear if Hema's technology will succeed where armies of cheap labour, ready to sort, pick and deliver groceries, have mostly failed.

No one has as yet quite cracked the problem. More wizardry, perhaps

virtual-reality headsets, may be required to make internet grocery shopping as intuitive for people as it is offline. But the incentives for grocers to press ahead are huge. No relationship in retail is as intense as that of shoppers with their supermarket. Few firms have as many eggs in the online-shopping basket as Ocado. If things do not work out, at least the Kroger deal has made Mr Steiner a rich man. If they do, he may be a rare example of a British entrepreneur with global ambitions who is not off his trolley. ■



熊彼特

番茄大战

Ocado向亚马逊、沃尔玛和阿里巴巴挑起食品杂货大战

恐慌在超市的过道里蔓延。利润微薄，便捷为王，折扣店比比皆是。就连全球三大零售商亚马逊、沃尔玛和阿里巴巴也在瑟瑟发抖。还没有谁完全掌握了在线销售食品杂货这门艺术。这项业务价值1600亿美元，仅占全球7万亿美元食品杂货市场的2.3%。随着这一份额的上升——这一点确定无疑，它可能会宣告业内一部分人的生死。

混乱之中出现了一个语速很快的英国人。他叫蒂姆·施泰纳（Tim Steiner）。他与人联合创立的公司Ocado已经撼动了英国的线上零售市场，眼下正试图将这种冲击推向全球。他把一家食品杂货电商先驱近20年的经验专长出售给美国等地的超市，希望帮助它们成为行业内的第四股势力，有能力与三大巨头分庭抗礼。

他在职业生涯中总要与质疑他的人做斗争，就这样磨出了一副快嘴皮子（一位分析人士曾拿俏皮话贬他：“Ocado的开头是个‘o’，结尾是个‘o’，价值也是个‘o’”）。怀疑者仍持相当的保留态度。尽管Ocado的市值在过去两年已增长了两倍多，达到75亿英镑（96亿美元），其股价在近期大跌。但是，施泰纳掀起的“叛乱”表明，在争夺食品杂货电商霸主地位的较量中，胜负还很难预料。Ocado和任何一方一样都有机会。

食品杂货业中的买卖双方就是施虐受虐关系。商家可以指望获得稳定的收入，但在采购、价格和损耗方面几乎没有犯错的余地。购物者则受到零售版斯德哥尔摩综合征的折磨。他们被食品杂货商以省钱的许诺引诱到店内，结果却被宰。商店让购物者承担了拣选和包装农产品的工作。为了使购物者放慢脚步，它们在过道里设置了陷阱——摆放位置暗藏玄机的名人八卦杂志，或新鲜出炉的甜甜圈。但顾客还是会一再光顾，尽管他们有越来越多的渠道可以在网上下单，享受食品杂货送货上门。在中国和美国，

电商渠道占食品杂货消费总额的比例仅分别为3.8%和1.6%。

前高盛债券交易员施泰纳罕见地完成了一件壮举，让送货上门服务既让购物者觉得还过得去，又让卖家有钱可赚。他知道如何从西红柿中榨出最后一分钱，并将仓库中的食品杂货分理工作变成了一门科学——确切地说是聪明的机器人科学——从而保持了成本竞争力。在某种程度上，由于Ocado的成功，食品杂货电商在英国的渗透率仅次于韩国和日本。

今年早些时候，施泰纳说服英国零售商玛莎百货以7.5亿英镑收购了Ocado国内食品杂货电商业务一半的股份。这笔钱眼下被用来帮助他的公司开发更有利可图的新国际项目：授权其他零售商使用Ocado的专门知识来打造可按需扩大规模的高科技模块化仓库。最大的一笔交易是2018年与克罗格（Kroger）达成的。这家美国连锁超市力争到2021年订购20个Ocado顾客履单中心（customer fulfilment centre，简称CFC，克罗格管它们叫货仓）。这个数字远超过Ocado迄今为止在英国建成的四个CFC（最新的一个在今年烧毁）。尽管Ocado的股票近期下跌了，但它的交易行情仍然像一家软件公司的股票而不是超市的。经纪公司摩根大通嘉诚（JPMorgan Cazenove）10月表示，该公司若想让自己近期90亿英镑的估值站得住脚，就需要宣布建设126个CFC，是其计划数字的三倍。

克罗格的货仓最长可能需要五年才完工，但已经让人感受到食品杂货领域内的战线逐渐拉开。这些货仓会很大，面积最大达33,000平方米，不过也可再扩大或缩小。它们将坐落在城市边缘。Ocado争取通过加快机器人的速度（在六七分钟里完成50件商品的装箱）来补偿长距离送货的时间。这里不会像其他超市里发生的那样，时间紧迫的拣货员为了找齐订单上的商品把购物者挤到一边去。

但是，Ocado的模式虽然在英国城市中运作良好，还没在人口更稀少的地方接受过检验。在美国和中国，其他从业者正朝着不同的方向前进——而且速度很快。

亚马逊在2017年收购了全食超市，令美国一众食品杂货商不寒而栗。11月

11日，该公司证实将在加州开设第一家食品杂货店，这家店并不属于全食超市这一高端连锁店。10月，亚马逊开始向其Prime会员提供亚马逊生鲜（Amazon Fresh）的免费送货上门服务。到目前为止，它在这方面的动作还是雷声大雨点小。据估计，易腐商品只占其销售额的6%，而传统食品杂货商的这一数字为65%。

亚马逊在本国的竞争对手正在把现有超市变成其在线业务的核心，要么是在接订单方面，要么是在送货方面。超市附近将设置微型履单中心，这些中心将设法效仿Ocado的效率，但会缩短运送时间。沃尔玛就个典型。今年夏天沃尔玛销售额上升，该公司称原因之一是它在美国的超级购物中心的食品杂货线上订单急剧增长。10月它在美国的三个城市推出了一项服务，其员工可在顾客家中无人的情况下，运用智能入门技术和可穿戴摄像头直接将食品杂货放进冰箱。它还承诺向加入了会员计划（与亚马逊Prime类似）的顾客提供当日送达服务。

阿里巴巴在中国的高科技超市盒马鲜生还要更前沿。它们用贴在鱼身上的二维码来确认其新鲜度、实现了基于应用的购物、拥有大量机器人（这是自然），并提供一个较小的区域范围内30分钟送达的服务。然而盒马的技术能否成功还不好说，毕竟在推进食品杂货线上销售的过程中，时刻准备着去分理、拣货和运送的廉价劳动力大军大多已经告败。

目前还没有哪一方真正解决了这个难题。要让人们觉得网购食品杂货和在线下购买一样直观，或许还需要更多高明的招数——可能会是虚拟现实头戴设备。但食品杂货商奋勇向前的动力是巨大的。在零售业里，没有哪种关系比购物者与其光顾的超市之间的关系更浓烈。很少有公司像Ocado那样把那么多鸡蛋都放进了网上购物篮。如果事情进展不顺遂，施泰纳至少还凭借与克罗格的订单成了有钱人。如果进展顺利，他可能就是罕有的有着全球野心却没有丧失理智的英国企业家。 ■



Free exchange

When the iron is hot

Belligerent unions are a sign of economic health

THE DISSONANCE could hardly have been more apparent. America's most recent employment figures captured a jobs market in fine fettle: firms added 128,000 new workers in October, while unemployment held near historically low levels and wages rose at a respectable clip. The data would probably have looked better, however, had they not been depressed by a costly labour dispute, only recently ended, at General Motors (GM). Workers around America are showing their restlessness; members of the Chicago Teachers' Union returned to work on November 1st, after striking to demand higher pay and more investment per student. The unrest may seem odd given the robust state of the labour market. In fact it is neither a bad omen nor entirely unwelcome.

In their book on organised labour, "What Do Unions Do?", Richard Freeman and James Medoff argue that unions play two principal economic roles. They provide workers with a voice; through a union frustrated workers, who might otherwise simply quit, can communicate their dissatisfaction to the firm. Communication can raise efficiency by boosting morale, and by helping firms to retain workers and identify and fix problems. But unions also function as monopoly providers of labour. By controlling labour supply they are able to extract rents—and thus raise members' compensation—reducing economic efficiency.

The book was published in 1984, at a critical moment. Across the rich world the share of workers covered by unions had fallen steadily from their post-war peaks (outside a handful of northern European countries). Declines in the employment share of highly unionised industries, like manufacturing,

bore some of the blame. But government policy also played a role. The mood turned against labour in the 1980s, first in America and Britain, then elsewhere; politicians seized on the moment. In 1981 President Ronald Reagan, who once led America's actors' union, summarily fired 11,000 striking air-traffic controllers. In the years since, labour has spoken softly and carried a twig. America experienced an average of 16 major work stoppages (affecting 1,000 workers or more) each year from 2001 to 2018, down from 52 per year between 1981 and 2000, and 300 per year from 1947 to 1980.

Unions, though weakened, survive. In America they represent 37% of public-sector workers and 7% of private-sector ones. In 2018 nearly half a million American workers were involved in work stoppages, the most since 1986. That militancy owes something to labour-market conditions. One might expect periods of economic strength to be placid ones, because firms can be conciliatory. When profits are high, they can afford pay rises—whereas in times of economic stress, holding the line on pay may mean the difference between survival and failure. Moreover, the opportunity cost of a work stoppage is higher when demand is robust. When consumers are hoovering up new cars, lost production time is very costly. Reflecting this, GM suffered operating losses of nearly \$2bn during the recent stoppage, according to one estimate, or nearly twice the sum of wages lost to workers.

But strong labour markets lend more encouragement to frustrated workers than pause to firms. Striking workers face the loss of pay and, potentially, of employment—threats that frighten less when good jobs are plentiful. Workers can more credibly withhold their labour from firms when there are no long lines of unemployed workers waiting to replace them. A strong jobs market may also give workers more to bargain for. Fighting over a larger share of a firm's earnings makes little sense when there are no earnings to fight over. GM filed for bankruptcy in 2009, but has since reorganised and

begun turning a healthy profit.

Strikes are more than arguments over profits gone wrong. They are also a way to elicit information, as John Kennan of the University of Wisconsin-Madison and Robert Wilson at Stanford University describe in a paper published in 1993. Unions often cannot tell if a firm's claim that it cannot afford pay rises is credible or merely cheap talk. By holding its bargaining position as the losses from a strike mount, a firm can convey to a union that its arguments are rooted in reality. GM's seemingly were. Striking workers failed to secure a larger pay rise than they had won in their previous contract negotiation, or to get the firm to reopen a plant in Ohio. They did win more profit-sharing—probably the best a profitable but vulnerable firm can do, given the risk of agreeing generous pay packages that cannot be amended in times of financial stress.

The situation could be different in other parts of the economy, however. When economists argue that unions impose economic costs, they typically assume that markets are competitive. Across much of the American economy that is not always the case. Sometimes one or a few big employers dominate local labour markets, and can thus impose below-market wages on vulnerable workers, a condition economists call “monopsony”. In recent testimony in a congressional hearing on antitrust issues, Kate Bahn of the Washington Centre for Equitable Growth, a think-tank, noted that though wages in manufacturing industries are close to the level one would expect in competitive markets, those in some others, like health care, are not. For workers frustrated by stagnant pay, a work stoppage may be the only way to determine if an employer is constrained by competitive markets or abusing its market power.

In the latter case, interventions by unions could prove economically useful. In a paper published last year, Mark Stelzner of Connecticut College and Mark Paul of the New College of Florida, argued that in the presence of

monopsony power, collective bargaining can reduce the rents collected by dominant firms and increase economic efficiency. In practice, America's diminished labour movement cannot on its own fix the problem of uncompetitive markets, or strike much fear into the hearts of employers. Nonetheless, workers are daring to try. ■



自由交流

打铁需趁热

工会起事说明经济向好

不协调的情况再明显不过了。最新的就业数据显示美国就业市场状况良好——10月，企业新增岗位12.8万个，同时失业率继续保持在接近历史低位，工资也有可观的增长。要不是受到通用汽车最近才结束的一场代价高昂的劳资纠纷的拖累，这些数据可能会更加亮眼。但美国各地的工人都躁动不安。11月1日，芝加哥教师工会的会员结束了一场要求提高员工薪资和加大对学生投入的罢工，回到了工作岗位上。在劳动力市场表现强劲的情况下，这样的骚动似乎有些匪夷所思。事实上，它既非不祥之兆，也不完全让人反感。

理查德·弗里曼（Richard Freeman）和詹姆斯·麦道夫（James Medoff）在他们合著的关于劳工组织的《工会做些什么？》（What Do Unions Do?）一书中指出，工会有两个主要的经济作用。一是为工人发声——心存不满的工人可以通过工会向公司表达诉求，而如果没有工会他们可能只能一走了之。沟通可以鼓舞士气、帮助公司留住工人、发现并解决问题，进而提高效率。但工会同时也是劳动力的垄断供应商。通过控制劳动力供应，工会可以收取经济租（并以此提高会员的报酬），这样便降低了经济效率。

该书出版的1984年正值关键时刻。在除少数几个北欧国家之外的整个富裕世界，工人的工会参会率自战后达到峰值后一直持续下滑。制造业等工会化程度较高的行业占就业的比例下降是部分原因。但政府政策也起到了一定的作用。80年代，氛围转而对劳工不利，这一苗头首先出现在美国和英国，然后蔓延到其他国家；政客们抓住了时机。1981年，曾任美国演员工会领袖的总统里根草草地解雇了1.1万名参与罢工的空中交通管制员。从那以后，工会开始态度软化，行事不温不火。2001到2018年期间，美国平均每年发生16起重大罢工（受影响工人达1000名或以上）。而1981年至2000年期间平均每年为52起，1947年到1980年期间为300起。

工会虽然被削弱了，但还是维持了下来。在美国，37%的公职人员和7%的私营部门员工加入了工会。2018年，参加罢工的美国工人接近50万，是1986年以来最多的一年。这种“好战”与劳动力市场的状况有一定的关系。人们可能预期经济好的时候不会出事，因为公司很多时候还是愿意息事宁人。当利润高企之时，公司能够负担得起加薪，而在经济不好的时期，能否守住薪资不变可能关系到生死存亡。此外，当市场需求强劲时，停工的机会成本更高。当消费者大量购买新车时，耽误生产就会造成巨大的损失。通用汽车近期的罢工就是明证。据一项估计，罢工期间，其运营亏损将近20亿美元，几乎是员工薪资损失总额的两倍。

但是，相比给公司以喘息之机，强劲的劳动力市场更多地给了心存不满的工人以底气。罢工的工人不仅面临工资损失，还有可能失业——但是，如果有很多好工作等着，这些损失的威胁就没那么大了。如果工人身后没有排着长队等着取而代之的失业者，那么他们参加罢工时腰杆就更硬了。强劲的就业市场可能也给了工人更多讨价还价的余地。如果公司已无利润可争，那么争取分得更多利润几乎就是无稽之谈。2009年，通用汽车申请破产，但此后进行了重组，又开始大幅盈利。

罢工不仅仅是利润分配之争出了岔子。正如威斯康星大学麦迪逊分校的约翰·凯南（John Kennan）和斯坦福大学的罗伯特·威尔逊（Robert Wilson）在1993年发表的一篇论文中所述，罢工也是获取情报的一种方式。工会往往无法判断公司无力加薪的说法是实话还是说辞。当罢工造成的损失增加时，公司坚持其谈判立场不变，便可以让工会知道自己没有说瞎话。通用汽车的说法看起来就是真的。罢工工人没能争取到高于上一次合同谈判的加薪，也没能让公司重新启动俄亥俄州的工厂。但他们确实赢得了更多的利润分配。鉴于同意慷慨的薪酬方案在财务状况不好之时无法修改因而风险很大，这可能是一家虽盈利但仍脆弱的公司能尽到的最大努力了。

不过，在经济的其他领域，情况可能有所不同。经济学家认为工会增加了经济成本，这是因为他们通常都假定市场是竞争性的。但在美国经济的大部分领域，情况并不总是如此。有时，一个或数个大雇主主宰了当地的劳

动力市场，因此就可以迫使弱势的劳动者接受低于市场行情的工资，这就是经济学家所说的“买方垄断”。智库华盛顿公平增长中心（Washington Centre for Equitable Growth）的凯特·巴恩（Kate Bahn）在近期一次国会反垄断听证会上作证时指出，尽管制造业的工资水平接近于竞争市场中的期望值，但医疗保健等其他一些行业的工资水平并非如此。对不满工资停滞的工人来说，罢工可能是鉴别雇主到底是受制于竞争市场还是滥用其市场权力的唯一方法。

在后一种情况下，工会的介入可能确实对经济有所帮助。康涅狄格学院（Connecticut College）的马克·施特尔茨那（Mark Stelzner）和新佛罗里达学院（New College of Florida）的马克·保罗（Mark Paul）在去年发表的一篇论文中指出，在存在买方垄断的情况下，集体谈判可以减少占主导地位的公司收取的经济租，提高经济效率。而在现实中，单靠美国日渐式微的工人运动无力解决市场缺乏竞争的问题，也无法让雇主闻风丧胆。尽管如此，工人们还是敢于一搏。 ■



Free exchange

It ain't over till it's over

A scholar of inequality ponders the future of capitalism

WHEN COMMUNISM fell, that was supposed to be that. History would continue, but arguments about how to organise society seemed to have been settled. Yet even as capitalism has strengthened its hold on the global economy, history's verdict has come to seem less final. In a new book, "Capitalism, Alone", Branko Milanovic of the Stone Centre on Socioeconomic Inequality at the City University of New York argues that this unification of humankind under a single social system lends support to the view of history as a march towards progress. But the belief that liberal capitalism will prove to be the destination has been weakened by financial and political dysfunction in the rich world, and by the rise of China. Its triumph cannot be taken for granted.

Mr Milanovic outlines a taxonomy of capitalisms and traces their evolution from classical capitalism before 1914, through the social-democratic capitalism of the mid-20th century, to "liberal meritocratic capitalism" in much of the rich world, in particular America. He contrasts this with the "political capitalism" found in many emerging countries, with China as the exemplar. These two capitalistic forms now dominate the global landscape. Their co-evolution will shape world history for decades to come.

Liberal meritocratic capitalism is generally associated with liberal political systems and, though redder in tooth and claw than its social-democratic forebear, is more egalitarian than classical capitalism, thanks to welfare states inherited from social democrats. Its distinguishing feature is a tolerance for inequality that derives from the way in which riches, in a meritocratic system, are earned by people of extraordinary talent. Political

capitalism, in contrast, is illiberal. It emerges when authoritarian governments rely for legitimacy on their ability to foster economic growth, which in turn provides the motive for free-market reforms.

It is wrong to suppose, though, that systems of political capitalism will inevitably become more politically liberal, as Western leaders once hoped would happen in China. They rely on a “zone of lawlessness” that allows the state to suppress uppity private-sector interest groups. The rule of law, as it holds in most advanced economies, would enable a merchant class to become a new centre of power that could press for political reforms, thus limiting the actions of the ruling elite. The zone of lawlessness also allows the state to suppress corruption—endemic under political capitalism—whenever it threatens to undercut economic growth. Whether political capitalism does better than liberal capitalism at fostering growth remains unclear (Mr Milanovic implies at times that it may). China and Vietnam have grown much faster than America in recent decades, but as their incomes rise and opportunities to learn from others dissipate, they will probably slow.

Whether or not political capitalism is better for growth, it appears to be sustainable—at least for a while. The global status quo may not be, however. Slower growth in China may eventually erode the legitimacy of the ruling party. And liberal systems may converge toward authoritarian ones, rather than the other way round. As Mr Milanovic writes, structural forces within liberal meritocratic capitalism work towards greater inequality. Older vintages of capitalism tended to separate those rich in capital and those with high incomes from labour into separate classes. But in liberal meritocratic capitalism the two groups are coterminous, because the wealthy invest heavily in their children’s education and the talented earn huge sums. The elite uses its economic power to cultivate political power, pushing societies toward the establishment of a permanent ruling class that cannot be dislodged.

Intergenerational economic mobility in America has indeed fallen. Political spending has soared and is dominated by the very rich. In 2016 the top 1% of the top 1% accounted for 40% of campaign donations. These financially astute people surely expect a return on their money, and indeed research suggests that elected leaders are more attuned to the interests of the rich than those of people further down the income scale. Other aspects of political capitalism are creeping in, too. One is corruption, from the pay-to-play proclivities of the Trump administration to the tendency of both Democrats and Republicans to leap from government service straight into lucrative private-sector jobs.

Behind this, Mr Milanovic suggests, is an erosion of liberal values. Within capitalist systems, money is the ultimate measure of worth. The pursuit of narrow self-interest is held to lead to the greatest good. People who forgo profit for ethical reasons could thus be seen as harming society, because they are preventing resources from being used at maximum efficiency. Moreover, their restraint creates an opening for less ethical rivals. The elite in such a system increasingly consists of individuals who are willing to do anything not outright illegal that increases their wealth.

There is something to be said for an amoral approach to business. As Mr Milanovic points out, people all over the world understand the pursuit of self-interest. Amoral commerce can be engaged in by people from many cultures and backgrounds; recent hyperglobalisation would not have been possible without it. But the costs are becoming apparent—when firms bow to Chinese censorship in order to retain access to lucrative markets, for example, or when governments accept flagrant tax avoidance as the price of unimpeded capital flows.

The ugly aspects of today's capitalism, like those of the 19th-century version, may be merely an awkward bump on the road to a better world. But it is also possible that the apparent march of progress, from coarser versions

of capitalism to better ones, was not a historical inevitability. It may instead reflect the painstaking cultivation of liberal values, such as honesty and the duty to treat others fairly. If so, capitalism alone, without the moderating influence of those values, could reach its own historical dead end. ■



自由交流

言之尚早

一位研究不平等的学者思索资本主义的未来

共产主义垮台时，人们认为本该如此。历史将继续，但关于该如何组织社会的争论似乎尘埃落定。然而，尽管资本主义已经加强了对全球经济的掌控，历史的裁决似乎还没有最终完成。纽约市立大学斯通社会经济不平等研究中心（Stone Centre on Socioeconomic Inequality）的布兰科·米兰诺维奇（Branko Milanovic）在其新作《单打独斗的资本主义》（Capitalism, Alone）中指出，全人类都在向一个单一的社会制度靠拢，这为历史是向着进步行进的观点提供了支撑。但是，富裕国家相继出现的金融和政治失灵，加之中国的崛起，削弱了这一行进的目的地必是自由资本主义的信念。资本主义的胜利不能被视作理所当然。

米兰诺维奇概述了资本主义的分类，并追溯了它们的演进过程：从1914年之前的古典资本主义，到20世纪中叶的社会民主资本主义，再到许多富裕国家尤其是美国践行的“自由精英资本主义”。他将最后一种资本主义与许多新兴国家的“政治资本主义”（中国是典型）加以对照。这两种资本主义形式如今主宰着全球格局。它们的共同演进将在未来几十年里塑造世界史。

自由精英资本主义普遍与自由的政治制度相关联。这类资本主义虽然比其前辈社会民主资本主义更加“红牙血爪”，但由于承袭了社会民主派的福利国家制度，还是比古典资本主义更主张平等。其显著特征是容忍才智非凡的人在择优体系下赚得财富所造成的不平等。相比之下，政治资本主义是不自由的。这种资本主义的出现是因为威权政府需要凭借其促进经济增长的能力来寻求自身的合法性。为了寻求经济增长，又需要开展自由市场改革。

然而，认为政治资本主义体系必然会在政治上变得更加自由是错误的——

西方领导人曾一度对中国寄予了这样的希望。这样的体系靠的是一个“没有法纪的地帶”，它让政府得以压制那些“不知天高地厚”的私营部门利益集团。而在大多数发达经济体秉承的法治之下，商人阶层可能会成为一个新的权力中心，有能力推动政治改革，从而限制精英统治阶层的行动。由于无法纪地帶的存在，政府还可以随时出手抑制腐败这一政治资本主义制度下的流行病，只要它威胁到了经济增长。很难说政治资本主义在促进经济增长方面是否比自由资本主义更出色（米兰诺维奇有时候暗示有这种可能）。近几十年来，中国和越南的经济增速远超美国，但随着两国收入水平的增长，以及向其他国家学习的机会逐渐消失，它们的增速可能会放缓。

政治资本主义是否更有利增长暂且不论，它看上去还是可持续的——至少在一段时间内是如此。然而全球现状却未必可持续。中国经济增长放缓最终可能会削弱其执政党的合法性。而自由制度则可能向威权主义靠拢，而不是反过来。正如米兰诺维奇所写道的，自由精英资本主义内部的结构性力量会将社会推向更加不平等的境地。在先前的几类资本主义制度下，资本雄厚的人和劳动收入较高的人往往分属于不同的阶层。但在自由精英资本主义之下，这两个群体几乎融为一体，难以区分，因为富人在子女的教育上砸下重金，而有才能的人赚着大钱。精英阶层利用自身的经济实力培育政治影响力，推动社会建立一个无从推翻的、永久的统治阶级。

美国的代际经济流动性确乎已经下降。政治支出猛增，且由巨富人群主导。2016年，最富有的1%人口中的前1%贡献了40%的竞选捐款。这些人在钱上很精明，当然期望花出去的钱能有回报。而确实有研究表明，当选领导人更关心富人的利益，而不是处于收入阶梯较下层的人们的利益。政治资本主义的其他特征也在悄悄渗入。其一是腐败。从特朗普政府“拿钱办事”的倾向，到民主党人和共和党人都趋向于从政府公职直接跳到薪水丰厚的私营部门岗位，都是例证。

米兰诺维奇认为，这背后的原因是自由主义价值观受到了侵蚀。在资本主义体系内，金钱是价值的终极衡量标准。对狭隘的私利的追求被认为会带来最大的善果。因此，出于道德原因而放弃利润的人可能会被视为有损社

会利益，因为他们妨碍了最大限度地利用资源。此外，他们的克制也为道德水平较低的竞争对手创造了机会。在这种体系之中，其精英阶层日益由为了增加自身财富而不惜做任何事（只要不全然违法）的人组成。

关于不够道德的经营手段，还是得多说两句。正如米兰诺维奇所指出的，全世界的人都会对追求私利表示理解。来自很多不同文化和背景的人都可能从事不符合道德标准的商业活动。没有这一点，近些年的“超级全球化”也就不可能实现。但代价也正变得显而易见，例如企业为了保住留在利润丰厚的市场的机会而屈从于中国的审查制度，或是政府容忍明目张胆的逃税行为，认为这是资本流动畅通无阻的代价。

也许和19世纪的资本主义一样，今天的资本主义所展现出的丑陋面相只是通往更美好世界的道路中令人不快的曲折坎坷。但是，也有可能，世界貌似从较粗劣的资本主义向更好的资本主义前进的历程并非一种历史的必然，而是有赖于悉心培育自由主义的价值观，例如诚实，以及尽己任公平待人。如果是这样，那么一旦缺少了这些价值观的缓和作用，资本主义单凭其自身将可能走进历史的死胡同。 ■



The future of entertainment

Power to the people

Media giants are battling for viewers' attention. There will be blood

IN HOLLYWOOD LINGO, Disney+ launched hot. On blitz day, as Disney called the eve of its television-streaming service's debut on November 12th, a massive marketing campaign reached a climax. Buses in its theme parks were wrapped in ads, employees in Disney shops wore QR codes for people to sign up with smartphones and ABC's "Dancing with the Stars" trailed the excitement to come. By the end of the first day, 10m people had signed up—beyond Disney's highest expectations, it said. Its servers struggled to cope. The company rushed to fix the glitches, as viewers devoured "The Mandalorian", a specially made live-action "Star Wars" spin-off.

For \$6.99 a month—slightly less than the cost of a cinema ticket—viewers in America, Canada and the Netherlands can now tap the world's most valuable entertainment catalogue. As well as new original content, they can watch anything from "Snow White" to "Avengers: Endgame" and, thanks to Disney's \$71bn acquisition this year of 21st Century Fox, all 662 episodes of "The Simpsons" (America's favourite cartoon family was also enlisted in the ad blitz). Behind the scenes, a new recommendation algorithm hoovered up enough user data in a few hours to start sending millions of personalised viewing suggestions, says Kevin Mayer, who runs Disney's international and direct-to-consumer businesses, including Disney+.

Going into on-demand streaming is an epochal shift for the 96-year-old company. Like its Hollywood rivals, it has built an empire on controlling access to films and TV shows, which were released in dribs and drabs—on cinema screens, broadcast networks and cable channels. That model, the entertainment industry has concluded, is no longer viable in the internet

age. In October AT&T, which owns WarnerMedia, the former Time Warner, unveiled HBO Max. The new service will give viewers full online access to HBO programming, as well as to other valuable content including the libraries of Warner Bros, New Line Cinema and Japan's Studio Ghibli, plus new original shows. NBCUniversal will parry with Peacock, a mainly ad-supported streaming platform also expected next year. Smaller services such as CBS All Access and Showtime have already piled in. On November 1st Apple, a tech giant with entertainment aspirations, launched Apple TV+, its own streaming service with several star-studded original shows.

"We are surprised it took them all so long," quips Ted Sarandos, chief content officer of Netflix, which began the streaming revolution in 2007. But now they are here. It is, in the words of Brian Roberts, chief executive of Comcast, a cable behemoth which owns NBCUniversal, "an important moment, as many parties across broad industries have entered the competition for content creation".

That competition should benefit consumers, who can expect a surfeit of high-quality fare. For media companies and their shareholders, it will be brutal. Billions of dollars will get torched. Some endings will be happier than others.

The entertainment business's original script was simple. People paid for cinema tickets (and later video rentals) to watch films, and advertisers paid networks for access to viewers of their TV shows. That began to change in the 1990s. Hit series like "The Sopranos" and "Sex and the City" on HBO, a cable channel then owned by Time Warner, proved that people would pay extra for compelling television. But HBO still relied on "sequential" releases of weekly episodes. It was also a wholesale proposition, sold in a bundle of pay-TV channels. "The big bang", says Barry Diller, chairman of IAC, who in 1986 founded Fox Broadcasting as a rival to the three incumbent free-to-air networks, ABC, CBS and NBC, came in the mid-2000s with Netflix and, soon

after, Amazon Prime Video, the e-commerce giant's streaming service.

The industry's initial response to the challengers was to pawn its crown jewels. Netflix paid hundreds of millions of dollars for rights to stream beloved sitcoms like "Friends" or "The Office". HBO struck deals with Amazon to supply it with programming such as "Six Feet Under". This allowed the streaming upstarts to rack up subscribers and splurge on more content. In time, they began producing their own programmes, notably in 2013 with "House of Cards". Netflix released the entire first season of its political drama at once, ushering in the age of "binge-watching".

Meanwhile, the rest of the business was being reshaped in other ways. Many media groups were folded into vertically integrated conglomerates that controlled both the production and distribution of content. In 2013 Comcast completed its purchase of NBCUniversal. In 2015 AT&T, a telecoms company, bought DirecTV, a satellite firm, and in 2018 paid \$85bn for Time Warner, owner of HBO and the Warner Bros studio. Disney eschewed vertical integration but expanded horizontally. Its megadeal with 21st Century Fox was the fourth for its boss, Bob Iger, who had earlier snapped up Pixar (an animation studio), Lucasfilm (maker of "Star Wars"), and Marvel Entertainment, home of Marvel Comics.

This flurry of consolidation created a handful of giant content owners, with massive back catalogues and a willingness to spend heavily on old shows and new programming (see chart 1). In October HBO Max reportedly agreed to pay over \$500m for the American rights to air 23 old series and three new ones of "South Park", a satirical cartoon owned by Viacom. It was one of the biggest on-demand-licensing deals of all time. The same rights went for \$192m four years ago. As one media executive puts it, with more than a hint of admiration, "AT&T is not screwing around." Since 2010 just three groups—WarnerMedia, Disney and Netflix—have ploughed a total of \$250bn

into programming (see chart 2).

As content-related costs have surged, the lucrative old business model has receded. Netflix has made viewers less willing to pay over the odds for a big bundle of pay-TV channels, which generated margins of around 50% and accounted for as much as three-quarters of profits at media conglomerates like Time Warner, Disney, Viacom or News Corporation. Streaming as a stand-alone business either loses money or at best, breaks even. Netflix books accounting profits but has yet to turn free cashflow positive (though it expects to soon). It has accumulated \$12bn of long-term debt despite making no acquisitions. Media firms moving into streaming have “swapped a quarter for a nickel and paid \$5 for the privilege,” sums up one executive.

There are three ways to make streaming pay. Firms can accumulate deep ranks of loyal subscribers at home and abroad. They can raise prices. Or they can spend less on programming.

Winning over millions of subscribers is getting harder. Once consumers have paid for broadband and for a simple bundle of news and sports, it takes only three or four streaming services at current prices before the bill adds up to not much less than what they coughed up for old pay-TV. Companies are jumping into streaming in a peak-attention economy, notes Tim Mulligan of MIDiA Research. Consumers have no more spare leisure time for new TV apps. Reed Hastings, boss of Netflix, has named “Fortnite”, a hit video game, and sleep as his main competition.

In practice, his and others’ streaming services will probably have to claw viewers away from each other. Even then, customers may not stay. Switching costs are low. People might sign up for Disney+ to see “The Mandalorian”, leave and then come back a year later for a new Marvel film.

If building an enormous subscriber base looks hard, what about raising

prices? Netflix did so in the spring, when its standard plan went up by \$2. There is chatter that Disney may need to raise its price for Disney+ sooner rather than later. But that risks driving subscribers into rivals' arms.

Again, Netflix serves as a cautionary tale. In the third quarter it added just 500,000 American subscribers, 300,000 fewer than expected. Earlier this year it saw their number decline for the first time in 12 years. And that was before Disney, Apple and others entered the fray. Globally, Netflix now expects to add 26.7m subscribers this year, down from 28.6m in 2018; 90% of its subscriber growth comes from abroad, where it is potentially more expensive to win viewers because of the need to tailor content for each market.

That leaves spending on programming as the last lever on profits. This, says Mr Roberts of Comcast, will need to be pulled back somewhat over time. There is no sign of that yet. According to Bloomberg Intelligence, a research firm, the average cost of producing a single episode of a scripted drama is close to \$6m, twice the going rate of three to four years ago. This year 16 firms, from Disney to Quibi, a short-form mobile-video platform, will spend a total of \$100bn on content, according to UBS, a bank. That is roughly equal to the sum invested in America's oil industry this year.

Disney expects its streaming service to break even by 2024, once it reaches 60m-90m subscribers. The plan is for two-thirds of these to come from overseas. Some on Wall Street worry that the firm could lose money on Disney+ for years to come. Streaming may encourage a faster rate of "cord-cutting", as people cancel pricey pay-TV subscriptions, cannibalising the company's mainstay cable profits.

Mr Iger has as good as admitted that Disney is betting the farm. But, as he explained in his recently published autobiography, it has little choice. Its rivals appear to share the sentiment. AT&T expects to invest \$2bn in year

one of HBO Max and to earn no revenue at the start. Over time, the hope is, investment will go down and revenue will rise; the service is also expected to break even in five years.

Still, a shake-out looks inevitable. There is much uncertainty about who will be left standing. The prevailing view in the industry is that Netflix will be hard to dislodge. It has amassed 158m global subscribers and created a brand that appeals to all ages and tastes. Its recent purchase of rights to "Seinfeld" will help make up for the loss of "Friends" and "The Office", two of its most popular shows which AT&T and Comcast, respectively, plan to pull from Netflix. It has 47,000 TV episodes and 4,000 films in its American catalogue, according to Ampere Analysis, a research firm. That is far more than the 7,500 episodes and 500 films that Disney+ will offer in its first year. It will spend \$15bn or so this year on original content. Mr Sarandos says there are no plans to adjust Netflix's strategy in response to all the new competition.

Disney, with its must-see shows and profits that are the envy of the industry, is also here to stay. So in all likelihood is HBO Max, which can tap its parent company's 170m customer relationships. "We could not do this without AT&T," says Bob Greenblatt, chairman of WarnerMedia Entertainment, who oversees the group's direct-to-consumer business. "There is no way that we could so easily reach tens of millions of people on our own." As with Comcast, whose Peacock service should find a nest in the new media landscape, entertainment is becoming an important source of revenue for AT&T. The phone giant will also use HBO Max to acquire and retain wireless customers. Smaller content players such as Discovery and Sony Entertainment will have to identify niches. CBS and Viacom (which are merging) are planning an arms-dealer strategy—of supplying content to anyone who wants to buy it.

Over time, firms that can aggregate the various streaming services in bundles with simple interfaces will reap rewards. Consumers are

overwhelmed by the volume of content coming their way. They are increasingly fed up with having to search for shows on various platforms. Internet service providers such as Comcast and Verizon can help curate this video onslaught. Comcast's Xfinity Flex, a new service for broadband-only customers, for example, offers a seamless way to use more than 100 video and music services. A voice-controlled TV remote can search for, say, "the episode in 'Seinfeld' where George claims to be a marine biologist".

Then there are the technology giants. For them, producing entertainment is not an end in itself, says Matthew Ball, former head of strategy at Amazon Studios (and an occasional contributor to *The Economist*). In Amazon's case, TV is a way to retain Prime subscribers and sell more shoes and loo roll. For Apple it is about selling hardware and expanding its range of services.

Many media executives, particularly the veterans among them, worry about what this means for the future of high-quality content. In their view, much of the film and TV business is now run by clueless outsiders. They cite Apple's "Stories to Believe in", as its first TV shows were mawkishly trailed, as evidence of naivety. "The Morning Show", a drama about working in television starring Jennifer Aniston and Reese Witherspoon, got mixed reviews. "The show, and the service, don't need to exist," concluded *Rolling Stone* magazine. Despite kudos for backing critically acclaimed shows like "Fleabag" and "The Marvelous Mrs Maisel", Amazon's longer record in TV draws similarly tepid reviews. "Apple doesn't know what the fuck they are doing and Amazon knows less," concludes a former film-studio bigwig.

Top management at AT&T wants HBO to produce a lot more programming. In practice, that could include less rarefied fare that might appeal to America's heartland, not just its coastal elites. HBO's unabashedly elitist old-timers are not keen on the new strategy. The decision by John Stankey, head of the telecom firm's entertainment unit, to ramp up production prompted a raft of departures, including that of Richard Plepler, HBO'S head,

who gave the green light to “Game of Thrones”. “Stankey wants HBO to compete with Netflix,” says Rick Rosen, a founder of the Endeavour Agency. But many people worry that there is a big risk of HBO’s brand losing its distinctiveness. “After 20 more years of doing it,” jokes one streaming boss, “John Stankey will be a great creative executive.”

It would nevertheless be a mistake to conclude that outsiders will never get things right. Jeff Bewkes, former chief executive of Time Warner, once dismissed Netflix as “the Albanian Army”. Now Hollywood considers the company a legitimate film studio. It is also easy to overstate the role of senior executives at media firms’ parent companies. Much of the creativity in Hollywood comes from lower down, from outside big firms and from informal networks of writers and stars, some with their own production companies, including Ms Witherspoon and Michael B. Jordan.

Tinseltown has a way of absorbing outsiders. Media executives point out that Apple and Amazon are already adapting. At first they put tech types in charge of their TV operations but later installed seasoned film folk with strong links to the creative world. On November 12th it was reported that Mr Plepler is in talks with Apple about an exclusive production agreement. Like many a moneyman seduced over the years, Jeff Bezos, Amazon’s boss, seems star-struck. He goes to all the awards ceremonies, including the Golden Globes—above and beyond what even movie-studio bosses feel obliged to, remarks a former studio executive.

As long as money keeps flowing, creativity should flourish. So far, shareholders appear happy to let it flow. Netflix’s share price has fallen from its peak in mid-2018 but the company remains highly rated relative to earnings. Disney shares have risen by 28% since the company revealed the details of Disney+ to investors in April. AT&T and Comcast are also up this year.

Even before the taps are tightened—as they inevitably will be—the streaming wars have reshaped media well beyond video entertainment. The shift from linear schedules to fragmented, on-demand consumption makes it harder for any one company to exert a big influence on people's viewing, says Bob Bakish, chief executive of Viacom. Every company needs to adapt accordingly, he adds. It is also weakening the link between entertainment and television news. That is most visible in Rupert Murdoch's decision to sell much of 21st Century Fox to Disney, a deal which closed in March. He continues to control News Corp, containing newspapers, and Fox Corporation, a broadcaster that owns Fox News and other assets.

The wild card hanging over the industry is what the tech giants will do next. Some people think Apple could cut its spending on entertainment or even exit the business. It is seen as more unpredictable than Amazon, which seems committed to making and showing content. Yet the overriding view in Hollywood is that, with their untold piles of cash and their valuations of \$1trn or so apiece, the tech giants are only just getting started. They could easily swallow a media firm or two.

Trustbusters may stymie any such move by Alphabet, Google's parent, which already owns YouTube. Amazon might find it hard in practice given scrutiny of its rapid expansion (and Jeff Bezos's ownership of the *Washington Post*). Apple might have an easier time. When Mr Bewkes was looking to sell Time Warner a few years ago, talks were held with Apple as well as AT&T. There has been much chatter about Mr Iger's comment in his autobiography that, if Steve Jobs were still alive, Disney and Apple would have combined (Disney, for its part, nearly bought Twitter in 2016).

For all Mr Sarandos's fighting talk, even Netflix could be a target if the streaming wars affect its growth and the firm's finances come under pressure. As dizzying as the pace of change has been in media in the past few years, it is unlikely to let up. ■



娱乐的未来

权力属于人民

媒体巨头在激烈争夺观众的注意力。流血不可避免

用好莱坞的话说，Disney+一炮而红。在迪士尼所说的“闪电战日”，也就是其电视流媒体服务首次亮相的11月12日的前夜，大规模的营销活动达到了高潮。主题公园中的公交车上都包裹着广告，迪士尼商店中的员工身穿二维码供人们使用智能手机注册，美国广播公司（ABC）的“与星共舞”真人秀为之捧场。迪士尼说，到第一天结束时，已经有1000万人注册——超出了迪士尼最高的估计。这让它的服务器捉襟见肘。随着观众蜂拥观看真人版《星球大战》的特制衍生剧《曼达洛人》，迪士尼手忙脚乱地解决故障。

只要每月支付6.99美元（略低于一张电影票的价格），美国、加拿大和荷兰的观众现在就可以饱览世界上价值最高的娱乐片库。除了新的原创内容外，他们还可以观看从《白雪公主》到《复仇者联盟：残局》的任何内容，而且由于迪士尼今年以710亿美元的价格收购了21世纪福克斯公司，这还包括全部662集《辛普森一家》（这个美国最受欢迎的卡通家族也参加了广告闪电战）。负责迪士尼国际业务及直接面向消费者业务的凯文·梅耶（Kevin Mayer）说，在幕后，一种新的推荐算法在数小时内就收集到了足够多的用户数据，开始发送数百万条个性化观片建议。

对于这家拥有96年历史的公司来说，进军按需流媒体服务是一个划时代的转变。和它的好莱坞竞争对手一样，它的帝国建立在控制电影和电视节目的观看权上——细水长流地在电影院线、广播电视网和有线频道上发行。娱乐业已经得出结论，这种模式在互联网时代行不通了。10月，拥有华纳媒体（原时代华纳）的AT&T推出了HBO Max。这项新服务将使观众可以完全在线观看HBO的节目以及其他宝贵的内容，包括华纳兄弟、新线影业和日本吉卜力工作室的片库，还有新的原创节目。NBC环球的应对则是“孔雀”（Peacock），一个主要由广告支持的流媒体平台，预计也将于明

年推出。还有诸如CBS All Access和Showtime等较小的服务也已经参与进来。11月1日，渴望挤进娱乐行业的科技巨头苹果推出了自有流媒体服务Apple TV+，提供多个明星云集的原创节目。

自2007年掀起流媒体革命的奈飞公司的首席内容官特德·萨兰多斯（Ted Sarandos）开玩笑道：“他们花了这么长时间，真让我们感到惊讶。”但他们终于来了。用拥有NBC环球的有线电视巨头康卡斯特的首席执行官布莱恩·罗伯茨（Brian Roberts）的话来说，“这是一个重要的时刻，因为各行各业的众多公司都加入了内容创作的竞赛。”

这种竞争应该会让消费者受益——他们可以期待大量高质量的产品纷至沓来。对媒体公司及其股东而言则会十分残酷。数十亿美元将被烧掉。有些人的结局会比其他人的更幸福。

娱乐业最初的“剧本”很简单。人们买电影票（后来又有了录像带租赁）来看电影，而广告商向广播电视台付费来覆盖电视节目观众。这在1990年代开始改变。当时由时代华纳旗下的有线电视频道HBO播出的热门剧，如

《黑道家族》和《欲望都市》，已经证明人们愿意为扣人心弦的电视内容支付更多钱。但HBO仍然依赖每周“按顺序”发布新一集的模式。这也只是一个批发生意——将收费电视频道打包出售给观众。IAC的董事长巴里·迪勒（Barry Diller）曾于1986年创立了福克斯广播公司，与三个已有的免费电视广播网ABC、CBS和NBC竞争。他说，“大爆炸”始于2000年代中期的奈飞，还有之后不久出现的电子商务巨头亚马逊的流媒体服务Amazon Prime Video。

面对挑战者，业界最初的应对是变卖皇冠上的宝石。奈飞支付了数亿美元，获得了深受观众喜爱的情景喜剧（如《老友记》或《办公室风云》）的播放权。HBO与亚马逊达成了交易，为其提供《六英尺下》等节目。这就让流媒体新贵吸引到了更多订户，并大手笔购买更多内容。随着时间的推移，他们开始制作自己的节目，最著名的是于2013年推出的《纸牌屋》。奈飞一次性发布了这部政治剧的整个第一季，开启了“刷剧”时代。

与此同时，行业的其他方面也被重塑。许多媒体集团被折叠成垂直整合的联合企业，同时控制内容的生产和发行。2013年，康卡斯特完成了对NBC环球的收购。2015年，电信公司AT&T收购了卫星电视公司DirecTV，并于2018年以850亿美元的价格收购了拥有HBO和华纳兄弟工作室的时代华纳。迪士尼避免了纵向整合，而是横向扩展。它与21世纪福克斯的巨额交易是其老板鲍勃·艾格（Bob Iger）的第四笔交易——他早先收购了动画工作室皮克斯、拍摄《星球大战》的卢卡斯影业，以及拥有漫威漫画的漫威娱乐。

如此一连串的整合打造出了几个内容巨头，它们拥有海量片库，并愿意在新旧节目上投入巨资（参见图表1）。据报道，10月，HBO Max同意以超过5亿美元的价格购买维亚康姆旗下的讽刺动画剧集《南方公园》旧有23季和全新3季的美国转播权。这是有史以来最大的点播授权交易之一。四年前，同样的授权卖出了1.92亿美元。正如一位媒体高管所说，“AT&T才不会瞎耽误工夫。”艳羡之情溢于言表。自2010年以来，仅仅三个集团（华纳媒体、迪士尼和奈飞）就在节目上投入了总计2500亿美元（见图表2）。

随着与内容相关的成本激增，利润丰厚的旧业务模式已经萎缩。奈飞降低了观众出高价购买一大堆付费电视频道的意愿，而这些频道的利润率约50%，并为时代华纳、迪士尼、维亚康姆或新闻集团等媒体联合企业贡献了利润的四分之三之多。作为独立业务的流媒体要么亏本，要么充其量能收支平衡。奈飞在会计上录得利润，但尚未把自由现金流变为正数（尽管它预计很快会实现）。虽未进行任何收购，它仍积累了120亿美元的长期债务。一位媒体高管总结说，进入流媒体领域的媒体公司是在“用25美分去换5美分，再为了进场付上5美元”。

有三种方式可以让流媒体业务取得回报：公司可以在国内外积累大量忠实订户。它们可以提高价格。或者可以减少节目开销。

要赢得数百万订户越来越难了。消费者为宽带和一套简单的新闻和体育节

目付完钱后，按当前价格来算只要再添上三四个流媒体服务，账单总额就不比以前的付费电视便宜多少了。MIDiA Research的蒂姆·穆里根（Tim Mulligan）指出，冲进流媒体服务的公司正面临注意力经济的顶峰。消费者没有更多的空闲时间来消费新的电视应用了。奈飞的老板里德·黑斯廷斯（Reed Hastings）称大热游戏“堡垒之夜”（Fortnite）和睡眠为自己的主要竞争对手。

而实际上，他和其他人的流媒体服务可能将不得不相互争抢观众。即便如此，客户可能也不会留下。切换平台的成本很低。人们可能会签约Disney+观看《曼达洛人》，随后离开，一年后再回来观看新的漫威电影。

如果建立庞大的订户群看起来这么难，那提高价格行不行呢？奈飞在春季就这样做了，当时它的标准套餐价格上涨了2美元。有传言说迪士尼可能需要尽早提高Disney+的价格。但这要冒着将订户推向竞争对手的风险。

奈飞在这方面又成了前车之鉴。它在三季度仅增加了50万美国用户，比预期少30万。今年早些时候，订户数出现了12年来的首次下降。那还是在迪士尼、苹果和其他公司加入竞争之前。从全球范围来看，奈飞现在预计今年将增加2670万订户，低于2018年的2860万。其用户增长90%来自国外。由于需要为每个市场量身定制内容，赢得海外观众的成本可能会更高。

这让节目支出成了撬动利润的最后一根杠杆。康卡斯特的罗伯茨表示，随着时间的流逝，这笔支出肯定需要回落。但目前这种迹象尚未出现。据研究公司“彭博行业研究”称，制作一集电视剧的平均成本接近600万美元，是三四年前的两倍。瑞银的数据显示，从迪士尼到移动短视频平台Quibi的16家公司将在内容上总计花费1000亿美元。这大约等于今年对美国石油行业的投资总额。

迪士尼预计其流媒体服务将在2024年达到6000万至9000万用户数，从而实现盈亏平衡。其中三分之二的订户将来自海外。华尔街的一些人担心，迪士尼可能会在Disney+上亏钱多年。流媒体可能会鼓励人们更快地“切断

电缆”（取消订阅昂贵的付费电视），从而使得该公司自我蚕食了基于有线电视的利润支柱。

艾格基本上承认迪士尼是在孤注一掷。但是，正如他在最近发表的自传中所解释的那样，公司别无选择。它的竞争对手似乎也有同样的感觉。

AT&T预计在HBO Max的第一年就要投资20亿美元，并且开始时不会获得任何收入。它的希望是投资会逐渐减少，而收入将增加；该服务同样预计在五年内达到盈亏平衡。

尽管如此，大洗牌似乎不可避免。最后谁能活下来有很多不确定性。业界普遍认为奈飞的地位很难撼动。它已经吸引了1.58亿全球订阅者，并创建了一个能够吸引所有年龄和口味的品牌。它最近购买的《宋飞正传》版权将有助于填补《老友记》和《办公室风云》留下的空缺——这两部最受其订户欢迎的剧集分别被AT&T和康卡斯特计划撤出。根据研究公司安培分析（Ampere Analysis）的数据，奈飞的美国片库中有47,000集电视节目和4000部电影。这远远超过了Disney+第一年将提供的7500集剧集和500部电影。今年它将在原创内容上花费约150亿美元。萨兰多斯说，没有计划针对所有的新竞争来调整奈飞的战略。

拥有令业界艳羡的必看节目和利润的迪士尼同样会留下。可以利用其母公司的1.7亿客户的HBO Max多半也是如此。“没有AT&T我们做不到，”华纳媒体娱乐的董事长、负责集团直接面向消费者业务的鲍勃·格林布拉特（Bob Greenblatt）说，“我们绝没可能靠自己这么轻松地覆盖数千万人。”就和康卡斯特（它的孔雀服务应该能在新的媒体格局中找到一席之地）一样，娱乐正在成为AT&T重要的收入来源。这家电信巨头也将利用HBO Max来获得和维系无线客户。探索频道和索尼娱乐等小型内容生产商则必须找到自己的利基市场。哥伦比亚广播公司和维亚康姆（正在合并中）在计划一项“军火商战略”——向任何愿意购买的人提供内容。

假以时日，能够通过简单界面将各种流媒体服务捆绑在一起的公司将收获回报。大量的内容使消费者应接不暇。他们越来越厌倦在各种平台上搜索节目。互联网服务供应商，例如康卡斯特和威讯，可以通过拣选和聚合来

帮助控制这种视频狂轰滥炸。例如，康卡斯特的Xfinity Flex是一项面向单纯宽带用户的新服务，它提供了一种无缝连接的方式来使用100多种视频和音乐服务。一个语音控制的电视遥控器可以搜索比如“《宋飞正传》中乔治自称是海洋生物学家的那一集”。

再就是技术巨头。对于它们来说，生产娱乐本身并不是目的，亚马逊工作室的前战略负责人（偶尔也为《经济学人》撰稿）马修·鲍尔（Matthew Ball）说。就亚马逊而言，电视是留住Prime订户并卖出更多鞋子和卫生纸的一种方式。对于苹果来说则是销售硬件并扩大其服务范围。

许多媒体高管，尤其是其中的资深人士，担心这对高质量内容的前景的影响。他们认为，现在许多影视业务都是由毫无概念的局外人经营的。他们援引苹果第一批电视剧颇煽情的预告片“值得相信的故事”来说明这种幼稚。由詹妮弗·安妮斯顿和里斯·威瑟斯彭主演、描述电视业职场的电视剧《早间新闻》褒贬不一。“这个秀，还有苹果的服务，都不需要存在。”《滚石》杂志总结道。尽管因投拍《伦敦生活》和《了不起的麦瑟尔夫人》等受评论界认可的剧集而收获荣誉，亚马逊在电视方面的整体历程招致了同样冷淡的评论。一位前电影制片厂大佬下总结道：“苹果根本特么不知道自己在干什么。亚马逊知道得比苹果还少。”

AT&T的最高层希望HBO生产的节目大幅增加。实际上，这可能包括用一些不那么阳春白雪的节目来迎合美国的心脏地带，而不仅仅是沿海精英。HBO那些毫不掩饰精英主义立场的老前辈并不热衷于这种新战略。AT&T的娱乐部门负责人约翰·斯坦基（John Stankey）提高产量的决定引发了许多人离职，包括对《权力的游戏》下达“绿灯”开拍指令的HBO负责人理查德·普莱普勒（Richard Plepler）。“斯坦基希望HBO与奈飞竞争。”奋进经纪公司（Endeavor Agency）的创始人里克·罗森（Rick Rosen）说。但是许多人担心，HBO品牌失去其独特性的风险很大。“经过20多年的努力，”一位流媒体服务的老板打趣道，“约翰·斯坦基将成为一位出色的创意主管。”

然而，下结论说局外人永远搞不好是错误的。时代华纳前首席执行官杰夫

·比克斯（Jeff Bewkes）曾将奈飞贬为“阿尔巴尼亚军队”。现在好莱坞视之为一家像样的电影制片厂。媒体公司的母公司中的那些高管的作用也很容易被高估。好莱坞的创造力大多源于底层、外部大工作室，以及作家和明星的非正式网络，其中一些人拥有自己的制作公司，包括威瑟斯彭和迈克尔·B·乔丹。

好莱坞总有办法吸引到外来者。媒体高管指出苹果和亚马逊已经在调整适应了。最初，他们让技术人员负责电视运营，后来安插了与创意界有紧密联系的电影界老手。据报道，11月12日，普莱普勒与苹果就独家制片协议进行谈判。和这些年被吸引进来的许多富翁一样，亚马逊的老板杰夫·贝索斯看上去也很爱追星。他参加所有颁奖典礼，包括金球奖——连电影制片厂老板都不觉得这是必须要去的，一位前制片厂高管说。

只要有钱源源不断地进来，创造力应该就会喷涌。到目前为止，股东似乎都很乐意输送资金。奈飞的股价已经从2018年中期的峰值下跌，但相对于收益来说，该公司的评级仍然很高。自迪士尼4月向投资者披露Disney+的详请以来，迪士尼股价已上涨了28%。AT&T和康卡斯特今年也都有所上涨。

甚至在水龙头旋紧之前（这是不可避免的），流媒体之战对媒体的重塑已经远远超出了视频娱乐的范畴。维亚康姆的首席执行官鲍勃·巴基什（Bob Bakish）表示，从线性的节目单转向零散的点播消费，这使得任何一家公司都很难对人们的观看产生重大影响。他补充说，每个公司都需要做出相应的调整。它也削弱了娱乐与电视新闻的联系。最明显的例子就是默多克决定将21世纪福克斯的大部分股份出售给迪士尼，这项交易于3月完成。他继续控制着新闻集团（报纸）和福克斯广播公司（拥有福克斯新闻频道和其他资产）。

那张悬在行业面前未知的牌是科技巨头的下一步动作。有人认为苹果可能会削减娱乐支出，甚至退出这部分业务。人们觉得它比亚马逊更不可预测——后者似乎致力于制作和展示内容。然而，好莱坞最主流的观点是，凭

借巨额现金和1万亿美元左右的估值，科技巨头才刚刚起步。它们可以轻易吞下一两家媒体公司。

反托拉斯机构可能会阻止谷歌母公司Alphabet的任何此类举动——它已经拥有了YouTube。亚马逊的迅速扩张（加上杰夫·贝索斯拥有《华盛顿邮报》）引来了严密审查，所以实际上可能也很难操作。苹果做起来或许更轻松些。几年前，当比克斯尝试出售时代华纳时，他与苹果和AT&T都进行了谈判。艾格在自传中有个说法引发了热议：如果史蒂夫·乔布斯还活着，迪士尼早就和苹果合并了（迪士尼在2016年差点收购了推特）。

虽有萨兰多斯好战的言论，但如果流媒体战争影响奈飞的增长并且公司的财务承受压力，甚至它也可能变成目标。媒体变革的步伐在过去几年间令人眼花缭乱，但它放缓的可能性并不大。 ■



Genetics

A design for life

A new type of genetic profiling promises cleverer, better-looking children. What could possibly go wrong?

DEBATE ABOUT using science to create “bespoke” human beings of one sort or another usually revolves around the ideas of genetic engineering and cloning. People worry about these for two reasons. One is practical. The tinkering involved could end up harming the resulting individual. The other is a more visceral dislike of interfering with the process of reproduction, perhaps best encapsulated in the phrase “playing God”.

There is, however, a third way that the genetic dice which are thrown at the beginning of human life might be loaded—and it does not involve any risky tinkering. It is a twist on the well-established procedure of *in vitro* fertilisation (IVF). The twist would be to decide, on the basis of their DNA, which of a group of available embryos should be implanted and brought to term.

The result would be a child optimised with the best-available genetic profile for a long and healthy life. And this is not science fiction. Two American firms have been working on the idea for some time, and one of them is now implementing it.

Single-nucleotide polymorphism (SNP, or “snip”) profiling, as the technique is called, promises healthier offspring—a clear good. It may also provide a way to upgrade things only tangentially associated with health, such as height and, more controversially, intelligence. Moreover, it is a technique that could be applied generation on generation, to improve grandchildren and great-grandchildren still further.

SNPs are the smallest possible differences between individuals' DNA—single genetic letters. Individually, most have little consequence. But there are millions of them in every human genome and their combined effects can be big. SNP profiling looks for particular combinations of SNPs that research has shown are associated with the risks of developing illnesses such as cancer, diabetes and heart disease. This is important medical information for people now alive, and can be used to recommend screening programmes, changes of behaviour and prophylactic drugs.

For those willing to undergo IVF, and with the money to pay for it, it may also be possible to SNP-profile an embryo and thus foretell its future. As well as disease risk, height and intelligence, SNP-profiling might eventually be capable of predicting (albeit imperfectly, for environment also plays a role) things as diverse as television-viewing habits, likelihood of being bullied at school and probability of getting divorced.

At the moment, non-medical attributes are not on the menu offered by would-be embryo SNPprofilers. But if the technique works it is hard to believe that they will not be on someone's menu in the future. And that does raise questions.

What all this amounts to is, in essence, a supercharged version of an existing process known as assortative mating. It is already true that intelligent, successful (and therefore probably rich) people seek each other out as partners. In doing so, they bring to the table whatever genetic variations helped make them intelligent, successful and rich, which they then pass on to their children. SNP profiling—available, at least to start with, only to those who can afford it—will enhance that by letting parents pick tall, good-looking and above all clever offspring.

For a single generation, that may not matter too much to the rest of society. It would be but one extra privilege that the rich enjoy. Piled generation

on generation, however, it really might create a genetic elite. SNP-profiling is already used to enhance desired attributes in livestock, so it seems reasonable to assume it will work on people.

Perhaps that is tomorrow's problem. For the moment there seems no reason beyond envy to oppose embryo SNP-profiling. But, from H.G. Wells's Eloi in "The Time Machine" to Aldous Huxley's Alphas in "Brave New World", science fiction is full of breeding programmes for elite humans that have gone wrong. Sci-fi always enjoys portraying dystopias, and mostly they do not come true. But it might be wise to debate the matter now, just in case this time people really are unknowingly playing God. ■



遗传学

设计生命

一种新型的遗传分析有望造就更聪明、漂亮的孩子。可能会出什么差错呢？

有关用科学来创造某种“定制化”人类的争论通常围绕基因工程和克隆这两种方案展开。人们的担忧出于两方面的原因。一个比较实际：过程中所做的修修补补到头来可能会伤害最终诞生的那个人。另一个更加发自本能，是对干涉繁殖过程的反感。“扮演上帝”这个说法也许最好地概括了这种情绪。

然而，还有第三种方式来对在人类生命孕育之初掷出的基因骰子做手脚——而且不涉及任何有风险的修补调整。它是体外受精这种久以有之的生育方式的一个变种。变化在于根据一组可用胚胎的基因来决定应将其中哪一个植入子宫孕育直至分娩。

由此将诞生出一个经过“优化”的孩子，带有可选得的最佳遗传属性，以利于拥有健康长寿的人生。而这并不是科幻小说。两家美国公司对这一想法的研究已有一段时间，其中一家正在付诸实践。

这项技术叫作单核苷酸多态性（SNP，或称“snip”）分析，有望培育出更健康的后代——这无疑是好事。该技术也许还提供了一种方法来改进那些勉强与健康沾边的特征，比如身高，以及更富争议性的属性——智力。此外，这也是一种可以应用在一代又一代人身上的技术，从而让孙辈和曾孙辈的生命质量进一步提升。

SNP是个体DNA之间的最小差异，也就是单个的遗传字母。就单个SNP而言，其影响大多微乎其微。但每个人类基因组中都有数百万个这样的字母，它们的综合效应可能很大。SNP分析寻找那些经研究显示可能与罹患某些疾病（如癌症、糖尿病和心脏病等）有关的特定SNP组合。这对于已经活在世上的人是重要的医学信息，可用来推荐筛查项目、行为改变方案和预防性药物。

对于那些愿意且有钱接受体外受精的人来说，或许还可以对胚胎做SNP分析以预测其未来。除了患病的风险、身高和智力外，SNP分析最终也许还能预测各种各样的事情，比如看电视的习惯、在学校被欺负的可能性，以及离婚的概率，尽管这类预测并不精准，因为环境也会起作用。

眼下，有志于提供胚胎SNP分析的机构尚未将预测非医学属性列入业务范畴。但是，如果这项技术行得通，很难相信未来不会有人将它们加进自己的服务菜单。而这确实引发了疑虑。

究其本质，以上种种其实相当于选型交配这种现有行为模式的加强版。聪明且成功（因而也可能富有）的人会寻找与自己相似的人作伴侣，这已经是事实。他们在此过程中凭借了所有帮助自己变得聪明、成功和富有的遗传变异，然后再将它们传给子女。SNP分析将强化这一点，因为父母可以靠它来挑选个子高、长得好看，还有最重要的一—聪明的一—后代。只有那些负担得起的人才能享用这项技术，至少一开始会是这样。

若只施加在一代人身上，对社会其他人可能影响不大。说起来这不过是富人享有的又一项特权而已。然而，如果是用在一代又一代人身上，可能就真的会创造出一个基因精英群体。SNP分析已经被用于加强家畜的理想特征，因此似乎也可以合理假定它在人身上也行得通。

也许这个问题可以留待明天再去考虑。就目前来看，除了嫉妒，似乎再无其他反对胚胎SNP分析的理由。但是，从H·G·威尔斯的《时光机器》中的埃洛伊人，到阿尔多斯·赫胥黎的《美丽新世界》中的阿尔法这一“种姓”，科幻小说中满是精英人类繁育计划出差错的情节。没错，科幻小说总是喜欢描绘反乌托邦，而大多数并未成为现实。但现在就来辩论这个问题也许是明智的，万一这次人们真的在不知不觉中扮演了上帝呢。■



Johnson

Don't fear the Writernator

Computer-generated writing will never replace the human kind

MANY PEOPLE will be familiar with automated writing through two features of Gmail. Smart Reply proffers brief answers to routine emails. If someone asks “Do you want to meet at 3pm?”, Gmail offers one-click responses such as “Sure!” More strikingly, Smart Compose kicks in as you write, suggesting endings to your sentences. Both are not only rendered in flawless English; they often eerily seem to have guessed what you want to say. If someone sends bad news, Smart Reply might offer “Ugh.”

The *New Yorker*'s John Seabrook recently described a more powerful version of this technology, called GPT-2, which can ably mimic his magazine's style. Such systems use a digital network of billions of artificial “neurons” with virtual “synapses”—the connections between neurons—that strengthen as the network “learns”, in this case from 40 gigabytes-worth of online writing. The version Mr Seabrook tested was refined with back-issues of the *New Yorker*.

The metaphor of the brain is tempting, but “neurons” and “synapses” deserve those scare-quotes. The system is merely making some—admittedly very sophisticated—statistical guesses about which words follow which in a *New Yorker*-style sentence. At a simple level, imagine beginning an email with “Happy...” Having looked at millions of other emails, Gmail can plausibly guess that the next word will be “birthday”. GPT-2 makes predictions of the same sort.

What eludes computers is creativity. By virtue of having been trained on past compositions, they can only be derivative. Furthermore, they cannot

conceive a topic or goal on their own, much less plan how to get there with logic and style. At various points in the online version of his article, readers can see how GPT-2 would have carried on writing Mr Seabrook's piece for him. The prose gives the impression of being human. But on closer inspection it is empty, even incoherent.

Meaningless prose is not only the preserve of artificial intelligence. There is already a large quantity of writing that seems to make sense, but ultimately doesn't, at least to a majority of readers. In 1996 Alan Sokal famously submitted a bogus article to a humanities journal, with ideas that were complete nonsense but with language that expertly simulated fashionable post-modernist academic prose. It was accepted. Three scholars repeated the ruse in 2017, getting four of 20 fake papers published. Humans already produce language that is devoid of meaning, intentionally and otherwise.

But to truly write, you must first have something to say. Computers do not. They await instructions. Given input, they provide output. Such systems can be seeded with a topic, or the first few paragraphs, and be told to "write". While the result may be grammatical English, this should not be confused with the purposeful kind.

To compose meaningful essays, the likes of GPT-2 will first have to be integrated with databases of real-world knowledge. This is possible at the moment only on a very limited scale. Ask Apple's Siri or Amazon's Alexa for a single fact—say, what year "Top Gun" came out—and you will get the answer. But ask them to assemble the facts to prove a case, even at a straightforward level—"Do gun laws reduce gun crime?"—and they will flounder.

An advance in integrating knowledge would then have to be married to another breakthrough: teaching text-generation systems to go beyond sentences to structures. Mr Seabrook found that the longer the text he

solicited from GPT-2, the more obvious it was that the work it produced was gibberish. Each sentence was fine on its own; remarkably, three or four back to back could stay on topic, apparently cohering. But machines are aeons away from being able to recreate rhetorical and argumentative flow across paragraphs and pages. Not only can today's journalists expect to finish their careers without competition from the Writernator—today's parents can tell their children that they still need to learn to write, too.

Aside from making scribblers redundant, a common worry is that such systems will be able to flood social media and online comment sections with semi-coherent but angry ramblings that are designed to divide and enrage. In reality, that may not be much of a departure from the tenor of such websites now, nor much of a disaster. Perhaps a flood of furious auto-babble will force future readers to distinguish between the illusion of coherence and the genuine article. If so, the Writernator, much like the Terminator, would even come to do the world some good. ■



约翰逊

无惧“作家终结者”

计算机生成的文字将永远无法替代人类的作品

许多人会通过Gmail的两个功能熟悉自动写作。智能回复（Smart Reply）为常规电子邮件提供简短回复。如果有人问“下午3点见面可以吗？”，那么Gmail就会提供“可以！”这样的一键式答复。更令人惊异的是，智能撰写（Smart Compose）会在你写邮件时启动，建议句子如何收尾。这两个功能生成的文字不仅语言规范，而且似乎常常能神奇地猜到你想说什么。如果有人发来坏消息，智能回复提供的答复可能是“呃……”。

《纽约客》的约翰·西布鲁克（John Seabrook）近日描述了这项技术的一个更强大版本，这个名叫GPT-2的系统可以巧妙地模仿《纽约客》的风格。这样的系统是基于有数十亿个人工“神经元”和虚拟“突触”（神经元之间连接的部分）的数字网络，这个网络能通过不断“学习”而变得更强大（GPT-2的学习对象是40个G的网络文章）。西布鲁克试用的是学习了《纽约客》过刊的改进版。

人们很喜欢把这类系统比作大脑，但“神经元”和“突触”这两个词必须得加上引号。该系统只是在对《纽约客》的语言做统计分析后，猜测一个词后面跟哪些词会写出更符合它风格的句子（不可否认，猜得水平很高）。在较简单的层级，假设一篇邮件以“祝你……”开头，看过数百万封其他电子邮件之后，Gmail可以合理地猜测接下来的内容将是“生日快乐”。GPT-2做预测时的道理也一样。

但计算机缺乏的是创造力。它的训练基于过去的创作，所以只能做到模仿。此外，计算机无法独立构思主题或意图，更不用说进而讲逻辑、有风格地谋篇成文。在西布鲁克撰写的一篇文章的网络版中，读者能在某些段落的末尾看到如果GPT-2代他写下去会是什么模样。那些语句感觉上像是人类的手笔，但仔细读就会发现内容空洞，甚至不连贯。

莫名其妙的文章并非人工智能的专利。世界上已经有大量的文字看似言之有物，但至少对大多数读者来说，终究还是空洞无物。1996年，艾伦·索卡尔（Alan Sokal）向一家人文期刊投递了一篇瞎编的文章，内容都是胡说八道，但行文熟练地模仿了流行的后现代主义学术语体。文章被录用了，此事广为人知。2017年，三位学者故技重施，他们投出的20篇胡编的论文中有四篇被发表。不管有意还是无意，人类自己就已经在生成没有意义的文字了。

但真正的写作首先得有话要说。电脑没有表达的欲望，它们只是等待指令，根据输入提供输出。这样的系统可以根据给定的一个主题或开头几段去开始“写作”。虽然写出来的东西可能语法正确，但不能与有意图的写作混为一谈。

要撰写有意义的文章，GPT-2之类的系统首先必须与现实世界的知识数据库集成。目前能做到的集成程度非常有限。向苹果的Siri或亚马逊的Alexa问一个单一的事实问题，例如电影《壮志凌云》是哪一年上映的？它们可以给出答案。但如果让它们收集事实以证明一个观点，哪怕是一个简单直接的问题，比如“枪支管制减少了枪支犯罪吗？”，它们就会不知所措。

接下来，在整合知识上取得的进步须致力于实现另一项突破：训练自动写作系统不只写句子，还要谋篇布局。西布鲁克发现，他从GPT-2得到的文字篇幅越长，就越能明显看出它前言不搭后语。每个句子单独看都没问题；颇厉害的是，连续三到四个句子也能紧扣主题，貌似还算连贯。但要让机器从段落到段落重建出修辞和论证过程，还有太长的路要走。不仅今天的记者不用担心自己的职业生涯中会面对“作家终结者”（Writernator）的竞争，如今的父母也还可以告诉他们的孩子，写作还是要学的。

除了令三流作家失业外，人们对这些系统有一个共同的担忧，就是它们会在社交媒体和网上评论区制造出大量半通不通的躁狂文字，蓄意分裂社会、煽动情绪。实际上，现在此类网站的情况可能差不多已经如此了，这也许也算不上太大的灾难。机器生成的愤怒胡话可能会迫使未来的读者区分貌似通顺的文字和名副其实的文章。若真如此，就像“终结者”那样，

“作家终结者”甚至可以为世界做出一点贡献。 ■



The economics of billionaires

The lives of the 0.0001%

Have billionaires accumulated their wealth illegitimately?

BILLIONAIRES HAVE never exactly been popular with the radical left. But with a member of the nine-zero club sitting in the White House, and a decade of slow growth in living standards, some Democrats have taken to attacking billionaires to draw attention to their argument for root-and-branch economic reform. “Billionaires should not exist,” says Bernie Sanders, a presidential candidate. Plutocrat-bashing has become part of the debate in Britain, too, where an election will be held on December 12th. At the Labour Party’s campaign opener Jeremy Corbyn, its far-left leader, attacked the Duke of Westminster, one of Britain’s wealthiest landowners, and Rupert Murdoch, a media mogul.

Socialists argue that anyone who has become fantastically rich has profited from a rigged system. “Every billionaire is a policy failure,” goes the memorable phrase. To assess this claim *The Economist* has drawn on data from *Forbes*, a business magazine, on billionaires in the rich world, updating an index of crony capitalism that we first put together in 2014 (see chart).

In the past decade the wealth of the world’s 2,200-odd plutocrats (which puts them inside the world’s top 0.0001%) has risen much faster than global GDP. Still, most of the world’s billionaire wealth has been earned fair and square. Oprah Winfrey, for instance, has a fortune of about \$3bn. It is one thing to feel that having so much money is distasteful. It is quite another to argue that these people have accumulated their wealth illegitimately and should be stripped of it.

But some billionaires are less upstanding, indulging in what economists call “rent-seeking”. This takes place when the owners of an input of production—labour, machines, intellectual property, capital—extract more profit than they would get in a competitive market. Such activity may or may not be illegal, and often involves cartels and lobbying for rules that benefit a firm at the expense of competitors and customers. Our analysis identifies industries where rent-seeking is common, including mining, defence, construction and casinos. This time it also includes the largest tech companies, since many of them have engaged in anticompetitive practices.

Three-quarters of billionaires’ wealth in advanced economies was fairly acquired. Still, rentier wealth has risen relative to GDP. Some countries are more cronyfied than others. Sweden and Germany less so. But in America rent-seeking industries made one in five billionaires and explain a third of total billionaire wealth.

What should be done? Governments could do more to expose oligopolies to competition. Another option would be higher taxes on wealth transfers (according to a separate analysis, one-third of global billionaire wealth is inherited). Making the economy more competitive would do more for ordinary folk than tarring all plutocrats with the same brush. ■



亿万富翁经济学

百万分之一人群的生活

亿万富翁发的是不义之财吗？

亿万富翁向来不怎么受极左派待见。但随着某位“亿万富翁俱乐部”成员入主白宫，加上十年来美国生活水平提升缓慢，一些民主党人开始抨击亿万富翁来吸引人们关注他们实施彻底经济改革的主张。“亿万富翁就不该存在。”总统竞选人伯尼·桑德斯（Bernie Sanders）说。在即将于12月12日举行大选的英国，批判富豪也成了辩论的一部分。在工党的竞选启动会上，其极左党魁杰里米·科尔宾（Jeremy Corbyn）炮轰英国最富有的大地主之一威斯敏斯特公爵和媒体大亨鲁伯特·默多克。

社会主义者认为，任何成为巨富之人都是从一个受操纵的体系中得益的。有句名言说：“每个亿万富翁都代表着一项政策失误。”为检验这一说法，《经济学人》利用商业杂志《福布斯》有关富裕国家亿万富翁的数据，更新了本刊自2014年起编制的裙带资本主义指数（见图表）。

过去十年里，全球2200多名亿万富翁的财富（使他们位列全球最富的0.0001%人群）增速远快过全球GDP。不过世界上大多数亿万富翁的财富都是堂堂正正赚来的，例如美国脱口秀主持人奥普拉·温弗瑞（Oprah Winfrey）拥有约30亿美元的资产。反感别人家财万贯是一码事，认为这些人的财富都是不义之财因而该被剥夺就是另一码事了。

但确实有些亿万富翁不那么诚实正派，沉迷于经济学家所说的“寻租”活动——拥有劳动力、机器、知识产权、资本等生产资料的人过度榨取利润，超过了在一个竞争性市场所能获得的水平。此类活动可能合法，也可能非法，往往涉及垄断组织和使法规有利于某家公司而牺牲竞争者和顾客利益的游说行为。本刊的分析发现寻租行为普遍存在于采矿、国防、建筑及赌场等行业。而这一次最大型的科技公司也在此列，因为其中许多公司都有反竞争的操作。

发达经济体中四分之三的亿万富翁的财富取之有道。但寻租者的财富占GDP之比在上升。有些国家经济裙带化比其他国家更甚。在瑞典和德国要好一些。而在美国，寻租性行业造就了五分之一的亿万富翁，占亿万富翁总财富的三分之一。

应该采取什么措施？政府可以多作努力来让寡头面临竞争。另一个方法是对财富转移征收更高的税（据另一项分析，全球亿万富翁的财富有三分之一来自继承）。相比一竹竿打翻全船的富人，增加经济中的竞争将更能造福普罗大众。 ■



Additive manufacturing

Could you print a printing press?

Not yet. But 3D printing can already manage boats and bridges, and will soon make space rockets—so one day, who knows?

BOAT BUILDING is a long-winded and tedious business, even when what is going down the slipway is a small craft made from modern materials such as fibreglass, rather than something nailed together out of planks of wood. Construct a mould. Build up layers of resin and glass fibre inside that mould. Extract the completed structure and finish it. All told, it can take months. That, though, may soon change. For researchers at the University of Maine are now in the process of testing an 8-metre (25-foot) patrol boat that took just 72 hours to make from scratch (see picture below). Their trick was to build the vessel using a giant 3D printer.

Since they appeared in commercial form in the 1990s, 3D printers have generally been employed in factories to make small things like prototype models, components of jet-engines and dental crowns. Now, a new generation of outsize printers is arriving. These are capable of turning out much bigger objects than previously possible, and printing them faster.

To print the patrol boat, part of an American army project, the team in Maine linked up with Oak Ridge National Laboratory, in Tennessee, which helped develop the printing process, and Ingersoll Machine Tools, in Illinois, which built the printer itself. The university reckons that for boat building, a common trade in the state, large 3D printers of this sort will dramatically cut the cost and time required to produce new vessels.

Broadly speaking, the biggest object that can be turned out by a 3D printer is determined by the size of the printer itself—and most printers are not much larger than a large domestic refrigerator. Over the years engineers have come

up with various ways of scaling this up a bit, by doing things like mounting the printing mechanism on a piece of external scaffolding. But the result is often a slow and inaccurate device that turns out things which require a lot of expensive hand-finishing.

The University of Maine's printer overcomes the problem of scale by suspending the printer's business end—the nozzle that extrudes the ink—from a gantry. The ink is molten thermoplastic resin containing carbon fibres. Under the control of a computer the nozzle moves horizontally to build (as is true of any 3D-printing process) the desired object up layer by layer. After each layer is complete, the nozzle is raised slightly to deposit another on top of it until the object is finished.

And this can be done quickly. The Maine university printer is able to extrude material at a rate of 70kg (150lbs) an hour. At the moment it can make things up to 30 metres long, 7 metres wide and 3 metres high, but those dimensions could easily be increased by building a bigger gantry. The arm carrying the nozzle can also be fitted with processing equipment, such as an automated milling head to grind off any surface imperfections.

Having established the principle, the university is now looking to change the nature of the composite, to make the process more environmentally friendly. New England's forestry industry is a potential source of cellulose fibres that could be incorporated into the ink instead of carbon fibres. That would please Greens, because carbon fibres are usually made from oil-based materials. Habib Dagher, one of the project's leaders, says the aim is to print with a material containing 50% wood products. This would create a composite as strong and light as aluminium. And with further work the group hope to deposit that material at 230kg an hour. The researchers recently used cellulose fibres and a resin made from maize to print a mould for constructing the roof of a boat. To add to the greenery, this mould could

be recycled and the material used again.

Making moulds and production tools will be an important job for large-format 3D printing, says Craig Blue, director of energy efficiency at Oak Ridge. Tool-making is expensive for two reasons. It requires specialist skills. And the items produced tend to be one-offs or to be made in small numbers, so there are no economies of scale. For 3D printers, however, the cost of making one or many items is about the same.

There are other advantages. For example, an Oak Ridge system was used by contractors to print specially shaped moulds for concrete castings on the façade of a 45-storey building on the site of an old sugar refinery in Brooklyn, New York. Usually, such moulds are made out of wood by skilled carpenters and might last only three or four pourings, so builders get through a lot of them. But, Dr Blue says, the 3D-printed versions, composed of carbon-fibre-reinforced plastic, were able to survive at least 200 pourings.

Oak Ridge is also working on ways to print concrete structures directly. The practicalities of erecting massive 3D-printing gantries suggest printing skyscrapers and other large structures is probably best not done in one go, but in smaller sections. Printing precast concrete subunits in the controlled conditions of a factory and then assembling them on site can be better suited to making complex and artistic structures. This is the approach taken by Xu Weiguo and his colleagues at Tsinghua University in Beijing. They used a pair of robotic arms that extrude concrete mixed with polyethylene fibres to print precast sections which were then assembled into a 26-metre footbridge that spans a pond in an industrial park in Shanghai.

This structure is styled after the Anji Bridge, a stone arch built around 600AD across the Xiaohe river in Hebei province. The replica took 450 hours to print—leisurely by the standards of Maine's boatyard, but rapid compared

both with the ten years the original took and the pace at which even modern building sites tend to move. The researchers reckon production costs were two-thirds that of making a similar bridge from conventionally cast concrete sections.

Other forms of 3D printing are getting bigger and faster, too. Chad Mirkin and his colleagues at Northwestern University, Illinois, have come up with something they call high-area rapid printing (HARP). Their prototype can make things four metres tall, with a cross section of nearly a square metre. It does so by pulling these solid objects out of a shallow pool of liquid polymer.

The printer scales up an existing industrial process which starts with the liquid polymer being held in a container with a transparent base. An ultraviolet image of the layers to be built is projected through the base. This triggers a chemical reaction which cures a corresponding layer of polymer immediately above the base, so that it solidifies into the image of the projected light. The first layer attaches itself to a tool lowered into the liquid from above. As the tool is raised it lifts the object out of the pool to permit subsequent layers to be added from below.

The innovation which HARP brings is having a film of oil flow across the transparent base. This oil, the researchers say, behaves like "liquid Teflon". It stops the polymer layers sticking to the base and also removes heat generated during curing. The result is that the printer can run much faster than was previously possible. It can, says Dr Mirkin, print in a couple of hours an object the size of an adult human being. A conventional 3D printer using this method would require a couple of days.

The HARP process allows a wide range of materials to be printed at large scale, including hundreds of different polymers, each one of which could be hard, soft or rubbery. It can also print resins that contain materials like

silicon carbide, which can be processed into hard-wearing heat-resistant ceramics. Components made from all these materials might be used in products ranging from cars to aircraft to buildings. The system can also be scaled up further, adds Dr Mirkin. He has co-founded a company, Azul 3D, to commercialise the process and expects the first HARP printer to be on the market in about 18 months.

The most difficult task 3D printing faces, though, is printing large metal objects. The main way of printing in metal is to melt successive layers of a metallic powder using a laser or an electron beam. To stop the powder oxidising and being contaminated by impurities in the air—or worse, exploding—that process needs to be carried out in a chamber filled with an inert gas. Scaling this procedure up is tricky and would be exceedingly expensive.

Yet metal printing is also escaping the box. One way it is doing so is by the deployment of large robots brandishing various types of MIG welders. “MIG” stands for metal-inert gas. MIG welders work by feeding a sacrificial electrode made of wire through the nozzle of a welding torch. The wire is connected at one end to a supply of electricity and at the other to an earthed workpiece. When the torch is held close to the workpiece an electric arc forms between its surface and the wire. The heat from the arc causes the wire and adjacent metal to melt and fuse together. During the process the torch blows an inert gas, such as argon, over the weld to protect it.

To turn a welding torch into a 3D printer the robot welds continuously over the same area, building up layer after layer of metal. This process is used by MX3D, a Dutch 3D-printing company, to build a variety of metal objects. Appropriately for the Netherlands, these include a lightweight bicycle printed in aluminium and a 12-metre long stainless-steel pedestrian bridge to cross a canal in Amsterdam.

Relativity Space, a firm in Los Angeles, is using large continuous-welding robots to build parts for space rockets (see main image). Each robot has an aluminium-alloy wire fed along its arm to the print head at its tip. The print head uses a high-temperature plasma arc to melt the wire and deposit it in layers whilst blowing an inert shielding gas around the arc.

3D-printed rockets, Relativity Space says, can be made faster and with fewer parts than conventional ones. The company has big ambitions. Its first rockets will be used to launch satellites but it hopes eventually to use its production system, which it calls Stargate, to print a rocket on the surface of Mars. When it comes to wondering what 3D printing is capable of, it seems, even the sky is not the limit. ■



增材制造

你能打印印刷机吗？

还不能。但3D打印已经可以造船和桥，很快还能造火箭——所以，谁知道会不会有这一天呢？

造船是个冗长又乏味的活计，哪怕造的是一条小船，用玻璃纤维这类现代材料制成，而不是用钉子把一大堆木板拼起来。先得建一个模具。在模具里填充一层层树脂和玻璃纤维。把填好的结构取出，做最后的加工。整个过程可能耗时数月。不过这可能很快就会改变。因为缅因大学的研究人员正在测试一艘八米长的巡逻艇，它从无到有只用了72小时（见下图）。他们的法宝是一台巨大的3D打印机。

自1990年代3D打印机的商用版本问世以来，它通常都被部署在工厂中制造小物件，例如原型模型、喷气发动机的部件和牙冠。现在，新一代超大型打印机浮出水面。它们能打印出大得多的物体，而且速度更快。

这艘巡逻艇属于美国军方的一个项目。为了打印它，缅因的团队的合作方包括田纳西州的橡树岭国家实验室（协助研发打印工序）以及伊利诺伊州的英格索尔机床公司（制造了打印机本身）。田纳西大学认为，对于造船这个田纳西州的大产业来说，这种大型3D打印机将大大减少生产新船所需的成本和时间。

一般而言，3D打印机可以打印出的最大尺寸取决于打印机本身的大小，而大多数打印机都不比一台家用大冰箱大多少。多年来，工程师们想了各种办法来让它们略微扩容。比如把打印结构安装在一个外部脚手架上，但得到的往往是一个缓慢又不够精确的设备，打印出的物体还需要做大量昂贵的手工加工。

缅因大学的打印机使用的解决办法是把打印机的功能端——挤出油墨的喷嘴——悬挂在龙门架上。所谓的油墨是含有碳纤维的熔融热塑性树

脂。在一台计算机的控制下，喷嘴水平移动（与任何3D打印过程一样），层层堆叠出要构建的物件。喷完一层后，喷嘴往上稍稍抬高，在其上喷涂另一层，直至完成整个物件。

而这可以很快完成。缅因大学的打印机能以每小时70公斤的速度喷出打印材料。目前，它可以制造长30米、宽7米、高3米的物体，但只要建造更大的龙门架就可以轻松地扩大打印尺寸。携带喷嘴的机械臂上还可以配备加工设备，例如能够磨掉任何表面瑕疵的自动铣头。

确定了工作原理之后，缅因大学正在寻求改变所用复合材料的性质，让整个过程变得更加环保。新英格兰的林业或许可以提供纤维素纤维，这种纤维可被加入“油墨”中来取代碳纤维。这是环保人士乐见的，因为碳纤维通常由油基材料制成。项目负责人之一哈比卜·达格尔（Habib Dagher）表示，目标是用包含50%木质产品的材料来打印。由此得到的复合材料会和铝一般轻且坚固。此外，随着研究的推进，该团队希望以每小时230公斤的速度堆叠这种材料。研究人员最近使用纤维素纤维和玉米制成的“树脂”打印了一个用于建造船顶的模具。为进一步加强环保，这个模具可以回收，材料循环利用。

橡树岭国家实验室的能源效率总监克雷格·布卢（Craig Blue）说，制造模具和生产工具将是大型3D打印的重要工作。工具制造很昂贵，原因有二。它需要专门的技能；工具生产往往是一次性的或产量很少，形成不了规模经济。但对于3D打印机来说，制造一件或许多件物品的成本无甚差别。

还有其他优点。例如，有承包商用橡树岭国家实验室的一套系统打印了一套造型独特的模具，用于给纽约布鲁克林一家老炼糖厂一栋45层建筑的外立面浇筑混凝土。这类模具通常由熟练的木匠用木头制成，可能只能浇筑三到四次，因此建筑商会消耗大量模具。但是，布卢博士说，由碳纤维增强塑料制成的3D打印版本能够使用至少200次。

橡树岭国家实验室也在研究直接打印混凝土结构的方法。从架设大型3D打印龙门架的实用性来看，打印摩天大楼和其他大型结构或许最好不要一次

完成，而是拆分成较小的结构。先在工厂内的受控条件下打印完预制混凝土子单元，再到现场组装起来，这样会更适于建造复杂和艺术性的结构。清华大学的徐卫国及其同事就采用了这种方法。他们用一对机械臂喷出混有聚乙烯纤维的混凝土来打印预制品，然后将它们组装成一座26米长的人行桥，横跨在上海一个工业园区内的一个池塘上。

这座桥的原型是于公元600年左右建于河北洨河之上的安吉桥。这个复制品花了450个小时打印完毕。按缅因大学“船厂”的标准来看算是慢悠悠，但它的原型可是花了十年时间才建成，而即使是现代建筑工地通常也没有那么快。研究人员估计它的生产成本是用传统浇筑混凝土预制品建设类似桥梁的三分之二。

其他形式的3D打印也在扩容和提速。伊利诺伊州西北大学的查德·米尔金（Chad Mirkin）和同事们研发出了一种他们称之为高区域快速打印（HARP）的技术。其原型机可以制造出高四米、横截面近一平米的物体，方法是从一个灌满液态聚合物的浅池中“拔出”这些固态物件。

这台打印机扩大了一个现有的工业流程。该流程的起点是存放在一个容器中的液态聚合物。容器的底座是透明的，待构建的每一层的紫外线图像穿过底座投影到液体中。这触发了化学反应，让底座上方相应的一层聚合物迅速硬化，按投射的图像固化成实体。最高一层会附着在从上方探入液体的工具上。当工具升高时，它将物体提出液体池，在下方还可继续添加新的层。

HARP带来的创新是让一层层薄薄的油在整个透明底座上流动。研究人员说，这种油的作用类似“液态特氟龙”。它可以防止聚合物层粘在底座上，也可以消除硬化过程中产生的热量。结果是这台打印机的运行速度大大超过从前能达到的水平。米尔金博士说，它能在几个小时内打印出一个成年人大小的物体。而使用这种方法的传统3D打印机需要两三天。

HARP技术可以大规模打印各种各样的材料，包括几百种不同的聚合物——或硬或软或有弹性。它还可以打印含有碳化硅等材料的树脂，可以将

其加工成经久耐用的耐热陶瓷。用所有这些材料制成的各种组件可能用于从汽车到飞机到建筑物的各种产品中。这个系统还可以进一步扩大规模，米尔金博士补充道。他与其他人联合创立了Azul 3D公司来将这项工艺商业化，预期第一台HARP打印机将在约18个月后上市。

3D打印面临最困难的任务是打印大型金属物件。打印金属的主要方法是用激光或电子束熔化连续的金属粉末层。为防止金属粉末氧化及被空气中的杂质污染（或更糟的情况是爆炸），整个过程需要在装有一种惰性气体的密室内进行。将这个工序扩容难度很高且耗资巨大。

但金属打印也在创新。一种方法是部署大型机器人，让它们挥舞各种类型的MIG焊机。“MIG”意为金属惰性气体。MIG焊机的工作原理是从焊枪的喷嘴中喷出由焊丝制成的消耗电极。焊丝的一端连接到电源，另一端连接到一个接地的工件上。当焊枪靠近工件时，在其表面和焊丝之间会形成电弧。电弧产生的热量使焊丝和旁边的金属熔化并熔合在一起。在此过程中焊枪会把一种惰性气体（如氩气）吹送到焊缝上方以施加保护。

焊枪要变成3D打印机，就需要机器人在同一个区域连续焊接，一层又一层地堆积金属。荷兰3D打印公司MX3D就用这种方法来打造各种金属物件，包括用铝打印的轻量自行车和横跨在阿姆斯特丹一条运河上的一座12米长的不锈钢人行桥——倒是都很适合荷兰这个创意先锋之地。

位于洛杉矶的“相对太空”公司（Relativity Space）正在用大型连续焊接机器人制造太空火箭部件（见主图）。每个机器人上都有一根铝合金焊丝贯穿其手臂直达末端的打印头。打印头用高温等离子电弧熔化焊丝并将其分层沉积，同时向电弧周围吹送保护性惰性气体。

相对太空公司说，用3D打印的火箭比传统火箭造得更快，零部件更少。该公司雄心勃勃。它的第一批火箭将用于发射卫星，但它希望最终会用自己名为“星际之门”（Stargate）的生产系统在火星表面打印火箭。当我们寻思3D打印有多大的能耐时，似乎天空都不是极限啊。 ■



Air pollution

Festival of darkness

Smog tends to be worst in middle-income countries

CITY-DWELLERS are used to dirty air, but few have seen a haze like the one enveloping Delhi weeks ago. The concentration of PM_{2.5} (fine particles that settle in lungs) has exceeded 1,000 micrograms per cubic metre of air—100 times the limit the World Health Organisation suggests for long-run exposure. Inhaling this is as unhealthy as smoking 50 cigarettes a day. On November 1st the city closed schools and declared an emergency. It is letting cars only with odd- or even-numbered plates drive each day.

Such smog drifts over Delhi each November, after farmers burn the remnants of their rice crops to clear the land for wheat, and Hindus celebrate Diwali, a festival of lights, with a barrage of firecrackers. Even when the autumn haze subsides, air is filthy all over India—especially in the north, where the Himalayas act as a wind trap. AirVisual, a monitoring company, reckons that northern India contains 22 of the world's 30 most toxic cities. One academic study found that of the 9.7m Indians who died in 2017, 670,000 would not have perished if the atmosphere had been clean.

The response from Indian politicians has been piecemeal. Limiting cars will help only a bit, since 75% of the pollution does not come from vehicles. Judges have tried to restrict crop-burning and firecrackers, but local governments have not enforced their rulings. The health minister's contribution has been advising Delhi-ites to protect themselves by eating carrots.

These woes are grave but predictable. In general, as economies develop, pollution-related deaths rise at first, due to the growth of industry. Later,

they fall, as countries get rich enough to afford clean production and their economies shift to services. According to Our World in Data, a website, deaths attributable to pollution peak in the middle-income range, at a GDP per person of \$5,000-15,000 (adjusted for local costs of goods and services).

This suggests that India will eventually clean up its air. A few steps are within politicians' power now, such as enforcing court rulings, cutting subsidies for rice (which farmers over-produce) and discouraging the use of coal. Shortly after China reached India's current level of development, its death rate from air pollution began to fall. But achieving a rapid, nationwide transformation is perhaps easier for an authoritarian state with direct control over big companies than for a chaotic democracy. ■



空气污染

黑暗庆典

中等收入国家的雾霾往往最严重

城市居民已经习惯了污浊的空气，但还是没多少人见识过几周前笼罩德里的那种严重雾霾。PM2.5（会沉积在肺部的细小颗粒）的浓度已超过每立方米空气1000微克，是世卫组织长期暴露建议限值的100倍。吸入这样的雾霾对健康的损伤相当于每天吸50支香烟。11月1日，德里宣布进入紧急状态，学校停课，汽车按单双号隔日限行。

每年11月，农民焚烧水稻秸秆以清理出土地种小麦，印度教徒燃放大量烟火庆祝排灯节，由此形成的雾霾飘浮在德里上空。即使秋天的雾霾散去，整体而言印度的空气仍然十分污浊，尤其在北部，喜马拉雅山挡住了那里空气的流动。检测公司AirVisual估计，世界上30个污染最严重的城市有22个在印度北部。一项学术研究发现，如果空气清洁，2017年印度970万的死亡人数会减少67万。

印度政界人士对此只有零星的应对措施。汽车限行只能起到很小的作用，因为75%的污染并非来自汽车排放。法官试图限制焚烧秸秆和燃放鞭炮，但地方政府并没有执行这类裁定。卫生部长所做的贡献就是建议德里居民多吃胡萝卜保健康。

这些问题很严重，但可以预见。通常，随着经济的发展，由于工业不断壮大，与污染相关的死亡人数在发展初期会增加。之后，随着国家变得更富裕、承担得起清洁生产的成本，同时经济转向服务业，这类死亡人数会减少。用数据看世界（Our World in Data）网站显示，污染造成的死亡人数峰值出现在中等收入国家内（人均GDP在5000至15,000美元之间，已根据当地商品和服务成本做调整）。

这表明印度终将拥有一片干净的天空。政客现在也能采取一些措施，例如执行法院裁决，削减对水稻的补贴（农民已过量种植）及推动减少用煤。

中国在达到印度目前的发展水平后不久，由空气污染造成的死亡率就开始下降。不过，相比一个混乱的民主国家，一个能直接控制大企业的威权政体要实现快速的全国性转型可能更容易些。 ■



The Economist film

The Gender Job Divide

Women who work full time still earn 15% less than men. But that's not because they are paid less for the same jobs.



经济学人视频

性别与职场收入

同样参与全职工作的女性平均比男性少挣15%。而且这并不是由同工不同酬导致的。



Schumpeter

Rethinking McKinsey

Disrupting the management priesthood

WHEN BUSINESSMEN talk to partners of McKinsey, the high priests of management consultancy, it is like Catholics going to confession. They reveal all. They expect confidentiality. And whether or not it changes behaviour, the act itself is good for the soul. In this era of corporate unease, over everything from the next recession to climate change, executives are lining up at the confessional. But McKinsey, too, has some soul-searching to do. Its industry, estimated to be worth \$300bn, is, like those of its clients, being transformed. And as its most revered—and hermetic—standard bearer, it is under more scrutiny than ever before.

Kevin Sneader, who took over as global managing partner last year, has lots on his plate. Recent years have been uncomfortable. Until a decade ago no McKinseyite had ever been sued for securities-law violations. In 2012 its former managing partner, Rajat Gupta, was convicted of insider-trading committed after he left the firm. Then in 2016 McKinsey was embroiled in a scandal in South Africa after it worked with Trillian, a local consulting firm owned by an associate of the controversial Gupta family (no relation to Mr Gupta). Mr Sneader has repeatedly apologised.

More recently it has faced allegations that its work on behalf of companies in bankruptcy in America represents a conflict of interest, because its \$12.7bn investment affiliate, McKinsey Investment Office (MIO), may invest in securities related to the bankruptcies. It denies the allegations, saying that MIO is a separate entity whose investments are controlled almost entirely by outside investment managers. Jay Alix, the founder of AlixPartners, a veteran of the bankruptcy business, has sought to drag

McKinsey through the courts. He claims that its alleged lack of disclosure should preclude it from working on bankruptcies. Judges have so far dismissed four out of five cases on the grounds that Mr Alix lacked standing to pursue them in the first place. In August a federal judge threw out another charge from Mr Alix that McKinsey had violated racketeering laws. In one remaining case involving the bankruptcy of Westmoreland Coal, a judge in Texas has set a trial date in February to rule on the dispute.

McKinsey says Mr Alix is engaged in a vendetta that aims to stifle competition. Mr Alix, whose litigious investment firm, Mar-Bow Value Partners, is mischievously named after Marvin Bower, one of McKinsey's founding fathers, claims to be fighting to defend the integrity of the bankruptcy system. But the saga is a regrettable one for McKinsey, even if it is fully vindicated. The bankruptcy business is not lucrative. McKinsey says it gets involved in bankruptcies only because its clients ask it to. It has worked on barely 15 cases since it started its restructurings practice in 2001. But it is understandably loth to be strong-armed out of the business by Mr Alix. That has made this an unusually public feud for a company that stands out for its discretion.

It is possible to think of these controversies as one-offs. McKinsey may win the remaining bankruptcy judgments. The two scandals can be explained as the work of rogue operators. But they speak to bigger questions about the firm's scope and mission, which Mr Sneader must grapple with. McKinsey has grown fast. Partners now number 2,200, up from 1,250 about a decade ago and it employs 30,000 people worldwide, up from 17,000 in 2009. Many of these are different from the buttoned-down business graduates of yesteryear. It has diversified into new business lines and some of its most valuable work is now outside America. As the firm has got bigger and more complex, it has got harder to manage.

Complicating things further, management consultancy itself is changing,

too. Six years ago, Clayton Christensen of Harvard Business School warned that it was an industry “on the cusp of disruption”. Now that disruption is in full swing. According to Tom Rodenhauser of ALM Intelligence, which analyses the industry, clients no longer just want to hire legions of people, however brainy they are. They want consultants to provide and install products, including new technologies, that transform them from top to bottom and keep disrupters at bay. Advice on strategy, which used to be meat and potatoes for firms like McKinsey and its peers, Bain and the Boston Consulting Group (BCG), is now a side dish; it accounts for about a tenth of revenues.

Mr Sneader could keep things ticking over as they are, at least for a while. Clients have shrugged off the media attention. McKinsey’s revenue has grown in recent years, to roughly \$10bn. And the firm still attracts armies of aspiring candidates—last year 800,000 applied for 8,000 jobs. But he is making changes. McKinsey says it is “addressing the changing panorama both internally and externally”. Partly in response to the South Africa debacle, its standards and processes for selecting clients have been beefed up. Partners are discouraged from doing work for undemocratic governments.

McKinsey has also made advising on technology more integral to its business. It worked with 1,200 companies on digital and analytics issues last year. It creates and sells tools for companies to use in their businesses, which generates new sources of recurring revenues. And it has bought a dozen companies since 2011, including QuantumBlack, a British startup that developed advanced data analytics for Formula One. Nonetheless, industry-watchers say McKinsey is often outspent by the technology offerings of the Big Four, as well as by firms like Accenture.

Mr Sneader should go further: that means getting leaner by ditching activities, clients and teams that bring in more headaches than cash, and

investing in technology. It is here that McKinsey may have a secret weapon—its partnership, honed over 93 years. It is not a listed firm, so faces less pressure to raise short-term profits. And, with luck, the priesthood has not yet become so sprawling that it has lost a sense of its values. Whisper it in the confession box: McKinsey needs to shrink its way to further greatness. ■



熊彼特

反思麦肯锡

颠覆管理教士团体

商界人士与有管理咨询教士之称的麦肯锡合伙人文谈，就像天主教徒去忏悔一样。他们全盘托出，并指望对方保密。而无论这种交谈能否改变行为，它本身总是有益身心的。如今，从下一次经济衰退到气候变化，每件事情都让企业忧心忡忡，难怪高管们会在告解室前排起长队。但麦肯锡也需要一些自我反省。价值约达3000亿美元的管理咨询行业和它的客户一样，也在转型。而作为该行业最受尊崇（也最神秘）的领军者，麦肯锡正受到前所未有的审视。

去年接任全球总裁的施南德（Kevin Sneader）手头有很多事情要处理。最近几年是麦肯锡的多事之秋。直到十年前，还没有哪个麦肯锡人因违反证券法被指控。2012年，前总裁顾磊杰（Rajat Gupta）因发生在离开麦肯锡后的一起事件被判内幕交易罪。之后，在2016年，麦肯锡因曾与南非本土咨询公司Trillian合作而卷入了该国的一桩丑闻。Trillian的老板是富有争议的古普塔家族（Gupta family，和顾磊杰不是亲戚）的商业伙伴。施南德已经屡次为此道歉。

最近，麦肯锡面临指控，称它在美国提供的公司破产咨询存在利益冲突，因为它旗下价值127亿美元的投资机构MIO（麦肯锡投资办公室）可能投资了与这些破产案相关的证券。麦肯锡否认指控，称MIO是个独立实体，其投资几乎完全由外部的投资经理掌管。老牌破产咨询公司AlixPartners的创始人杰伊·阿利克斯（Jay Alix）试图将麦肯锡告上法庭。他声称，麦肯锡被指控的信息披露不足应该让它不得从事破产咨询业务。截至目前，法官以阿利克斯没有发起这些指控的资格为由，驳回了五起诉讼中的四起。8月，一名联邦法官驳回了阿利克斯另一起针对麦肯锡违反欺诈法的指控。在剩下的一起涉及威斯特摩兰煤炭公司（Westmoreland Coal）的破产案中，得克萨斯州的一名法官定于明年2月启动庭审，以对此番争议

做出裁定。

麦肯锡表示，阿利克斯这么起劲，是因为与麦肯锡的宿怨，目的是为扼杀竞争。阿利克斯的投资公司Mar-Bow Value Partners热衷于打官司，公司名字故意取自麦肯锡创始人之一的马文·鲍尔（Marvin Bower）。阿利克斯则宣称打官司是为了捍卫破产制度的诚信。不过，对麦肯锡来说，即使它被证明完全无辜，这场缠斗也令人遗憾。破产咨询业务的利润并不丰厚。麦肯锡表示自己只是应客户要求才参与的。自2001年启动企业重组咨询以来，它只做了15个这类项目。但它自然不愿意被阿利克斯强行驱逐出这个领域。对一家以审慎著称的公司来说，这场公开争斗已然非同寻常。

这些争议可被看作一次性事件。麦肯锡可能会在余下的破产官司里胜诉。两起丑闻可以归咎于无良操作人员。但它们反映出在公司经营范围和使命方面的更大问题，而这些问题也是施南德必须解决的。麦肯锡发展迅速。大约10年前，麦肯锡的合伙人是1250名，现在达到了2200名。2009年，它的全球员工总数为1.7万，现在增加到了3万。许多员工不再是以前那些传统保守的商科毕业生。麦肯锡开辟了一些新业务，实现了多元化。它最具价值的业务现在有一些不在美国本土。随着公司规模更大、更复杂，管理的难度也加大了。

更麻烦的是，管理咨询行业本身也在发生变化。六年前，哈佛商学院的克莱顿·克里斯滕森（Clayton Christensen）警告称，该行业“处于被颠覆的风口浪尖”。如今这种颠覆达到了高潮。管理咨询业分析机构ALM Intelligence的汤姆·罗登豪泽（Tom Rodenhauser）表示，客户不再只是想雇用一大堆人，无论他们有多聪明。客户希望咨询公司提供并设置好包括新科技在内的产品，让它们彻底转型，将颠覆的威胁拦在门外。战略咨询曾经是麦肯锡以及贝恩、波士顿咨询等同行的主营业务，现在却成了副业，约占总收入的10%。

施南德至少能在短期内维持现状。公司客户并不在乎媒体的关注。近年来，麦肯锡的收入已经增长到约100亿美元。它仍然吸引了大批有抱负的求职者——去年有80万人竞争它的8000个职位。但施南德正在做出改变。

麦肯锡表示，它正在“应对公司内外不断变化的大环境”。一定程度上作为对那起南非灾祸的回应，它提升了选择客户的标准与流程，劝诫其合伙人避免为非民主政府工作。

麦肯锡还让科技咨询进一步成为其业务中不可或缺的一部分。去年，它与1200家公司就数字化和分析类项目进行了合作。它开发出售供企业使用的业务工具，开辟出新的经常性收入来源。自2011年以来，它还收购了十几家公司，包括为一级方程式赛车开发高级数据分析的英国创业公司QuantumBlack。尽管如此，行业观察人士表示，麦肯锡在科技上的投入常常不及四大会计师事务所，也不及埃森哲等公司。

施南德改革的步子应该迈得更大些：给公司“瘦身”，扔掉那些给自己带来更多麻烦而非利润的业务，并且投资于技术。而在这点上，麦肯锡或许有自己的秘密武器——经过93年打磨的合伙人制度。麦肯锡不是上市公司，因此提高短期利润的压力相对较小。而且，幸运的话，这支教士队伍尚没有无序扩张到丢了自己价值观的地步。去告解室轻声说一句：麦肯锡需要以退为进，才能更卓越。 ■



The dangers of studying abroad

Thar be dragons

Ex-commandos prepare students heading overseas for the worst

THE DRILL-SERGEANT barking orders is a former commando who lost bits of two fingers while deployed in South Sudan. His 100-odd young charges are dressed in camouflage uniforms and army boots. After a bit of marching in time they are shown how to abseil out of a besieged building.

The group under instruction are not conscripts, however, but students hoping to study abroad. “There is nothing very frightening about education in the West,” said China’s then-leader, Deng Xiaoping, to his American guest, Henry Kissinger, in 1979. His words signalled a dramatic opening: Chinese students would at last be allowed to study in countries that were enemies of communism. Today hundreds of thousands of them head abroad every year, mostly to Western countries. Many, however, are more apprehensive than Deng suggested they should be.

Their fear is not of ideological contamination, but of the petty crime and shootings that China’s state media highlight as a scourge of Western societies. For Wang Xuejun, this is an opportunity. A veteran of Chinese peacekeeping and international relief work, he is the founder of Safety Anytime, a company that runs security-training programmes for anxious Chinese who are preparing to sojourn abroad. His customers are taught how to respond to gun-toting assailants, kidnapping attempts and terrorist attacks, among other perils. But the bulk of the training focuses on safety consciousness: how to be aware of more mundane dangers such as muggings or pickpocketing and how to avoid or cope with them. There are also lessons in first aid, information security and drugs laws, plus advice on how to handle fraud and sexual harassment.

The clients include not just Chinese students, more than 660,000 of whom went abroad last year, but also workers from the many Chinese energy, telecoms, finance and engineering companies that send employees abroad as part of China's Belt and Road Initiative. That project, a sprawling scheme to build infrastructure and spread influence across much of the poor world, has put ever more Chinese into some of the world's riskier places.

Many of the students are heading off to leafy college campuses in America rather than strife-torn African countries, but they are still extremely anxious. With relentless regularity, they see reports of senseless and deadly mass shootings in American cities. Mr Wang stresses that his training is about much more than avoiding crazed gunmen, but that is the main draw for many of his trainees. "I hope to go to university in America, but we always hear so much about gun violence there that I really have to take it into consideration," says 15-year-old Cao Zhen, as his mother stands alongside nodding in agreement.

Mr Wang, who took part in relief operations in Haiti in the aftermath of a massive earthquake there in 2010, acknowledges that most of his customers will never face the dramatic situations he trains them for. The point, he says, is to develop the preparedness and presence of mind that will serve his trainees well in any dangerous situation, even after they get back home. After all, he says, although China is safer than many of the places his students venture to, anything can happen. ■



留学的风险

危险之域

前突击队员教导即将留学海外的学生防范最凶险的情形

高喊着指令的教官是一名前突击队员，在南苏丹执行任务时断了两根手指。受训的100多名年轻队员身穿迷彩服，脚踏军靴。他们齐步走了一阵，然后看教官演示如何从一座被围困的建筑中降绳逃离。

不过，接受指导的这群人并不是应征入伍者，而是希望出国留学的学生。“西方教育没有什么好怕的。”1979年，当时的中国领导人邓小平对他的美国客人亨利·基辛格这样说道。他的话标志着一个激动人心的开端：中国学生终于可以去与共产主义为敌的国家学习了。如今每年有数十万人出国留学，大部分是去西方国家。然而，邓小平的话没能安抚许多人，他们还是忧心忡忡。

他们担心的不是意识形态的侵染，而是被中国官媒着重报道并指为西方社会祸患的小型犯罪和枪击事件。对王学军来说，这是一个机会。这位中国维和行动及国际救援工作的老兵创立了“时分安全”公司，向准备旅居国外而焦虑不安的中国人提供安全培训。公司教客户如何应对持枪歹徒、绑架企图、恐怖袭击以及其他危险。但大部分培训项目还是聚焦安全意识的培养：如何察觉更寻常的危险，如抢劫或扒窃，以及如何避免或应对这些危险。此外公司还提供急救、信息安全和药物法方面的课程，并就处理欺诈和性骚扰提供建议。

公司客户不仅有中国学生（去年出国留学人数超过66万），还包括来自能源、电信、金融和工程领域的众多中国企业的员工。这些企业将员工派往海外是中国“一带一路”倡议的一部分。这项庞大的计划要在广大贫穷国家建设基础设施并传播影响力。为此越来越多的中国人走入了世界上一些较危险的地方。

许多学生即将前往的都是美国绿树成荫的大学校园，而不是饱受战乱蹂躏

的非洲国家，但他们仍极度不安。他们持续不断地看到有关美国城市发生无目的的大规模枪击致命事件的报道。王学军强调，其实他的训练除躲避丧心病狂的枪手外还有非常丰富的内容，但对许多受训者来说这是最主要的吸引力。“我希望能去美国上大学，但是我们听了那么多跟枪支暴力有关的事情，这一点我真的得考虑到。”15岁的曹振（Cao Zhen，音译）说，他的母亲在旁边点头表示赞同。

王学军曾在2010年海地发生大地震后前去参加救援行动。他承认，他的客户基本上永远也不会碰到培训中涉及的那些惊险状况。他说，关键在于训练他们做到有备无患、处变不惊，这在任何危险情况下都会对他们大有帮助，即使日后回国也一样。他说，尽管中国比他的学员要冒险前往的许多地方都更安全，但毕竟什么事都有可能发生。 ■



Buttonwood

A river needs a dam

How machine learning is revolutionising market intelligence

THE THAMES seems to draw people who work on intelligence-gathering. The spooks of MI6 are housed in a funky-looking building overlooking the river. Two miles downstream, in a shared office space near Blackfriars Bridge, lives Arkera, a firm that uses machine-learning technology to sort intelligence from newspapers, websites and other public sources for emerging-market investors. Its location is happenstance. London has the right time zone, between the Americas and Asia. It is a nice place to live. The Thames happens to run through it.

Arkera's founders, Nav Gupta and Vinit Sahni, both have a background in "macro" hedge funds, the sort that like to bet on big moves in currencies and bond and stock prices ahead of predicted changes in the political climate. The firm's clients might want a steer on the political risks affecting public finances in Brazil, or to gauge the social pressures that could arise as a consequence of an austerity programme in Egypt. It applies machine learning to find market intelligence and make it usable.

For many people, the use of such technologies in finance is the stuff of dystopian science fiction, of machines running amok. But once you look at market intelligence through the eyes of computer science, it provokes disquieting thoughts of a different kind. It gives a sense of just how creaky and haphazard the old-school, analogue business of intelligence-gathering has been.

Analysts have used text data to try to predict changes in asset prices for a century or more. In 1933 Alfred Cowles, an economist whose grandfather

had founded the *Chicago Tribune*, published a pioneering paper in this vein. Cowles sorted stockmarket commentary by William Peter Hamilton, a long-ruling editor of the *Wall Street Journal*, into three buckets (bullish, bearish or doubtful) and attached an action to each (buy, sell or avoid). He concluded that investors would have done better simply to buy and hold the leading stocks in the Dow Jones index than to follow Hamilton's steer.

The application of machine-learning models to text-as-data might seem a world away from Cowles's approach. But in concept, it is similar. The relevant text is sought. Values are ascribed to it. A statistical model is applied. Its predictions are tested for robustness. Of course, with bags of computing power and suites of self-learning models, the enterprise is on a different scale from Cowles's rudimentary exercise. The endless expanse of the internet means far richer source material. The range of possible values ascribed to it will be broader than "bullish, bearish or doubtful". And self-learning algorithms can test and retest the combinations that yield the best predictions.

It is tempting to focus on the black-box elements of all this: the language software that "reads" the source text and the algorithms that use the data to make predictions. But this is like judging a hi-fi system by its speakers. A lot of the important work comes earlier in the process. Arkera, for instance, spends a lot of effort finding all the relevant text and "cleaning" it—stripping it of extraneous junk, such as captions and disclaimers. "A good signal is crucial," says Mr Gupta.

He gives Brazil's pension reform as an example. The country has 513 parliamentarians. They have social-media accounts, websites and blogs. They speak to the press—Brazil has scores of regional newspapers. All are potential sources of useful data. If you cut corners at this stage you might miss something that even the best statistical model cannot fix later. There is little point in having a cool amplifier and great speakers if the stylus on your

record-player is worn out.

Any good emerging-market analyst knows this, too. If you bumped into one shortly after Brazil's elections last year, he was probably on his way to Brasília to sound out prospects for a crucial pension reform. Without it, Brazil's public debt would be certain to explode, sparking capital flight. In July a pension bill finally passed Brazil's lower house. Arkera's models tracked the leanings of Brazil's politicians to get an early sense of the likely outcome. It would be hard for an analyst working unaided to mimic this reach, even if he was always on the ground and spoke perfect Portuguese.

Intelligence-gathering is a labour-intensive business. It is thus ripe for automation. That this is happening in finance is also natural. There is a well-defined objective (to make money). There is a well-defined end-point (buy, sell or avoid). Without such clarity of purpose, intelligence is an endless river. It is one undammed thing after another. ■



梧桐

河流需要水坝

机器学习如何彻底变革市场情报业

泰晤士河似乎很吸引情报收集人员。军情六处的间谍们就在俯瞰泰晤士河的一栋外观怪异的建筑里工作。往下游两英里处，黑修士桥附近的一个共享办公空间里有一家名为Arkera的公司，它利用机器学习技术为新兴市场的投资者从报纸、网站和其他公开来源中收集情报。这个选址纯属巧合。伦敦的时区很理想，在美洲和亚洲之间。这是个适合居住的好地方。而泰晤士河恰好横穿伦敦。

Arkera的创始人纳夫·古普塔（Nav Gupta）和维尼特·萨尼（Vinit Sahni）都有“宏观”对冲基金的背景，这类基金喜欢抢在预计将出现的政治气候变化发生前押注货币、债券和股票价格的大幅波动。该公司的客户也许想就影响巴西公共财政的政治风险寻求建议，或是想评估埃及财政紧缩计划可能会令社会压力增大几何。它利用机器学习发现市场情报并为己所用。

对许多人来说，在金融领域运用这类技术就像是反乌托邦科幻故事里机器胡作非为的情节。不过一旦用计算机科学的眼光看待市场情报，就会激起另一种令人不安的想法。它让人感到老式的、模拟时代的情报收集方法是多么老掉牙又杂乱无章。

一个多世纪以来，分析师一直利用文本数据来尝试预测资产价格的变化。1933年，经济学家阿尔弗雷德·考尔斯（Alfred Cowles）（他的祖父创办了《芝加哥论坛报》）发表了一篇这方面的开创性论文。考尔斯将长期担任《华尔街日报》主编的威廉·彼得·汉密尔顿（William Peter Hamilton）的股评分为三类（看涨、看跌或难以确定），并且附上了每一类股评对应的行动（买入、卖出或不碰）。他的结论是，投资者如果只是简单地买进并持有道琼斯指数中的龙头股，会比追随汉密尔顿的选股建议效果更好。

将机器学习模型应用于文本数据似乎与考尔斯的方法相去甚远，但在概念

上是相似的。寻找相关的文本，对它们赋值，再应用某个统计模型，反复测试其预测结果的准确度。当然，有了强大的计算能力和一系列的自学习模型，这种预测与考尔斯简陋的操作已经不可同日而语。互联网的无边无际意味着如今的原始资料要丰富得多。可能赋给这类资料的值的范围也比“看涨、看跌或难以确定”广得多。而自学习算法可以测试并重复测试出产生最佳预测的组合。

人们很容易把注意力集中在这套系统的黑箱元素上：“读取”源文本的语言软件，以及利用数据来做预测的算法。但这就像用音箱来评判整套高保真音响系统的好坏一样。在这个过程中，许多重要的工作都做在了前面。例如，Arkera花了大量的精力找寻所有相关的文本，并对其进行“清理”，即去除诸如图说和免责声明等无用信息。“良好的信号至关重要。”古普塔表示。

他以巴西的养老金改革为例。巴西有513名议员。他们有社交媒体账号、网站和博客。他们对媒体发言，而巴西有很多地方报纸。这些都可能成为有用数据的来源。如果你在这个阶段图省事，可能就会错过一些东西，之后即便用最好的统计模型也无法修正。这就像如果电唱机上的唱针坏了，配一个很酷的功放和很棒的音箱也没什么意义。

任何一个优秀的新兴市场分析师都知道这一点。如果你在去年巴西大选后不久就碰到这样一位分析师，他可能正在去巴西利亚的路上，想要探询一项至关重要的养老金改革的前景。不改革，巴西的公共债务势必激增，引发资本外逃。7月，巴西众议院终于通过了一项养老金法案。Arkera的模型追踪了巴西政客的倾向，提前预判了可能的结果。一个分析师若没有任何辅助手段，即便他成日深入现场调查并且能说一口流利的葡萄牙语，也很难做到这个程度。

情报收集是一项劳动密集型工作，因此自动化的时机已经成熟。它发生在金融业也很自然。那里有明确界定的目标（赚钱）、明确界定的终点（买进、卖出或不碰）。没有这样明确的目的性，情报就是一条无尽的河流。没有水坝拦截，一条接一条地流下去。■



Entertainment

Mortal kombat

Streaming has changed music, film and TV. Time for video games

THE LAUNCH in 2018 of “Red Dead Redemption 2” was a huge event in the history of entertainment. It raked in \$725m in its first three days, behind only “Avengers: Endgame”, a recent superhero flick, and “Grand Theft Auto V”, a game from 2013—and that despite being available only to owners of pricey games consoles. On November 19th it became available to an even wider audience with the launch of Stadia, Google’s game-streaming service.

Google is not the only tech titan to bet that streaming will prove as transformative for the \$150bn video-game industry as it has been for music, film and television. Last month Microsoft announced new games for its experimental xCloud service, which is due to launch in 2020. It will work with Xbox Game Pass, an existing download-based subscription service that offers more than 100 titles. Amazon is widely assumed to be working on something similar. Big Tech will be battling second-tier players, including Nvidia, a maker of gaming-focused computer chips, and Electronic Arts (EA), a games publisher. Sony, which makes consoles, already offers streaming through its PlayStation Now service.

Streaming lets anyone with an internet connection play any game by farming out the computational heavy lifting required to run gaming software to cloud servers. It will not replace consoles overnight; both Microsoft and Sony are launching new machines next year. But by offering the option to play blockbuster games like “Red Dead Redemption 2” without paying upfront for hardware, it could lure owners of comparatively feeble devices such as smartphones, tablets and TVs to cutting-edge games.

Catherine Gluckstein, one of the Microsoft executives in charge of xCloud, points out that of the 5bn people who own smartphones, about half dabble in cheap-and-cheerful mobile games. Next year xCloud tests will be expanded to India, where consoles remain a luxury but internet no longer is; more than 500m Indians enjoy access to the web, mostly on their phones. Michael Pachter of Wedbush, an investment firm, thinks streaming's worldwide expansion could triple the size of the gaming market to nearly \$500bn by 2030.

If, that is, the companies can pull it off. Streaming a film or a song is straightforward. Data can be downloaded ahead of time to smooth out connection hiccups. Not for games, which must react instantaneously to players' moves and vice versa. Even with a rock-solid connection (which most mobile ones are not) commands take time to travel from the controller to the data centre and back. This can introduce annoying delays. And distributing games the old way, via physical disks or downloads, is cheap, whereas providing high-end, game-capable computing in the cloud is not, notes Piers Harding-Rolls, an analyst at IHS Markit, a research firm. A decade ago early attempts at game streaming flopped precisely because of high prices and iffy technology.

All eyes are now on Google. Like Amazon and Microsoft, it owns a worldwide network of cloud-computing data centres, which could help surmount technological niggles. But unlike Microsoft or Sony, it lacks deep roots in gaming. And in contrast to Amazon, whose 100m Prime subscribers could, Mr Patcher thinks, be offered games as part of their membership, it must build a customer base from scratch.

Stadia's debut could have gone better. Promised features have been delayed. Prices remain high: early adopters must pay \$129 for a controller and \$10 a month for a subscription, and then fork out some more for individual games. (A subscription-free option, with less fancy graphics, will launch in

2020.)

Most worrying, Google has struggled to convince publishers to sign up. Just 22 games were available at Stadia's launch. The test version of Microsoft's xCloud features over 50. Sony's PlayStation Now has over 650 games (although some are over a decade old and the service is available only on PCs and the PlayStation). For all its heft elsewhere, in gaming Google continues to look like a bit player. ■



娱乐

殊死格斗

流媒体已经改变了音乐和影视，现在轮到电子游戏了

电子游戏《荒野大镖客2：救赎》（Red Dead Redemption 2）在2018年发布，是娱乐史上的一个重磅事件。尽管只面向拥有昂贵游戏主机的玩家，该游戏推出三天便大卖7.25亿美元，仅次于今年上半年上映的超级英雄电影《复仇者联盟4：终局之战》及2013年推出的游戏《侠盗猎车手5》。随着谷歌的游戏流媒体服务Stadia于11月19日上线，更广泛的人群玩上了这款游戏。

谷歌押注流媒体服务会像它变革了音乐和影视那样，变革价值1500亿美元的电子游戏产业。它可不是唯一这么认为的科技巨头。微软上月发布了为其试验性云游戏服务xCloud打造的新游戏。定于2020年上线的xCloud将与现有的订阅服务、提供100多种游戏下载的Xbox Game Pass配合使用。外界普遍认为亚马逊也在开发类似的项目。各大科技巨头将对垒二线玩家，包括游戏专用芯片制造商英伟达（Nvidia）和游戏发行商艺电（EA）。也制造游戏主机的索尼已通过其PlayStation Now平台提供了流媒体游戏服务。

流媒体技术把运行游戏软件时繁重的计算工作外包给云服务器，这样人们就能通过互联网畅玩各种游戏。云游戏服务不会在一夜之间取代游戏主机：微软和索尼都计划在明年推出新款游戏机。但既然现在无需先购入游戏硬件就能玩到《荒野大镖客2》之类的大热游戏，自然会吸引仅拥有智能手机、平板电脑和电视等性能相对较弱设备的玩家去玩这些新款游戏。

负责xCloud项目的微软高管凯瑟琳·格鲁克斯坦（Catherine Gluckstein）指出，在拥有智能手机的50亿人口中，大概一半玩过一些便宜有趣的手机小游戏。明年，xCloud的测试将扩展至印度，游戏主机在那里仍然是奢侈品，而互联网已不再稀罕——超过五亿印度人能够上网，大多是通过手

机。投资公司Wedbush的迈克尔·帕切特（Michael Pachter）认为，到2030年，流媒体的全球扩张可能令游戏市场扩大两倍，达到近5000亿美元。

这一切的前提是这些公司能成功推广这类服务。流媒体播放电影或歌曲很简单，可以把数据提前缓存下来以防连接不畅。游戏不一样，必须根据玩家的操作做出即时反应，反之亦然。即便网络连接稳如磐石（大多数移动设备都做不到），指令从玩家的控制器传给数据中心而后再返回也需要时间。这可能导致恼人的延时问题。研究公司IHS Markit的分析师皮尔斯·哈丁-罗斯（Piers Harding-Rolls）指出，用实体磁盘或下载等传统方式分销游戏成本低廉，相比之下，提供高端的游戏云计算服务并不便宜。十年前，游戏流媒体的早期尝试正是由于价格高昂和技术不足而告败的。

现在所有目光都集中在谷歌身上。跟亚马逊和微软一样，谷歌拥有遍布全球的云计算数据中心网络，这可能有助于克服技术上的小缺陷。但和微软或索尼不同的是，谷歌在游戏方面的根基不深。帕切特认为，亚马逊可向其一亿Prime付费会员提供游戏服务，而谷歌必须从零开始建立客户群。

谷歌Stadia平台的首发本可以做得更好。但有些承诺的功能延后推出了。价格依然很高：早鸟玩家必须花129美元购买控制器，支付每月十美元的订阅费，再为单个游戏额外付钱。（无需订阅费的低画质版将于2020年推出。）

最令人担忧的是，谷歌难以说服游戏出版商加入自己的平台。Stadia上线时仅有22款游戏上架。微软xCloud的测试版就有50多款游戏。索尼的PlayStation Now有超过650款（不过有些游戏已有十多年的历史，而且该服务只能在个人电脑端和PlayStation上使用）。尽管谷歌在其他方面举足轻重，在游戏领域它还是个小玩家。 ■



LVMH

The everything-that-shines store

Bernard Arnault, Europe's richest man, tests the limits of the luxury-conglomerate model

WHAT DO YOU buy the luxury group that has everything? More diamonds, apparently. On November 25th LVMH, already the biggest beast in global luxury, announced it was taking over Tiffany & Co, where Wall Street bond traders sink a few bucks to improve their chances of turning girlfriends into fiancées. The American marque will become the 76th *maison* of the Parisian group, joining Louis Vuitton, Dior and Veuve Clicquot champagne. How many more can fit under the corporate umbrella of Bernard Arnault, LVMH's boss and biggest shareholder?

The deal is as richly priced as a flawless gem. LVMH will pay \$16.9bn including net debt, equivalent to nearly four years' sales at Tiffany. Nonetheless, the takeover was greeted with the enthusiasm befitting a suitable engagement. Luxury, once little more than a cottage industry dominated by family firms in Europe, has become the preserve of a few giant conglomerates. In recent decades there has been a sense of inevitability when another well-known company has fallen into the clutches of LVMH or its rivals, Kering (home of Gucci and Balenciaga among others) and Richemont (which owns Cartier and Montblanc).

The acquisition cements the place of LVMH at the peak of the luxury world. Its rise has been nothing short of dazzling since Mr Arnault took it over three decades ago. Its shares have risen threefold in the past five years, including a 60% run since January. Worth around €206bn (\$227bn), LVMH now vies with Royal Dutch Shell as the most valuable firm based in the EU.

Mr Arnault, whose family owns nearly half of LVMH (and a solid majority

of voting rights), is said to be Europe's richest man. From the gritty town of Roubaix in northern France, he turned a family construction firm to property, then luxury. He snapped up Dior as part of a package of distressed textile assets in the 1980s, then seized control at LVMH. The "wolf in cashmere" has all the trappings of a \$100bn fortune, from a public art collection housed in a Parisian museum designed by Frank Gehry to his impeccably tailored Christian Dior suits and a couple of newspapers.

"LVMH dominates a structurally favoured sector, buoyed by globalisation and income inequality," says Luca Solca of Bernstein, a research firm. Its success is the result of being the right size—big—in the right business at the right time.

Start with the industry. Sales of luxury goods, such as handbags, posh watches and Hermès scarves, have grown by about 6% a year since 1996 according to Bain, a consultancy. It estimates the industry will be worth €281bn this year. Chinese shoppers, who barely featured in 2000 but now account for a third of all sales, have added much of the fizz.

Size has brought more rewards. In an industry with high fixed costs—spent on marketing, but also on eye-watering rents for shops on flashy thoroughfares—selling more translates into better margins. LVMH has achieved nearly double the industry's growth rate in the past two decades, and last year sold over €46bn-worth of extravagance (see chart). That is more than three times the figure for Kering and Richemont, its nearest rivals.

Mr Arnault emerged as the most obvious buyer for Tiffany in part because scale begets advantages not available to smaller bauble-peddlers. That might seem odd at first. Compared with lesser industries, mergers in the luxury world kick up few opportunities for cost-cutting or synergies. Nobody expects Tiffany watches to be sold in Louis Vuitton stores, for

example.

But analysts think brands can do better within a conglomerate. Take Tiffany. Its shareholders had pestered management to improve margins and raise sales fast, unduly hurrying its turnaround efforts. LVMH says it will give Tiffany time and money, for example to renovate stores and push upmarket. It did something similar with Bulgari, an Italian jeweller. Mr Arnault last week said profits there had risen five-fold since LVMH took it over in 2011. The group does not disclose how each brand is doing (its annual report contains more pictures of jewel-laden models than financial minutiae), easing the pressure on creative types to meet quarterly targets.

Scale has more mundane advantages, too. Conglomerates have more clout when negotiating, for example, with landlords of new malls in China. They can browbeat magazines for better advertising rates. Hefty costs associated with building e-commerce sites can be shared.

Such advantages suggest more consolidation. But there are limits for LVMH and others. One is supply. The timeless brands that conglomerates crave by definition need a long history, and these are relatively few. Those that remain independent, such as Chanel or Rolex, preserve that status fiercely. Mr Arnault has got round this by subtly expanding the scope of luxury, for example by branching out into hotels.

Another limit, which is particular to LVMH, is whether any group can handle so many different businesses. In other industries, conglomerates are regarded as unwieldy and have fallen out of fashion. Kering slimmed down by spinning off Puma, a sportswear brand, last year. So far the mood is for building empires, not dismantling them. Some wonder if Richemont and Kering might merge to boost their prospects.

LVMH is not without challenges. The luxury sector's future is uncertain.

Growth in China will not last for ever, especially if trade tensions continue. Even Dom Pérignon drinkers feel the impact of recessions. Marketing has had to evolve to attract millennials who care about Instagram and sustainability. More shopping is happening online, where mastodons like Amazon and Alibaba lurk.

Perhaps half the firm's profits come from a single brand, Louis Vuitton. Mr Arnault has made it clear that LVMH is a family firm and that one of his children (four of whom work in the business) will take over. At 70, he remains firmly in charge. But as time passes, the question of whether his heirs have inherited his talent for flogging objects of desire will come into focus.

And can luxury continue to sell to ever more people yet retain its cachet? So far it has. But the industry Mr Arnault helped create is young, despite the timeless quality it seeks to exude. It has thrived by spending extravagantly to get people to buy beautiful foreign things they do not need. It is the archetypal business model of the times. But what if times change? ■



LVMH集团

样样闪光的名店

欧洲首富贝尔纳·阿尔诺挑战奢侈品企业集团模式的极限

一家什么都不缺的奢侈品集团，你还能再给它买点什么？ 显然是更多钻石了。11月25日，已贵为全球最大奢侈品巨头的法国LVMH路威酩轩集团（以下简称LVMH）宣布收购蒂芙尼（Tiffany & Co，华尔街的债券交易员爱在这里花点小钱，好把女友变成未婚妻）。这个美国名牌将加入路易威登、迪奥和凯歌香槟（Veuve Clicquot champagne）之列，成为总部在巴黎的LVMH旗下第76个品牌。LVMH的老板兼最大股东贝尔纳·阿尔诺（Bernard Arnault）的企业大伞下还能再放进多少品牌？

这宗收购如同无瑕的宝石一样价格不菲。包括净债务在内，LVMH将支付169亿美元的收购费用，几乎是蒂芙尼四年的销售额。尽管如此，这桩门当户对的联姻还是很受欢迎。奢侈品产业一开始不过是欧洲家族企业主导的家庭手工业，如今已经被几家大型企业集团把控。近几十年来，一家又一家知名公司接连被LVMH或它的对手开云集团（Kering，拥有古驰和巴黎世家等品牌）、历峰集团（Richemont，拥有卡地亚和万宝龙等品牌）收入囊中，一切都似乎理所当然。

此次收购将巩固LVMH奢侈品业老大哥的地位。自阿尔诺30年前接手以来，LVMH一路狂飙，成绩亮眼。过去五年，公司股价上涨了两倍，今年1月以来就上涨了60%。LVMH目前市值约为2060亿欧元（2270亿美元），与荷兰皇家壳牌公司争夺欧洲最有价值的企业宝座。

阿尔诺家族拥有LVMH近半股份和绝对多数投票权，他本人已被认为是欧洲首富。阿尔诺出生于法国北部的贫困小城鲁贝（Roubaix），他把一个家族建筑公司变成了一家地产公司，继而又变成奢侈品企业。上世纪80年代，他通过收购一系列不良纺织品资产获得了迪奥，后又夺得了LVMH集团的控制权。这匹“披着羊绒的狼”坐拥一千亿美元的各类财富，从巴黎一

座由弗兰克·盖里（Frank Gehry）设计的公共艺术博物馆，到完美剪裁的迪奥西装，还有几家报社，应有尽有。

研究公司盛博的卢卡·索尔卡（Luca Solca）说：“LVMH主宰的这个行业拥有结构性优势，受惠于全球化及收入不平等。”在正确的时间、正确的行业拥有正确的规模——庞大，是它成功的原因。

先说行业。据咨询公司贝恩的数据，自1996年以来，手袋、豪华手表及爱马仕丝巾等奢侈品的销售额每年增长约6%。贝恩估计，奢侈品行业今年的价值将达到2810亿欧元。2000年时，中国顾客还不成气候，现在则占到销售额的三分之一，为这番繁荣做出了不少贡献。

规模带来了更大的回报。在这个固定成本高昂的行业中（除了市场营销成本，还有开在繁华大道上的店铺那令人瞠目结舌的租金），销售额越大利润就越高。过去20年，LVMH的增速几乎是整个行业的两倍，去年其奢侈品销售额就超过460亿欧元（见图表），是最接近的对手开云和历峰的三倍多。

阿尔诺成为蒂芙尼理所当然的买家，这在一定程度上是因为规模带来的小型奢侈品企业不具有的优势。乍看之下这有点奇怪。与产品不那么昂贵的行业相比，奢侈品行业里的合并基本无助于削减成本或产生协同效应，比如没有人会期待路易威登的店铺卖蒂芙尼手表。

但分析师认为，集中在一个集团里，各个品牌的表现会更好。以蒂芙尼为例，其股东之前一再要求管理层提高利润并快速提高销量，导致公司重振旗鼓的步伐走得太急。LVMH表示将给予蒂芙尼时间和资金，投入到翻新店面和推动高端市场等方面。LVMH曾对意大利珠宝商宝格丽（Bulgari）采取了类似的做法。阿尔诺上周表示，自2011年被LVMH收购以来，宝格丽的利润已增至原来的五倍。集团并不公布旗下每个品牌的经营情况（其年报内更多是珠光宝气的模特图片而非财务细节），减轻了创意人才完成季度目标的压力。

规模经营还有许多寻常的好处。举例来说，在与中国的新购物中心的业主谈判时，大型集团更有谈判筹码。它们可以向杂志施压，拿到更好的广告价格。建设电商网站的沉重成本也可以分摊。

这样的优势显示未来会有更多整合。但对LVMH和其他奢侈品集团而言这是有极限的。一方面是供应。大集团渴求的隽永品牌显然需要具备悠久的历史，而这样的品牌相对不多。仍是独立品牌的香奈儿或劳力士等都在极力守护自己的这种身份。为解决这个问题，阿尔诺巧妙地把“奢侈”的概念扩展到更广的领域，比如涉足酒店业。

另一个极限则是LVMH所特有的——一家集团能否经营好那么多不同范畴的业务？在其他行业，企业集团这一经营模式被视为笨拙而过时。去年，开云集团剥离了运动服装品牌彪马来瘦身。但目前的总体局势仍是打造帝国而非拆伙分家。有人猜测历峰和开云可能会合并以改善前景。

LVMH并非没有挑战。奢侈品行业的前景并不明朗。中国不可能永远保持高速增长，尤其是贸易冲突持续的话。连爱喝唐培里侬香槟王（Dom Pérignon）的人也感受到了经济衰退的影响。营销必须转向吸引喜爱Instagram且关心可持续发展的千禧一代。人们越来越多地在网上购物，而这个领域有亚马逊和阿里巴巴等电商巨头坐镇。

LVMH大概有一半的利润都来自一个品牌——路易威登。阿尔诺已明确表示LVMH是一家家族企业，自己的某个孩子（其中有四人在公司工作）将接管公司。现年70岁的他仍紧握大权。但继任的子女是否继承了他在销售人们渴望的奢侈品方面的才能，将日渐引发关注。

另外，奢侈品能在持续拓宽受众范围的同时保持其尊贵地位吗？到目前为止还是可以的。但阿尔诺参与创造的这一行业仍然年轻，尽管它努力想营造一种永恒感。通过砸巨资吸引人们购买并非必需的精美进口商品，奢侈品行业蓬勃发展，成为这一时代的典型商业模式。但如果时代变迁，又会如何呢？ ■



Problem-solving

Boots on the ground

The meaning of two Nobel-prizewinning economists' work lies in their method

WHEN THE authors of this excellent book were awarded the Nobel prize for economics in October, French media crowed that a Frenchwoman had won it; Indian media that an Indian-born economist and his wife had done so. Most reports eventually mentioned that their national champion was not the sole laureate. But the parochialism of the headlines bears out one of the book's central observations.

The world is messier than conventional economic models assume. People respond not only to material incentives but also to the pull of tribe and custom. They are not only rational but also emotional, superstitious and attached to the familiar. All economists know that their models oversimplify—that is what models are for. But few have grappled as energetically with the complexity of real life as Esther Duflo and Abhijit Banerjee, or got their boots as dirty in the process.

The couple are best known, along with their fellow Nobel laureate Michael Kremer, for pioneering the use of randomised controlled trials to answer economic questions. An earlier book, “Poor Economics”, is full of powerful examples. To see whether small loans improve the lives of the poor, the team persuaded a microlender in Hyderabad to expand into some randomly selected districts but not others. (They found that microcredit works, but not as well as its boosters claim.) In another trial, they found that Indian teachers were more likely to show up to work if they were made to take date-stamped photos of themselves, and their pay was docked if they missed classes.

“Good Economics for Hard Times” is more wide-ranging. It reviews the evidence for what works and what doesn’t in tackling some of the world’s biggest problems, from climate change to trade. The authors admit that their knowledge is imperfect and their proposals will need refining. They don’t claim to understand what causes rapid economic growth, for instance. They would far rather you absorbed their evidence-based, trial-and-error method than any specific policy.

The result is a treasure trove of insight. They describe how caste politics fosters corruption, how potential migrants can overcome their fear of the unknown, and how, when government posts are excessively well-paid, as they are in several poor countries, fresh graduates remain jobless for years rather than settle for a private-sector position.

The authors are fascinated by what motivates people, and how this varies by social context. In an experiment involving coin-flipping for cash rewards, Swiss bankers are more likely to cheat if reminded beforehand that they are bankers, less so if they are asked to talk about what they do in their leisure time. In “banker” mode, it seems, people are more ruthlessly acquisitive than when in “volunteer football coach” mode. In a similar experiment, students in India cheated more when reminded that they hoped one day to work for the government; for students in Denmark, the opposite was true. A government’s reputation for corruption or cleanliness “affects the honesty of those who want to work for it”, suggest the authors.

Thinking about inequality, they are sceptical about the fashionable idea that rich countries should offer every citizen a “universal basic income”. The real crisis in such places is not material deprivation but that “many people who used to think of themselves as middle class have lost the sense of self-worth that they used to derive from their jobs.” In poor countries, by contrast, material deprivation is a huge problem and an “ultra-basic” handout of a dollar or two a day could release people from penury and hunger.

India could largely pay for this by abolishing wasteful subsidies for petrol, food and fertiliser. Universal cash payments are simple—a big plus when the government is incapable of administering complex social programmes. The authors do not imagine, however, that their logical arguments settle the matter. Mr Banerjee is running a randomised trial of ultra-basic cash payments in Kenya; he expects results next year.

All readers will find something to disagree with in this book. It is too harsh on Margaret Thatcher and too kind to Europe's farm subsidies. But they will be captivated by the authors' curiosity, ferocious intellects and attractive modesty. "The only recourse we have against bad ideas", they argue, is to "resist the seduction of the 'obvious', be sceptical of promised miracles, question the evidence, be patient with complexity and honest about what we know and what we can know." Amen. ■



解决问题

脚踏实地

两位诺贝尔经济学奖得主的成就在于他们所用的方法

当这部佳作的两位作者10月被授予诺贝尔经济学奖时，法国媒体得意地夸赞一位法国女性赢得了诺奖，印度媒体欢呼一位印度裔经济学家及他的妻子夺得了殊荣。两国的大多数报道一直要写到最后才提到自己国家的杰出人物并非唯一的获奖者。但这些头条新闻的狭隘表现恰恰印证了这本书其中一个主要观点。

现实世界比传统经济模型所假设的情形更混乱。人们不止对物质激励做出反应，还受到族群和习俗的牵制。人有理性的一面，也有感性、迷信和依恋熟悉事物的一面。所有的经济学家都知道他们的模型过度简化了现实，可模型的作用正在于此。但是，很少有人像阿比吉特·班纳吉（Abhijit Banerjee）和埃斯特·迪弗洛（Esther Duflo）那样不遗余力地对抗真实世界的复杂性，并在这个过程中深入第一线实践。

这对夫妇——以及一同获奖的迈克尔·克雷默（Michael Kremer）——因开创性地运用随机对照实验解答经济问题而闻名。从两人早先出版的《贫穷的本质》（Poor Economics）一书中就能看到大量具说服力的例子。为了验证小额贷款是否能改善穷人的生活，他们说服海得拉巴（Hyderabad）的一家小额贷款机构将业务拓展到一些随机选择的地区。（他们发现小额贷款有其作用，但没有像支持者们说得那么好。）在另一项实验中，他们发现，如果要求印度的教师到校后给自己拍一张带日期戳的照片，并规定旷课会被扣工资，他们出勤的几率就会提高。

《艰难时代的优良经济学》（Good Economics for Hard Times）涉及的内容更广泛。它回顾了在应对从气候变化到贸易等世界最大难题上哪些方法有效而哪些无效的证据。作者承认自己掌握的情况并不全面，提议也需要进一步完善。例如，他们并不自认为已经了解了导致经济快速增长的原

因。他们宁愿读者去理解和吸收他们基于证据的试错式方法，而不是任何特定的政策。

他们的成果是一个洞见的宝库。他们描述了种姓政治如何助长腐败，有志移民的人如何能克服对未知的恐惧，以及当政府职位薪酬过高时（就像在几个贫困国家的情况），应届毕业生有时宁愿在家待业多年，也不愿意接受一份私营部门的工作。

作者对什么能激励人以及这又如何随社会环境而变化兴趣浓厚。在一项让瑞士银行家掷硬币赢现金的实验中，如果事先提醒参与者其银行家的身份，他们就更有可能作弊；如果让他们谈论自己闲暇时都做些什么，作弊的可能性就低一些。看来，人们处于“银行家”模式时比处于“义务足球教练”模式时更贪婪。在类似的实验中，如果事先提醒印度的学生他们希望未来能在政府部门工作，他们作弊的情况就会更严重。而丹麦学生的情况恰恰相反。作者认为，一个政府腐败或廉洁的名声“会影响那些想要为它工作的人们的诚实度”。

在讨论不平等问题时，作者对富裕国家应为每一位公民提供“全民基本收入”的流行观念持怀疑态度。在这些国家，真正的危机不是物质匮乏，而是“许多曾经认为自己是中产阶级的人失去了以前从工作中获得的自我价值感”。相反，在贫穷国家，物质匮乏是一个巨大的问题，每天发放一两美元的“最基本”救济就可能让人们摆脱困窘和饥饿。

如果印度取消对汽油、食品和化肥的铺张的补贴，省下来的钱基本上够实施这样的救济了。全民现金补贴容易实施——在政府没有能力管理复杂的社会项目时这是一大优势。但作者并没有臆断自己的逻辑推论就能解决问题。班纳吉正在肯尼亚开展最基本现金补贴的随机实验，预期明年会有结果。

任何读者都会在这本书里找到自己难以认同的地方。比如对撒切尔夫人的看法太过苛刻，对欧洲的农业补贴的评价又太过宽容。但他们会被作者的好奇心、超高强度的思考推理和让人如沐春风般的谦逊深深吸引。作者认

为，“我们抵御坏主意的唯一方法是抵制‘显而易见’的想法的诱惑，怀疑那些人们许诺的奇迹，质疑证据，对复杂的情形保持耐心，坚持知之为知之的态度。”阿门。 ■



Schumpeter

One company, two systems

Alibaba is suffering from a bout of Amazon envy

ANYONE WHO is cursed with a rational mind should ponder Alibaba's faith in eight, the luckiest single digit in China. On November 26th China's e-commerce juggernaut sold HK\$88bn (\$11.2bn) of secondary shares on the Hong Kong Stock Exchange under the stock symbol 9988—88 is not only a homonym for *baba*, but also signifies double luck. As soon as the gong was banged to launch trading, the shares soared from HK\$176 to the auspicious price of HK\$188. Luck was on Alibaba's side. Nearby Pedder Street, where 19th-century stockbrokers gathered to trade shares, has been a hotspot of anti-China protests since early summer. On occasion, the smell of tear-gas has wafted into the exchange. Yet after a landslide win for pro-democracy parties in local elections late last month, the chaos has—at least temporarily—subsided.

Luck aside, the listing provides the company with triple benefits. It wins brownie points with the Chinese government for demonstrating confidence in Hong Kong's financial future amid the protests. It partially hedges its exposure to America, where it launched the biggest initial public offering of all time in 2014, but has recently suffered from trade-war related turbulence. And it increases the accessibility of its shares to Asian institutional investors, who may be less inclined to view China through the prism of trade and geopolitical tensions. Soon it may be eligible for Stock Connect schemes that link Hong Kong with markets in Shanghai and Shenzhen, allowing mainland investors to pile in as well.

In the process, Alibaba has already chalked up one victory. It has shrunk the discount at which its shares have long traded against Hong Kong-listed

Tencent, its sworn enemy among China's internet titans. Its eyes are now on a bigger prize. Alibaba's executives suggest that the firm should be valued like Amazon, its biggest global e-commerce competitor. Amazon is worth \$890bn compared with \$520bn for Alibaba. The American firm's prospective price/earnings ratio, at around 67, is over twice that of its Chinese rival. To narrow the gap Alibaba has a tricky balancing act to pull off. It needs to keep the Chinese government on its side, but also appear less Chinese when winning over the outside world.

Alibaba's ability to achieve its ambitions should not be underestimated. But even the most bullish analysts say that overtaking Amazon is a long shot. The two firms have different business models. Alibaba provides a platform that links buyers and sellers on its biggest sites, Taobao and Tmall, and it mostly makes money from sellers spending money to push their wares higher up the search rankings. Unlike Amazon, it does not sell its own goods, meaning it has no need for inventory and warehousing. That helps it generate much fatter profit margins. But according to David Dai of Bernstein, a research firm, its cloud-computing business, though the biggest in China, makes a negligible contribution to its valuation. Amazon's cloud business, Amazon Web Services, is a gold mine, accounting for about half of the American firm's value. And while Amazon generates over \$70bn of annual sales from outside its home market the figure for Alibaba is less than \$10bn.

Daniel Zhang, who in September took over running the firm from Jack Ma, its charismatic founder, is trying to transform Alibaba by making better use of its vast trove of data to create more value. Roughly one of every two Chinese buy via its e-commerce platforms. Bolstering it all is Alipay, its online-payments platform with about 900m users in China. Alibaba owns a 33% stake in Ant Financial, Alipay's parent company, potentially further boosting its appeal to investors.

But for all its clout, it remains at the mercy of the Chinese government. After its listing in New York in 2014, a boom in its share price turned to bust when government regulators publicly tore it off a strip for peddling fakes. As Alipay and Tencent's Tenpay have muscled into territory controlled by state-owned banks, the government of President Xi Jinping has angrily pushed back. Now regulatory heat is rising over allegations of unfair competition, particularly with regard to "pick-a-side" deals, in which platforms forbid merchants from trading with their rivals. Galanz, a home-appliance-maker, and JD.com, a big e-commerce rival, have recently sued Alibaba's Tmall for allegedly abusing its market power. In April Colin Huang, founder of Pinduoduo, a \$43bn upstart that is nipping at Alibaba's heels, warned of "forced exclusivity" in e-commerce. Alibaba dismisses the issue as "baseless sensationalisation". It adds that "committing to a single partner is normal commercial behaviour". Shortly before Alibaba's Singles' Day sales jamboree on November 11th, regulators travelled to its home town of Hangzhou to warn e-commerce firms that such deals were illegal. If they want, they can make life deeply uncomfortable.

Alibaba, for now, appears relaxed about the pressure. It argues that Big Tech in China is hardly a cosy oligopoly. The constant battle between Alibaba, Tencent and others is almost visceral. Yet the importance of remaining in the government's good books may undercut its efforts to build a global business. It has made inroads in South-East Asia. But analysts doubt its ability to compete strongly with Amazon in Europe and America, especially in cloud services because of concerns about the Chinese government's access to its data (though much of that belonging to its clients outside China is stored offshore). Even in Hong Kong, it may find itself in an awkward position if anti-China sentiment resurges.

Alibaba has made its own luck. Since its founding 20 years ago, it has battled the Chinese state to get where it is, trounced foreign competition in China and helped revolutionise e-commerce. This year it has responded to

onslaughts from the likes of Pinduoduo by upping its e-commerce offerings in China's hinterland. From a tech point of view, it stands shoulder to shoulder with Amazon. But its valuation shows how steep the China discount remains. If it is truly lucky, the Hong Kong listing may help change that a bit. ■



熊彼特

一企两制

阿里巴巴正患上一场亚马逊嫉妒症

每个饱受理性思维之苦的人，都应该参考一下阿里巴巴对“8”这个中国最吉祥数字的执念。11月26日，这家中国电商巨头在香港交易所发售了880亿港元（112亿美元）的二级股票，股票代码9988。“88”不仅与“阿里巴巴”的后两个字谐音，还寓意“大发”。开市的锣声一响，股价便从176港元飙升到大吉大利的188港元。幸运之神眷顾了阿里巴巴。港交所附近的毕打街在19世纪时是股票经纪人交易股票的聚集地，今年夏初以来这里成了反中抗议活动的热点地区，催泪瓦斯的气味有时还会飘进交易所。不过，上月底泛民派以压倒性优势获得地方选举的胜利后，混乱局面得以平息——至少暂时如此。

除了好运之外，此次上市给阿里巴巴带来了三个好处。在一片示威抗议潮中，它展示了对香港金融前景的信心，此举取悦了中国政府。2014年，阿里巴巴在美国完成了有史以来规模最大的IPO，但近期受到贸易战相关动荡的拖累，而在港上市在一定程度上对冲了它在美国的风险敞口。此次上市还方便了亚洲的机构投资者购买它的股票，而这些投资者可能不太会从贸易和地缘政治紧张局势的角度看中国。很快阿里巴巴可能就有资格加入连接香港和沪深市场的“互联互通”计划，让大陆投资者也能参与投资。

在此过程中，阿里巴巴已经取得了一项胜利。长期以来，相比在香港上市、同为中国互联网巨头的死敌腾讯，阿里巴巴的股价有所折价，现在它缩小了这一幅度。现在它把目光投向了更大的目标。阿里巴巴的高管们表示，公司估值应该向它在全球电子商务领域的最大竞争对手亚马逊看齐。亚马逊价值8900亿美元，而阿里巴巴为5200亿美元。亚马逊的预期市盈率约为67倍，是阿里巴巴的两倍多。要缩小差距，阿里巴巴需要完成一个高难度的平衡动作。它需要中国政府的支持，但在争取外部世界的 support 时，又要让自己显得“不那么中国”。

阿里巴巴实现抱负的能力不容小觑。但即使是最乐观的分析师也表示，它赶超亚马逊的可能性很小。这两家公司的商业模式不同。阿里巴巴提供了一个平台，将旗下两个最大网站淘宝和天猫上的买卖双方连接起来，它最主要的收入来自卖家花钱提升自己商品的搜索排名。与亚马逊不同，阿里巴巴自己不销售商品，这意味着它不需要库存和仓储。这有助于它实现高得多的利润率。但是，研究公司盛博的戴秉国表示，虽然阿里巴巴的云计算业务在中国规模最大，但对公司价值的贡献却微乎其微。而亚马逊的云业务Amazon Web Services则是一座金矿，约占公司价值的一半。与此同时，亚马逊每年海外市场的销售额超过700亿美元，但阿里巴巴的这一数字还不到100亿美元。

今年9月，张勇从富有领袖魅力的创始人马云手中接管阿里巴巴。他正尝试更好地利用巨大的数据宝库来创造更多价值，从而改造阿里巴巴。大约每两名中国人中就有一人通过阿里巴巴的电商平台购物。为这一切提供支撑的是它约有九亿中国用户的在线支付平台支付宝。阿里巴巴持有支付宝母公司蚂蚁金服33%的股份，这可能进一步加大它对投资者的吸引力。

但是，尽管阿里巴巴影响力巨大，它仍然受制于中国政府。2014年阿里巴巴在纽约上市后，政府监管机构公开斥责它兜售假货，导致它的股价从暴涨转为暴跌。由于支付宝和腾讯旗下的财付通强势侵入国有银行的地盘，遭到了习近平政府的愤然回击。目前，围绕不公平竞争指控的监管力度加大，尤其是针对平台要求商户签署“二选一”协议、禁止其与竞争平台做生意的操作。家电制造商格兰仕和大型电商对手京东最近对阿里巴巴旗下的天猫提起诉讼，指控其滥用市场权力。今年4月，拼多多创始人黄峥警告称电商领域存在“强制排他性”。这个市值430亿美元的行业新贵正对阿里巴巴紧追不舍。对此阿里巴巴称该问题不过是“毫无根据的炒作”。它还补充说，“忠于单一的合作伙伴是正常的商业行为”。就在11月11日阿里巴巴光棍节大促销前不久，监管人员前往阿里巴巴的总部所在地杭州，警告电商公司这类选边协议是违法的；如果他们愿意，可以让它们的日子非常不好过。

就目前而言，阿里巴巴面对压力显得泰然自若。它反驳称，中国的科技巨

头可不是什么轻松舒适的寡头。阿里巴巴、腾讯和其他公司之间的持久战近乎本能。但是，阿里巴巴需要继续让政府满意，这一点的重要性可能不利于它打造全球业务。它已经打入了东南亚市场。分析人士怀疑它是否有能力在欧洲和美国与亚马逊展开激烈竞争，尤其是在云服务方面，因为人们担心中国政府获取阿里巴巴的数据（尽管其境外客户的大部分数据都存储在海外）。即使在香港，如果反中情绪卷土重来，它可能也会发现自己处境尴尬。

阿里巴巴的运气由自己一手创造。自20年前创立以来，它一直与中国政府角力，才取得了今天的成就，它在中国击败了外国竞争对手，并促使电子商务领域掀起一场革命。今年，为应对拼多多等公司的围剿，阿里巴巴加强了在中国内陆地区的电商服务能力。从科技角度看，阿里巴巴与亚马逊并驾齐驱。但从它的市值能看出，中国背景仍然导致了很大幅度的折价。在香港上市可能会带来一些改变，如果它确实幸运的话。 ■



The twilight of the WTO

The umpire expires

Global commerce is about to lose its referee. Get ready for more punch-ups

ONE WAY of thinking about the world's trading system is as a sports match featuring a sprawling, brawling international cast of players, each with their own tactics and tricks. The game works best when there is a referee, and for nearly 25 years a group of seven judges at the World Trade Organisation (WTO) has done the job. But on December 11th this body will cease to function, because America is blocking new appointments to it. The referee's departure will make cross-border commerce unrulier and, in the long run, invite an anarchy that would make the world poorer.

The WTO's appellate body is one of those institutions that most people have never heard of, but which will be missed when it is gone. Set up in 1995, it hears appeals over trade disputes and grants the right to limited retaliation where there has been wrongdoing. Some 164 countries and territories follow its rulings, and the body has prevented some of the nastiest rows from spiralling into outright tariff wars—for example, the epic spat between America and the European Union over subsidies for Boeing and Airbus. Since it was created, it has been the enforcer-of-last-resort for over 500 cases.

Before 1995 the system was less stable and less fair. The General Agreement on Tariffs and Trade, the WTO's predecessor, had rules but no judges to enforce them. Big countries had bullying rights. The legal clarity and independence provided by the appellate body is one reason why trade rose from 41% of world GDP in the year before it was created to 58% in 2017.

The immediate cause of the judges' downfall is the Trump administration's

refusal to appoint new judges to replace those who are retiring, a symptom of the president's suspicion of multilateral institutions. But it is a mistake to blame everything on him. The WTO's troubles expose deeper problems.

Most countries like independent arbiters, until they suffer a critical ruling. American unease predates Mr Trump. The Bush and Obama administrations tried to influence outcomes by blocking the reappointment of judges. The WTO is also unwieldy. Ideally the rules would be updated every decade or so, giving countries a chance to modernise them and take on judgments they dislike. But the WTO's membership has doubled since 1995, and because each country has a veto it has been impossible to update the rules to reflect, say, the disruption caused by China's state-led model (it joined the WTO in 2001). Instead, grumbles have festered.

What happens from December 11th? Some WTO members are trying to concoct an unofficial appellate body, drawing on retired judges, to resolve disputes. A new president elected in 2020 might reverse America's stance, although several Democratic presidential contenders are lukewarm on free trade.

Most likely, the appellate body will die, or remain dormant for years. If so, expect a deterioration in conduct—Japan and South Korea are already in an ugly spat. Some Americans believe that their country's size gives them the raw clout to impose rules on others, but it has yet to wrest any big concessions from China.

Indeed, as the legal framework for trade decays, even America will be vulnerable to escalating tensions. So far, trade frictions have not caused a global recession. But trade has stopped growing and long-term investment by multinational firms dropped by 20% in the first half of this year. If there is a recession, the temptation of tit-for-tat tariffs will rise across the world. When the referee leaves the field, anything goes. ■



【首文】WTO的暮光

裁判到期

全球贸易即将失去裁判。准备好迎接更多的激烈争吵吧

看待世界贸易体系的方式之一是把它看作一场体育比赛，主角是一群散乱、吵吵嚷嚷的国际球员，每个人都有自己的战术和技巧。这场比赛在有裁判的情况下运转得最好——在将近25年的时间里，世贸组织上诉机构的七位法官就承担了这项工作。但由于美国一直阻挠新法官的任命，这个机构将于12月11日停摆。裁判的离场将让跨境贸易无矩可循，从长远来看还会引发贸易无政府状态，让世界更贫穷。

世贸组织的上诉机构属于那类大多数人从未听说过、而一旦消失就令人怀念的机构。它成立于1995年，受理有关贸易争端的上诉，并针对不当行为授予一定程度的反击报复权。约有164个国家和地区服从它的裁决，而且它还曾经防止了一些最严重的争端演变成全面的关税战，如美国和欧盟之间关于波音和空客获得补贴的旷日持久的争吵。自成立以来，它已对五百多起争议执行了最终裁决。

在1995年以前，这个体系不那么稳定，也不那么公平。世贸组织的前身《关税与贸易总协定》虽有规则，但没有法官来执行它们。大国有恃强凌弱的权利。上诉机构带来了法律上的清晰度和仲裁上的独立性。在它成立的前一年，贸易占全球GDP的比重为41%，到2017年上升至58%，这和它的作用不无关系。

法官停摆的直接原因是特朗普政府拒绝任命新法官接替退休的法官，表明了这位总统对多边机制的怀疑。但把一切都归咎于他是不对的。世贸组织的麻烦暴露了更深层次的问题。

大多数国家都喜欢独立的仲裁方，直到吃到自己不利的裁决的苦头。美国的不安在特朗普上台前就已显现。布什和奥巴马政府试图通过阻止法官连任来影响仲裁结果。世贸组织本身也臃肿笨拙。理想情况下，世贸的规

则应该每十年左右更新一次，让各国有机会让规则与时俱进，并挑战它们不喜欢的判决。但世贸组织的成员数量自1995年以来已经翻了一番，而且因为每个国家都有否决权，所以无法更新规则以反映最新的状况，比如中国（2001年加入世贸）由政府主导的模式造成的破坏。牢骚日积月累。

在12月11日之后会发生什么？一些世贸成员国正尝试组建一个非官方的上诉机构，让退休法官来解决争端。2020年当选的新总统可能会转变美国的立场，尽管几位民主党总统竞选人对自由贸易不太感冒。

最有可能的情况是上诉机构会消亡或停摆多年。如果是这样，成员们的操行估计会进一步恶化——日本和韩国已经陷入了一场难看的口水仗。一些美国人认为自己国家的体量给了他们原始影响力来对其他国家强加规则，但它还没能从中国那里赢得任何大的让步。

事实上，随着贸易法律框架的衰落，即使是美国也会受到紧张局势升级的影响。到目前为止，贸易摩擦还没有造成全球经济衰退。但贸易已经停止增长，而跨国公司的长期投资在今年上半年下跌了20%。如果出现经济衰退，世界各地将更可能出现针锋相对的关税战。一旦裁判离场，什么都有可能发生。■



Sergey Brin and Larry Page leave Alphabet

Search result

Google's departing co-founders leave three unanswered queries

“YEAH, OK WHY not? I’ll just give it a try.” With those words Sergey Brin abandoned academia and poured his energy into Google, a new firm he had dreamed up with a friend, Larry Page. Incorporated in 1998, it developed PageRank, a way of cataloguing the burgeoning world wide web. Some 21 years on, Messrs Brin and Page are retiring from a giant that dominates the search business. Alphabet, as their firm is now known, is the world’s fourth-most-valuable listed company, worth \$910bn. In spite of its conspicuous success, they leave it facing three uncomfortable questions—about its strategy, its role in society and who is really in control.

Silicon Valley has always featured entrepreneurs making giant leaps. Even by those standards Google jumped far, fast. From the start its search engine enjoyed a virtuous circle—the more people use it and the more data it collects, the more useful it becomes. The business model, in which advertisers pay to get the attention of users around the world, has printed money. It took Google just eight years to reach \$10bn in annual sales. Its peak cumulative losses were \$21m. By comparison, Uber has incinerated \$15bn and still loses money.

Today Alphabet is in rude health in many respects. Its search engine has billions of users, who find it one of the most useful tools in their lives. One recent study found that the typical user would need to be paid \$17,530 to agree to forfeit access to a search engine for a year, compared with \$322 for social-media sites, such as Facebook. Alphabet cranks out colossal profits. Many pretenders have tried to mimic the Google approach of having a vast customer base and exploring network effects. Only a few, including

Facebook, have succeeded at such a scale.

There are uncertainties, however. Take strategy first. Other tech giants have diversified away from their core business—Amazon began in e-commerce, for example, but is now big in cloud-computing. In China Tencent has shifted from video games to a huge array of services. Alphabet has not stood still: it bought YouTube in 2006 and shifted to mobile by launching Android, an operating system, in 2007. But it still makes 85% of its sales from search-advertising. A big bet on driverless cars has yet to pay off. As the firm matures, it should start paying a dividend.

The second question is how closely the company might end up being regulated. Alphabet's monopoly in the search business has led to worries that it may squeeze other firms unfairly. Its huge store of data raises privacy concerns. And because it is a conduit for information and news, its influence over politics has come under ever more scrutiny. All this augurs much tighter regulation. Alphabet has already paid or been subject to \$9bn in fines in the EU, and in America politicians on both sides of the aisle support tighter rules or, in some cases, a break-up. If it were to be regulated like a utility, profits could fall sharply.

The last question is who will be in control. Messrs Page and Brin famously sought “parental supervision” in 2001 and hired an external chief executive. Both founders will now relinquish any executive role, handing the reins to Sundar Pichai, a company stalwart. Yet dual-class shares mean they will still control over 50% of the firm’s voting rights. This structure is popular in Silicon Valley. But there is little evidence that it ages well. Of today’s digital giants, two have so far faced succession—Microsoft and Apple. They have prospered partly because their founders or their families did not retain voting control after they left the scene. Alphabet’s founders should forfeit their special voting rights and gradually sell their shares. Their firm faces deep questions—best to give someone else the freedom to answer them. ■



【首文】谢尔盖·布林和拉里·佩奇离开Alphabet

搜索结果

谷歌联合创始人离任，留下三个疑问搜索无果

“嗯，行啊，为什么不呢？我要试试。”这么说着，谢尔盖·布林（Sergey Brin）离开了学术界，把精力投向了他和朋友拉里·佩奇（Larry Page）一起构想的新公司谷歌。成立于1998年的谷歌开发出了佩奇排名

（PageRank）——一种对迅速增长的万维网网页做分类排名的方法。差不多21年后，布林和佩奇从这家雄霸网络搜索领域的科技巨头退休。如今，谷歌已重组为Alphabet，成为全球市值第四高（达9100亿美元）的上市公司。尽管成绩瞩目，他们还是给这家公司留下了三个令人不安的问题——发展战略、社会角色、真正的控制人。

硅谷从来不乏实现了巨大飞跃的企业家。即使对照这些标准，谷歌的飞跃也堪称高远而迅捷。从一开始，它的搜索引擎就进入了良性循环——使用的人越多，收集的数据就越多，它的功用就越大。其商业模式——广告主付费以获得全球用户的关注——带来了滚滚财源。谷歌仅用了八年时间就实现了100亿美元的年销售额。它的累计亏损峰值为2100万美元。相比之下，优步已经烧掉了150亿美元，目前还在亏损。

今天，Alphabet从很多方面看都非常稳健。谷歌搜索引擎拥有数十亿用户，被人们视为生活中最有用的工具之一。近期一项研究发现，一般用户要换得17,530美元才会同意在一年内不使用搜索引擎，而让他们放弃使用Facebook等社交媒体只要给322美元。Alphabet实现了极高的利润。许多觊觎者试图模仿谷歌的模式，建立庞大的客户群以寻求网络效应。但只有Facebook等少数公司取得了同等规模的成功。

然而还是存在不确定性。先看发展战略。其他科技巨头已从核心业务走向多元化，例如，亚马逊以电子商务起步，如今在云计算领域大展拳脚；在中国，腾讯已从电子游戏转向提供种类繁多的各式服务。Alphabet也没有

固步自封：它在2006年收购了YouTube，并在2007年推出安卓操作系统转向移动设备。但它仍有85%的销售额来自搜索广告，对无人驾驶汽车的巨额投资尚未见到回报。随着公司发展成熟，也该开始支付股息了。

第二个问题是公司最终会受到多大程度的监管。Alphabet在搜索上的垄断地位引发外界担忧它可能以不公平手段排挤其他公司。它拥有的庞大数据又导致了隐私方面的关切。而作为信息和新闻的传播渠道，它对政治的影响愈发受到审视。所有这些都预示着监管将大幅收紧。在欧盟，Alphabet已支付或已被判罚的罚款达90亿美元。在美国，共和民主两党的政客都支持收紧法规，有些甚至主张拆分公司。如果Alphabet受到像公用事业企业那样的监管，其利润可能急剧下降。

最后一个问题是公司由谁管控。众所周知，佩奇和布林在2001年寻求“家长式监督”，从外部聘请了一位首席执行官。现在，两位创始人将放弃所有管理职务，把大权交给公司的忠臣桑达尔·皮查伊（Sundar Pichai）。然而，由于双重股权结构的存在，他俩仍将控制公司过半的投票权。这种股权结构在硅谷很流行，但没有什么证据证明它能长久地良好运作。在当今的数字巨头中，微软和苹果这两家公司已经面对过交接的问题。它们能繁荣发展，部分原因是它们的创始人或其家人在离开管理层后没有保留控制投票权。Alphabet的创始人应放弃特别投票权并逐步出售持有的股份。他们的公司面临深刻的问题，最好还是把解答这些问题的自由让给其他人。■



Chinese dairy

Cow cash

A milk colossus gulps down two Australian producers

THIS AUGUST Andrew Cohen, boss of Bellamy's Organic, an Australian maker of infant formula, enthused to investors about having a brand "that's loved in China". So loved, in fact, that a few weeks later Mengniu Dairy, China's second-biggest producer of milk products, said it wanted to buy Bellamy's for A\$1.5bn (\$1bn). On December 5th its shareholders voted in favour of the deal.

At first Bellamy's seemed to be milking it, not Mengniu. An Australian government committee that reviews foreign acquisitions set out conditions: Mengniu must keep headquarters and most of the board Australian, and pour A\$12m into local factories. Mengniu offered a 59% premium on the firm's share price, which had shed three-fifths in the 18 months before the offer (it has rebounded a bit since). Mr Cohen blamed falling Chinese birth rates, a regulatory hold-up on imports and competition in China's thirsty infant-formula market.

Now Mengniu looks like the cat that got the cream. It wasted no time in making another bid on November 25th to buy Lion Dairy & Drinks, Australia's second-largest milk processor, for A\$600m. The pair of acquisitions would hand it a rich vat of organic and premium brands that China's middle class covets, including Farmers Union yogurt and licences to the Yoplait franchise. Mengniu can tap high-quality Aussie milk. And it is one in the eye for Yili, its bigger cross-town dairy rival in Hohhot, the regional capital of Inner Mongolia.

The two firms control about half of China's dairy market. If it wins Lion,

Mengniu stands a chance at surpassing Yili by revenue next year, reckons Song Liang, an independent dairy analyst (both want to make sales of 100bn yuan, or \$14bn). They are expanding in South-East Asia, where Bellamy's and Lion are already popular. Last year Yili acquired Thailand's biggest ice-cream maker. In August it bought Westland Milk Products, a New Zealand co-operative. It envisions "a vast dairy bridge crossing the Pacific Ocean".

In a decade Chinese milk production will meet only half of domestic demand, says Terrance Liu of CLSA, a broker, down from around 70% today. And, as Mengniu and its rival move overseas and upmarket, they need better ways to keep products chilled through production and transport, which rich-world firms can teach them. At home spending on formula per infant is rising thanks to declining rates of breast-feeding in many cities. A deadly tainted-milk scandal in 2008 has put shoppers off local products. CLSA estimates that four-fifths of Bellamy's products have ended up in China thanks to a flourishing informal trade by so-called *daigou*, who buy products overseas and resell them online.

New regulations have recently crimped grey-market sales. But Mengniu is expected to work out the import-clearance delay promptly: COFCO Dairy, a state-owned giant, owns 24% of the Hong Kong-listed firm. China's \$62bn dairy market is still little more than a tenth of the world's by value. But Euromonitor, a research firm, predicts that by 2022 it will overtake America as the globe's biggest market for dairy. Welcome to the land of milk and money. ■



中国乳业

现金牛

一家中国乳业巨头吞并两家澳洲厂商

今年8月，澳大利亚婴儿配方奶粉制造商贝拉米有机食品公司（Bellamy's Organic）的老板安德鲁·科恩（Andrew Cohen）兴致勃勃地向投资者介绍自己的品牌“在中国深受喜爱”。确实如此，因为几周之后，中国第二大乳品生产商蒙牛表示希望以15亿澳元（10亿美元）收购贝拉米。12月5日，贝拉米股东投票赞成该收购案。

一开始，借机捞好处的似乎是贝拉米，而非蒙牛。负责审查外国收购的澳大利亚政府委员会定下收购条件：蒙牛必须把贝拉米总部留在澳大利亚，大部分董事必须是澳大利亚人，并向当地工厂投资1200万澳元。蒙牛提出的收购价比贝拉米的股价高出59%，那之前的18个月里贝拉米的股价下跌了五分之三（在收购要约提出后有所反弹）。科恩将问题归咎于中国出生率下降、监管机构限制进口，以及需求旺盛的中国婴儿配方奶粉市场竞争激烈。

而如今看来，蒙牛倒像是那只舔到了奶油的猫咪。11月25日，蒙牛毫不迟疑地再次出价六亿澳元收购澳大利亚第二大牛奶加工企业雄狮乳品饮料公司（Lion Dairy & Drinks）。这两宗收购将使得蒙牛把一系列中国中产阶级心仪的有机高端乳品品牌收归囊中，包括农夫联盟酸奶（Farmers Union yogurt）以及优诺（Yoplait）的特许经销权。蒙牛可以开发优质的澳洲牛奶。这让总部同在呼和浩特、规模更大的竞争对手伊利很是难受。

这两家公司控制着中国乳制品市场约半数的份额。独立乳业分析师宋亮认为，如果能成功收购雄狮，明年蒙牛就有可能在营收上超越伊利（两家公司都希望实现1000亿元的销售额）。它们正在向东南亚扩展，而贝拉米和雄狮品牌在该地区已广受欢迎。去年，伊利收购了泰国最大的冰淇淋生产商，今年8月又收购了新西兰乳制品合作社威士兰牛奶（Westland Milk

Products）。这家公司正在展望“一座跨太平洋牛奶大桥”。

中信里昂证券的刘彤表示，十年内，中国的牛奶产量将只能满足国内需求的一半（目前约为70%）。而且，随着蒙牛及其竞争对手向海外和高端市场转移，它们需要改进乳品生产和运输过程中的冷藏保鲜技术，而富裕国家的乳品公司可以传授这方面的经验。由于中国许多城市的母乳喂养率在下降，婴儿配方奶粉上的支出正在增加。2008年发生的致命牛奶污染丑闻令消费者不愿购买本国产品。中信里昂证券估计，由于“代购”（代购商在海外购买产品然后在网上转售）这种非正式贸易的蓬勃发展，贝拉米的产品有五分之四都销到了中国。

近期出台的政府新规定限制了灰色市场的销售。但蒙牛有望迅速解决在进口清关上的延误：国有巨头中粮乳业拥有蒙牛这家在香港上市的公司24%的股份。中国价值620亿美元的乳制品市场目前仅占全球市场的十分之一多一点。但市场调研公司欧睿（Euromonitor）预测，到2022年，中国将取代美国成为全球最大的乳制品市场。欢迎来到这片流淌着牛奶和金币的乐土。■



Free exchange

Works in progress

The Nobel prize for economics prompts soul-searching about the profession's poverty of ambition

NOBEL PRIZES are usually given in recognition of ideas that are already more or less guaranteed a legacy. But occasionally they prompt as much debate as admiration. This year's economics award, given to Abhijit Banerjee, Esther Duflo and Michael Kremer, was unusual both for the recency of the contributions it recognised and the relative youth of the recipients. (For a review of "Good Economics for Hard Times", by Mr Banerjee and Ms Duflo, see Books and arts section.) Intentionally or not, it has inflamed arguments about the direction of the profession.

The prize, awarded in early October, recognised the laureates' efforts to use randomised controlled trials (RCTs) to answer social-science questions. In an RCT, researchers assess the effect of a policy intervention by dividing participants into groups, only some of which are treated with the policy. This year's winners used RCTs to study the effectiveness of anti-poverty programmes in developing economies. To take one example, Mr Kremer suspected that poor health might depress learning by reducing school attendance. By using randomisation to set the schedule by which different schools' pupils would be treated for intestinal worms, Mr Kremer and his co-author, Edward Miguel, learned that deworming improved health and attendance—but not test scores. Their work has been highly acclaimed, before the Nobel and after. But strikingly, given its practical success, it has also faced sustained criticism.

RCT evangelists sometimes argue that their technique is the "gold standard", better able than other analytical approaches to establish what causes what.

Not so, say some other economists. Angus Deaton, himself a Nobel prizewinner, published an essay in October arguing that RCTs deserve no special status, but should be used only when the context demands it. Martin Ravallion, formerly of the World Bank, has pointed out that insistence on RCTs will skew the direction of research, since not all economic questions can be suitably framed. Results are contextually dependent in ways that are hard to discern; a finding from a study in Kenya might not reveal much about policy in Guatemala.

Then there are ethical quandaries. In a medical context, RCTs were once criticised for denying some participants access to potentially beneficial interventions. Those concerns have largely dissipated as RCTs proved effective at sorting treatments wrongly thought to improve health from those that actually do. Such worries are harder to dispatch in economics. An RCT might test the economic effect of a treatment that is clearly welfare-improving (like deworming medicine), meaning some participants are deprived of that welfare-improving intervention, for a time at least. Power imbalances are also a problem. Participants in rich-world medical trials are typically rich-world citizens themselves, who have, moreover, given informed consent. But Mr Deaton notes that, in development economics, experimenters tend to be well-off, well-educated and “paler” than their subjects. And informing participants in social-science RCTs of the nature of an experiment can change behaviour and bias results. William Easterly, a development economist, has warned against the “technocratic illusion”: the idea that clever people in rich countries can fix poor countries with technical solutions that sidestep the messiness of political action and social reform.

It takes nothing away from this year’s Nobelists to say that RCTs are a valuable tool when used carefully. Other criticisms are more fundamental. No one questions that policies which reduce illness and improve education in poorer countries are welcome. But some economists suspect that such

interventions are merely palliative, rather than steps along a path to sustained development. Advanced economies grew rich as a result of a broad transformation that affected everything from the aspirations of working people to the functioning of the state, not by making a series of small, technocratic changes, no matter how well-supported by evidence. The dramatic decline in global poverty in the past two decades owes more to shifts in global trade, and radical reform in China, than to tweaks to education. As Mr Easterly has argued, RCTs cannot be used to answer the biggest of questions: how do such massive shifts occur? Economists cannot randomly assign one set of institutions to one country and a different set to another.

Indeed, some economists have a sneaking suspicion that the rise of RCTs represents a pivot not just to smaller questions but also to smaller ambitions. Over the past two decades, economics has unquestionably become more empirical. Stars of the profession today build their reputations on discovering new facts about the economy; giants of the past made their names parachuting into a corner of the economy and summing up its workings in a few neat equations (wrongly, often enough). Researchers are still guided by theory, which shapes the empirical questions that get asked and whether results are interpreted as capturing some deeper aspect of an economy's nature. But a world in which economists are mostly policy-tweakers—or “plumbers”, in Ms Duflo's phrase—is very different from the one to which many economists once aspired.

Paul Krugman, another Nobel laureate, hoped through economics to become like a hero from Isaac Asimov's “Foundation” science-fiction series, which portrayed a universe in which the mathematical understanding of society was so complete that crises could be predicted with certainty millennia into the future. By comparison, this year's laureates' achievements are modest indeed. What critics do not seem to acknowledge is that something bolder might not be possible. The Nobelists' work could

be done only because economists, despite their considerable efforts, do not know how to transform poor countries into rich ones. If they did, there would be no poor villages to experiment on. Some criticisms of RCTs are valid. Others seem little more than an expression of fear: that this is in fact the best that economics can be. ■



自由交流

尚在研究中

诺贝尔经济学奖促使人们反省经济学为何缺乏抱负

诺贝尔奖表彰的通常都是多多少少已经可以确信会成为人类遗产的成就。但个别时候，它在带来如潮赞美之时也会引起同样热烈的争议。今年的诺贝尔经济学奖就有些不同寻常，三位得奖者阿比吉特·班纳吉（Abhijit Banerjee）、埃斯特·迪弗洛（Esther Duflo）和迈克尔·克雷默（Michael Kremer）相对都比较年轻，研究成果提出的时间也不长。不管有心还是无意，这引发了对经济学发展方向的争论。

本年的经济学奖于10月中颁发，表彰几位获奖者运用随机对照实验（以下简称RCT）解答社会科学问题的努力。在评估某项政策干预效果的RCT中，研究人员会把受试者分组，其中只有部分小组会接受到政策干预。今年的获奖者运用RCT来探究发展中经济体推行的减贫项目的效果。举例来说，克雷默怀疑学生健康状况不佳可能导致上课出勤率低，影响学习成效。通过随机设定不同学校的学生接受肠道蠕虫治疗的时间表，克雷默和论文的另一位作者爱德华·米格尔（Edward Miguel）发现，驱虫治疗能够改善健康状况及出勤率，但不能提高考试成绩。他们的研究在获诺贝尔奖之前和之后都广受赞誉。但令人诧异的是，尽管取得了实际的成就，其研究也一直备受批评。

RCT的推崇者有时主张这是“黄金标准”，比其他分析方法更能弄清问题的成因。但另一些经济学家不以为然。也曾获得诺贝尔奖的安格斯·迪顿（Angus Deaton）在10月发表文章，认为不值得对RCT另眼相看，而应该只在有需要时才使用它。前世界银行官员马丁·拉瓦雷（Martin Ravallion）指出，一味运用RCT会带偏研究方向，因为并非所有经济问题都适合套用这一方法。结果取决于各种背景因素，其中的关联影响难以分辨。在肯尼亚的一项研究获得的发现对危地马拉的政策可能并没有太多启示。

此外还有伦理方面的难题。在医学领域，RCT曾因不让一部分受试者接受可能有效的治疗而受到批评。但后来，由于证明了RCT可以有效剔除被误以为有助于改善健康的疗法，而筛选出真正有效的疗法，这样的担忧已基本消散。然而在经济学领域，这类担忧更难消除。RCT可能被用于测试某项能明显改善人们福祉的干预措施（如驱虫药）的经济效益，这就意味着至少在某一段时间内，部分受试者被剥夺了享用该项措施的机会。权力失衡也是一个问题。在富裕国家的医学实验中，参与者通常是本国公民，而且是在充分知情的前提下同意受试的。但迪顿指出，在发展经济学相关研究中，实验人员往往比研究对象更富裕，受教育程度更高，肤色更“白”。另外，在社会科学RCT实验中，如果告知受试者实验的性质，可能就会改变其行为，造成偏向性结果。发展经济学家威廉·伊斯特里（William Easterly）提醒人们警惕“技术治理幻觉”，也就是以为富裕国家的能人智士用技术性方案就能解决穷国的问题，而绕过政治和社会改革的混乱复杂。

如果说RCT要慎用才是一种宝贵工具，这并不有损今年诺贝尔经济学奖得主的成就。其他批评则更直捣根本。在贫困国家，能减少疾病和改善教育的政策是值得欢迎的，这一点无人质疑。但有经济学家怀疑这类干预措施治标不治本，并不是沿着可持续发展的道路迈出的步伐。发达经济体当初能致富是一种广泛变革的结果，这种变革影响了从劳动者的抱负到政府的职能等社会的方方面面；它并不是通过连串的小范围技术性政策转变成就的，无论有多么充分的证据支撑这些举措的效果。过去20年全球贫困率显著下降更多是源于全球贸易的变化和中国的根本性改革，而非对教育的小幅调整。正如伊斯特里所言，我们无法运用RCT来回答那个最重大的问题：这些巨大的变化是如何发生的？经济学家不能随机给某个国家设定一套体制，给另一国设定另一套。

确实，一些经济学家私下怀疑RCT的兴起显示经济学不仅关注的问题变小，抱负也变小了。过去20年，经济学无疑已经变得越来越倾向实证。当今的明星经济学家扬名立万靠的是发现有关经济的新的事实；过去的巨匠的成名之路是空降某一经济领域，以几个简洁的公式总结其中的运作方式（经常是错的）。研究人员仍然由理论引导，理论决定了他们会问出怎样

的实证问题，以及研究结果是否会被诠释为抓住了一个经济体更深层次的特性。但如果经济学家大多一心只求微调政策——用迪弗洛的说法就是充当“水管工”——这可不是许多经济学家曾经向往的世界。

另一位诺贝尔奖获得者保罗·克鲁格曼（Paul Krugman）希望通过经济学成为艾萨克·阿西莫夫（Isaac Asimov）笔下的系列科幻小说《基地》（Foundation）里的主角。在这部小说描绘的世界中，社会可以用数学完全解析，因而也能准确地预测出几千年后的危机。相比之下，今年获奖者的成就确实算不上伟大。但批评者似乎没有认识到，更大胆的研究也许并不可能发生。这些诺贝尔获奖者的研究之所以能够开展，正是因为经济学家尽管付出了巨大的努力，却仍不知道如何将穷国变富。如果已经有了答案，也就不会有贫穷的村庄供他们开展实验了。对RCT的批评有一些是合理的，另一些似乎只是在表达一份惶恐：这实际上已经是经济学能做到的最好程度了。 ■



Lives of the rich and famous

The lap of luxury

One day the haven for presidents and socialites may sink into the Atlantic

“THE RICH are different from you and me, we all know that even if some of the people in Palm Beach don’t,” the writer Nora Ephron said of the town in south Florida where society is the local industry. In “Palm Beach, Mar-a-Lago and the Rise of America’s Xanadu”, Les Standiford, author of a book about Andrew Carnegie and Henry Clay Frick, traces the history of a sandbar lifted from swamp and scrub to gilded glory by the Florida East Coast Railway line.

Lapped by the Atlantic to the east and Lake Worth to the west, Palm Beach has been home to an epic cast of characters. Henry Flagler, who laid the railway at the turn of the 20th century, also built a string of majestic hotels—including the Ponce de Leon in St Augustine and the Royal Poinciana and the Breakers in Palm Beach itself. Marjorie Merriweather Post, a cereal heiress and philanthropist, built the 115-room Mar-a-Lago (dismissed by a local as “early Bastardian Spanish”) and took four husbands. The architect Addison Mizner set the town’s Mediterranean-Moorish tone (“Ali Baba Comes to Florida,” judges Mr Standiford). Among the newest arrivals are iguanas inadvertently introduced from South America.

Palm Beach, Mr Standiford observes in a book that will appeal to nose-pressed-against-the-glass readers, helped redefine class in America. Once upon a time, status was predicated on lineage and ancestors who had arrived on the *Mayflower*. That was before celebrity “became the new imprimatur of consequence”. Newport, Rhode Island? Stale upper crust. Saratoga Springs? That crème de la crème had curdled. For social cachet without the prerequisite of pedigree, up-and-coming Americans looked to

Palm Beach, which has welcomed the Duke and Duchess of Windsor, King Hussein of Jordan and the pornographer Larry Flynt.

It was also where, in 2005, Melania Knauss, a model, married reality-show host, future president and latter-day lord of Mar-a-Lago Donald Trump, with Elton John and Hillary and Bill Clinton among the big names and net worths in attendance. Buying Mar-a-Lago and its furnishings for \$8m in 1985 was Mr Trump's ticket to Palm Beach—now his permanent residence after he and New York fell out of love. Post had bequeathed the property to the National Park Service in 1973, for use as a winter White House, but in 1981 Congress returned it to the Post Foundation as too expensive to maintain. It was put on the market and Mr Trump snapped it up.

Now it is a private club, with a portrait of Post on a wall in the former library, across from a younger version of the current proprietor in tennis gear. The announcement, when the club opened, that Prince Charles and Lady Diana had bought memberships was “rubbish”, said Buckingham Palace; but Mr Trump was undeterred. “Even people who hate me are joining the club,” he crowed. The initiation fee is now said to be \$200,000. One day, probably, rising seas will sink Palm Beach and leave behind a level, if soggy, playing field. ■



富豪名流的生活

富贵滩

总统和社会名流们的避风港也许有一天会沉入大西洋【《棕榈滩，海湖庄园和美国世外桃源的兴起》书评】

“富人和你我不一样，这一点我们都知道，虽然棕榈滩的一些人不知道。”作家诺拉·埃夫隆（Nora Ephron）在谈到佛罗里达州南部的这个小镇时这样说过。当地的产业是上流社交。莱斯·斯坦迪福德（Les Standiford，曾写过一本关于安德鲁·卡内基[Andrew Carnegie]和亨利·克莱·弗里克[Henry Clay Frick]的书）在他的新著《棕榈滩，海湖庄园和美国世外桃源的兴起》（Palm Beach, Mar-a-Lago and the Rise of America's Xanadu）中，追溯了在佛罗里达东海岸铁路的带动下，一片沙洲自泥沼和灌木中崛起，演变成镀金繁华地的历史。

东临大西洋、西接沃斯湖（Lake Worth）的棕榈滩上出现过许多传奇人物。亨利·弗拉格勒（Henry Flagler）在19世纪和20世纪之交铺设了那条铁路，还建造了一系列宏伟的酒店，包括圣奥古斯丁的庞塞德莱昂酒店（Ponce de Leon）以及棕榈滩的皇家凤凰木酒店（Royal Poinciana）和浪花酒店（Breakers）。玛荷丽·梅莉薇德·波斯特（Marjorie Merriweather Post）是一家谷物食品公司的继承人和一位慈善家，她修建了有115个房间的海湖庄园（一名当地人不屑地称它带着“早期不入流的西班牙风格”），结了四次婚。建筑师艾迪生·米兹纳（Addison Mizner）为这座小镇定下了地中海-摩尔风情的基调（斯坦迪福德的评语是“阿里巴巴来到了佛罗里达”）。最新的来客里有无意中从南美引进的鬣蜥。

在这本将吸引猎奇者的书中，斯坦迪福德指出，棕榈滩帮助重新定义了美国的阶层。曾几何时，人们的社会地位已经由他们的血统和乘着“五月花”号到达的先祖决定了。不过那是在名望“成为身份地位的新凭证”之前。罗德岛新港？那是过时的上流社会。萨拉托加温泉市？那里的精英圈子已经固化腐朽。为了彰显不依靠家世的社会地位，后来起家的美国人把目光投

向了棕榈滩。这里曾经迎来温莎公爵夫妇、约旦国王侯赛因和色情出版业大亨拉里·弗林特（Larry Flynt）。

同样在这里，2005年模特梅拉尼娅·克纳斯（Melania Knauss）嫁给了真人秀主持人、未来的总统和海湖庄园如今的主人特朗普，出席婚礼的名人大腕包括艾尔顿·约翰和克林顿夫妇。1985年，特朗普以800万美元买下了海湖庄园及其室内陈设，获得了进入棕榈滩的门票。与纽约斩断情丝后，海湖庄园现在成了他的永久住所。波斯特在1973年将这处房产遗赠给了国家公园管理局，用作冬季白宫，但因维护费用过于高昂，1981年国会将它归还给了波斯特基金会。它被挂牌出售，特朗普很快将之收入囊中。

现在这里是一家私人俱乐部。曾经的藏书室里，一面墙上挂着波斯特的肖像，对面墙上则是现在的主人年轻时穿着网球服的画像。白金汉宫表示，俱乐部在开业时称查尔斯王子和戴安娜王妃曾购买过会员资格的公告是“胡说八道”。不过特朗普毫不在意。“就算是那些恨我的人也来加入这个俱乐部了。”他得意地说。据说现在入会费是20万美元。也许有一天，上升的海平面会淹没棕榈滩，让这个潮湿的公平的竞技场成为过去。■



The Economist film

How can we police the high seas?

Illegal and unregulated fishing accounts for 20% of the world's seafood, and poses a major threat to entire species that are already endangered.



经济学人视频

我们该如何监管公海？

全球20%的海产品来自非法和未受监管的捕捞，这对许多已濒临灭绝的物种造成了巨大威胁。



Education

The parable of Finland

PISA results can lead policymakers astray. They still matter

WHEN ESTONIA gained independence from the Soviet Union in 1991 it took the chance to reshape the country's education system. Mailis Reps, the current education minister, says officials and politicians looked everywhere—from America to the Netherlands—for inspiration. But they kept coming back to their Nordic neighbours. As Ms Reps recalls, the concluding argument in any debate often ran: “Let's try something like that because it works in Sweden or Finland.”

Many others have done similarly. Every three years the OECD publishes results from the Programme for International Student Assessment, with the latest out on December 3rd. PISA tests the reading, maths and science skills of 15- and 16-year-olds in the OECD's member states, as well as volunteers not in the club of mostly rich countries. The results provide a means to directly compare different education systems. It is now nearly two decades since the first batch were released. Back then, there was a surprise. Finland, not previously renowned for its education, topped the table when it came to reading, and excelled in other categories, too.

The Nordic country appeared to have discovered a way to get brilliant results without the discipline and intense workload of East Asian champions like Japan and South Korea, which were the other top scorers at the time. Educationalists descended on Helsinki. They reported back that not only was education free and comprehensive, but teachers were highly respected, well trained and left to get on with their jobs, which frequently involved enabling children to discover things for themselves. Schools in countries from Scotland to South Korea sought to mirror Finnish education. Indeed,

international visits became so popular that the Finnish government started to charge for them. Those arriving today pay more than €1,200 (\$1,300) to visit a school.

Yet Finland's image as an educational Utopia now appears to be somewhat out of date. The latest PISA results show a fall in its average score, as they have every round since 2006. Gaps between rich and poor pupils are widening, something which is distressing for a country that prides itself on equality. Estonia, once a mere imitator, is now the highest achiever among OECD countries. Mart Laidmets, the secretary-general of Estonia's ministry of education, notes with more than a hint of satisfaction that although Asian delegations still fly to Helsinki, they increasingly use it only as a connection on the way to Tallinn.

The parable of Finland helps to explain why there has been little overall progress since PISA began. The hope at the turn of the millennium was that the wealth of new information provided by the tests would help identify why some school systems do so well. Others would follow their lead, causing results to rise across the board. But although spending per pupil in the OECD has risen by 15% in just the past decade, performance in reading, maths and science remains essentially the same as when the tests started.

As ever, this year's results include plenty of bright spots (see chart). Singapore's sparkling scores have got better still. Even so, it is no longer the highest achiever overall. That is China—or to be more precise, Beijing, Shanghai, Jiangsu and Zhejiang (the OECD declines to include results from farther afield because it cannot guarantee their veracity). Less well-studied countries including Jordan, Poland and Turkey have also seen improvements. And yet for every Jordan, there is a Finland.

Part of the reason for the lack of overall progress is that schools have less

influence over results than is commonly assumed. Culture and other social factors, such as adult literacy, matter more, meaning that even well-informed policymakers can only make so much difference. As John Jerrim of University College London notes, “You are always going to have East Asian countries coming top.” And, as the data suggest, above a certain level (around \$50,000 per pupil, cumulatively between the ages of six and 15) there is not much of a relationship between expenditure and PISA scores.

The importance of culture can be seen in Estonia and Finland, both of which have long histories of high levels of literacy, often promoted by the local Protestant church. “There is this kind of general understanding” says Ms Reps, “that we don’t have, I don’t know, a golden diamond, but that education is the thing.” Finland created a series of children’s books featuring the Moomins—pale, rounded creatures that are beloved by youngsters around the world. Libraries are scattered throughout the country, including a spectacular, sloping one next to the train station in the centre of Helsinki, called Oodi, which was built to celebrate the country’s centenary at a cost of €98m. These kinds of things are difficult for other countries to replicate.

Other factors are also beyond the control of education ministers. Immigration plays an important role, with recent arrivals scoring below locals in most countries. Finland has seen a small uptick in the number of migrant pupils taking PISA over the past decade. More than four-fifths do not speak Finnish at home, helping to explain the big gap in performance between them and local students. Estonia has seen a similar increase in the number of immigrant pupils, but new arrivals are much less likely to be poor than they are in its Nordic neighbour.

Finland’s decline may make the wonks who rushed to copy its schools seem silly. But looking deeper there are still lessons to learn from Finland’s example. Despite the country having a reputation for cuddly teaching, it

used to take a slightly more hardline approach. In 1996, four years before the first batch of PISA results, a group of British researchers visited the country. They found “whole classes following line by line what is written in the textbook, at a pace determined by the teacher...We have moved from school to school and seen almost identical lessons—you could have swapped the teachers over and children would not have noticed the difference.” As Gabriel Heller Sahlgren, an economist, has noted, most of the children who scored so highly in the first round of tests would have experienced this sort of schooling.

By the time the results came out, many Finnish schools had started to move in a very different direction, confounding touring policymakers. A forthcoming study by Aino Saarinen and colleagues at the Universities of Helsinki and Oulu analyses PISA data from 2012 and 2015, finding that children in schools which gave pupils more freedom to direct their own learning had lower scores in maths and science. Those from poor and migrant families suffered the most. Eschewing the possibility of a happy midpoint between reading from a textbook and leaving children to their own devices, schools have continued to experiment in the years since. A wave of new institutions are being built without classrooms. A new curriculum, which began to be introduced in 2016, encourages lessons without defined subjects.

Despite this, there remain many similarities in the organisation of the Estonian and Finnish education systems. There are very few fee-paying schools, for instance, and both seek to minimise exams and segregation by ability. Belying the slightly staid office in which he sits, replete with portraits of the country’s leaders and a large Estonian flag, Rando Kuustik, the head of the Jakob Westholm School in the centre of Tallinn, says that his first priority is his pupils’ happiness, and his second is to “help them manage better in the world than when they entered.”

But although Mr Kuustik's teachers are beginning to tweak their style of instruction by, for instance, making more use of group work, "we are still a very traditional school," he explains. Before pupils work in groups, the teacher makes sure they have a thorough understanding of what they are working on. Rules are clear, and teachers lead lessons from the front of the class. Academics report a similar picture across the country. Tim Oates of Cambridge Assessment, a testing company, lauds the country's rigorous, coherent curriculum.

Much of this can be learnt from. But any country hoping to import the Estonian model in its entirety is likely to be disappointed. The country has seen fast economic growth over the past three decades, which is associated with better results. And migration out of the country, combined with a lower birth rate, means the school population has fallen by 29% since 2000, leaving an unusual education system. Andreas Schleicher, head of education at the OECD, notes there is a "healthy degree of competition" between schools to attract the remaining pupils. In rural primary schools, it is not uncommon to have classes as small as two or three pupils, says Ms Reps, meaning they receive something akin to private tuition. One school even managed to stay open for two years without any children—something other countries will probably choose not to copy. ■



教育

芬兰寓言

PISA的结果可能会令决策者误入歧途。但它们仍然重要

一九九一年爱沙尼亚脱离苏联独立后，抓住机会重塑该国的教育体系。现任教育部长玛伊丽斯·莱普斯（Mailis Reps）说，当时的官员和政客为寻求启发，把从美国到荷兰等各国的经验看了个遍。但他们总会回过头来看看北欧邻国。莱普斯回忆说，在各种辩论中，结论经常是：“这在瑞典或芬兰成功了，我们也这样试试。”

其他许多国家也这么做过。经合组织每三年发布一次国际学生评估项目（PISA）的测试结果，最新结果于12月3日发布。PISA面向经合组织成员国（多为富裕国家）及该组织以外自愿参加国的15和16岁学生，测试其阅读、数学和科学能力。测试结果提供了一种直接比较不同教育体系的方法。自首次发布结果以来至今已近20年。当年首次测试有一个结果出人意料：以前从未因教育而闻名的芬兰在阅读这一项上位列榜首，在其他方面也表现优异。

这个北欧国家那时似乎找到了一种方法，在取得出色成绩的同时，不必像当时同样位居榜单前列的日本和韩国等东亚国家那样纪律严明，课业繁重。教育学家蜂拥来到赫尔辛基考察。他们的考察结果显示，芬兰的教育不仅免费、全面，教师也非常受尊重，他们训练有素，在工作中自主程度高，常常让孩子们自己去探索和发现。从苏格兰到韩国，许多国家的学校都试图模仿芬兰模式。事实上，由于外国人的考察变得非常普遍，芬兰政府开始收取费用。现在考察一所学校需支付1200多欧元（1300美元）。

但是，芬兰的教育乌托邦形象现在似乎有些过时了。PISA最近几次结果显示，自2006年以来，芬兰每次测试的平均得分都在下降。贫富学生之间的成绩差距正在扩大，这对于一个以平等为荣的国家来说令人担忧。曾经只是模仿芬兰的爱沙尼亚如今已成为经合组织中成绩最好的国家。爱沙尼

亚教育部秘书长马特·莱德梅茨（Mart Laidmets）难掩自豪地指出，尽管亚洲各国的教育考察团仍会飞往赫尔辛基，但他们越来越多地只是将它作为前往爱沙尼亚首都塔林（Tallinn）的经停站。

芬兰的故事有助于解释为什么自PISA推出以来，测试结果总体而言几乎没有提升。千年之交时的希望是，PISA测试提供的大量新信息将有助于发现某些教育体系的成功经验。其他国家将可以效仿，推动测试成绩全面提高。但是，尽管过去十年间经合组织国家学生的人均教育经费增加了15%，但学生在阅读、数学和科学方面的表现与测试刚推出时基本相同。

与以往一样，今年的结果有很多亮点（见图表）。新加坡本就优异的分数又上一层楼。即使这样，它也不再是总成绩最高的国家。今年排名第一的是中国，或者更确切地说是北京、上海、江苏和浙江（经合组织因无法保证准确性而拒绝纳入中国其他地区的结果）。约旦、波兰和土耳其等教育体系未被深入研究的国家排名也有所提升。然而，有约旦这样排名提升的国家，就有芬兰这样退步的国家。

成绩整体上没有进步的部分原因是，学校对成绩的影响比普遍认为的小。文化以及成人文化水平等其他社会因素的影响更大，这意味着即使是充分了解情况的政策制定者也只能起到有限的作用。正如伦敦大学学院的约翰·杰里姆（John Jerrim）所说：“东亚国家总是会名列前茅。”而且数据表明，教育支出增加到一定水平（学生从6至15岁的人均累计支出约五万美元）之后，它和PISA分数之间的关联就不大了。

从爱沙尼亚和芬兰可以看出文化的重要作用。两国历史上很早就实现了较高的民众文化水平，这通常是当地新教教会鼓励的结果。“大家普遍认为，”莱普斯说，“也许我们没有黄金钻，但教育就是我们的无价宝。”以姆明（Moomin）为主角的儿童系列绘本诞生于芬兰，这种圆墩墩的白色生物深受世界各地青少年的喜爱。芬兰各地图书馆众多，位于赫尔辛基市中心火车站旁的赫尔辛基颂歌中央图书馆（Oodi）屋顶呈缓坡状，十分壮观，是为庆祝芬兰独立百年而建，耗资9800万欧元。这些对于其他国家

来说都难以复制。

还有其他因素教育部长无法左右。移民的影响很大，大多数国家的新移民测试得分低于当地人。过去十年里，芬兰参加PISA测试的移民学生人数小幅增加。这些学生中超过五分之四的人在家里不说芬兰语，这有助解释他们和当地学生在成绩上的巨大差距。爱沙尼亚的移民学生数量也有类似的增长，但其中穷人的比例要比芬兰新移民小得多。

芬兰测试成绩下降可能会让那些急于效仿其教育模式的学究们显得愚蠢。但是，深入了解后会发现，芬兰模式仍有许多经验可供借鉴。尽管芬兰以快乐教育闻名，但它曾经采用的是略微严苛的方法。1996年，也就是PISA首批结果公布的四年前，一群英国研究人员访问了芬兰。他们发现“全班都按照老师定下的节奏，逐行逐字地学习教科书上的内容……我们去了很多学校，发现课堂内容几乎一模一样，就算换个老师，学生也不会发现有什么不同”。正如经济学家加布里埃尔·海勒·萨格伦（Gabriel Heller Sahlgren）指出的那样，大多数在第一轮PISA测试中得分高的学生都经历过这种教学方式。

等到结果公布时，许多芬兰学校已经开始朝着完全不同的方向发展，令前来考察的官员们困惑不已。赫尔辛基大学和奥卢大学（University of Oulu）的安诺·萨里宁（Aino Saarinen）及其同事即将发表的一项研究分析了2012年至2015年的PISA数据，发现在给学生更多自由来开展自主学习的学校，学生的数学和科学得分较低。贫困和移民家庭的学生得分最低。芬兰的学校放弃了在照本宣科和自主学习之间找到一个恰当折中点的可能性，自那以后一直在不停探索新模式。一批没有教室的新学校正在建设之中。2016年开始引入的课程大纲鼓励上课内容不明确分科。

尽管如此，爱沙尼亚和芬兰的教育体系在组织方式上仍有许多相似之处。例如，私立学校都很少，而且都试图尽量减少考试和按能力分班。在位于塔林市中心的雅各布·韦斯特霍尔姆学校（Jakob Westholm School），校长兰多·库斯蒂克（Rando Kuustik）的办公室略显古板，墙上挂满了爱沙

尼亚领导人的画像和一面国旗。不过，这位校长说他的首要任务是让学生快乐，第二个任务是“帮助他们提高应对社会的能力”。

但是，尽管库斯蒂克手下的老师们已经开始通过展开更多分组学习等形式来微调教学风格，但他说：“我们仍然是一所非常传统的学校。”在学生开始分组学习之前，老师会确保他们已经充分理解了教学内容。课堂规则很明确，而老师们站在教室前面授课。根据学者们的报告，全国各地的情况相似。测试公司剑桥大学国际考评部（Cambridge Assessment）的蒂姆·奥茨（Tim Oates）盛赞爱沙尼亚课程体系严谨又一以贯之。

这样的教育模式有很多可以学习的地方。但是任何想照搬照抄爱沙尼亚模式的国家多半会失望。该国在过去的30年中实现了快速的经济增长，这也与学习成绩的提升有关。爱沙尼亚向国外移民的人数增加，再加上出生率降低，自2000年以来在校学生人数减少了29%，这就形成了一个不同寻常的教育体系。经合组织的教育负责人安德烈亚斯·施莱歇尔（Andreas Schleicher）指出，为吸引不多的生源，学校之间“健康竞争”。莱普斯说，在农村地区的小学，只有两三个学生的班级并不少见，这意味着学生接受的教育类似于私教。一所学校甚至在没有学生的情况下坚持了两年，其他国家可能不会复制这种做法。■



America v China

A profitable student

Should the World Bank still lend to China?

THE CARIBBEAN islands of St. Kitts and Nevis are known for luxury tourism (visitors include Meryl Streep and Oprah Winfrey), pricey citizenship (on sale for \$150,000), and a sprint world champion (Kim Collins). But despite the country's many assets (including a national income per person of over \$18,000) it is eligible for loans from the World Bank, an institution dedicated to eradicating extreme poverty.

Because the islands are so small, this draws little comment. Not so for China. Its income per person is half that of St. Kitts and Nevis, and lower than that of Poland, Malaysia, Turkey and 15 other potential borrowers. But its eligibility to borrow from the World Bank strikes many Americans as anomalous, even scandalous.

One of them is President Donald Trump. “Why is the World Bank loaning money to China? Can this be possible?” he tweeted on December 6th, a day after the bank discussed a new five-year lending framework for America’s rival. Another used to be the World Bank’s president, David Malpass, in his former job as an American treasury official. In 2017 he argued that “it doesn’t make sense to have money borrowed...using the US government guarantee, going into lending in China”. Steven Mnuchin, the treasury secretary, heard similar sentiments in a congressional hearing on December 5th. “What are you doing to stop those loans?” asked a Democrat. “It’s unconscionable to me that our taxpayers should...be subsidising the Chinese growth model,” said a Republican. On this question, at least, America’s legislature is almost as harmonious as its Chinese counterpart.

America had objected to the new framework, Mr Mnuchin said. But it cannot have surprised him. In a deal struck last year, America agreed to an increase in the bank's capital, in return for which the bank agreed to charge its richer borrowers higher interest rates, lend to them more sparingly and encourage more of them to "graduate" (ie, cease to be eligible for the bank's loans).

But graduating from the bank is like graduating from a German university: neither brisk nor uniform; leaving behind many *dauerstudenten* (eternal students). Once a country reaches a national income of \$6,975 per person, a "discussion" begins. The bank also considers a country's access to capital markets and the quality of its institutions. Of the 17 countries that have graduated since 1973, five later sank back into eligibility, according to a study by the Policy Centre for the New South, a Moroccan think-tank. South Korea left in 1995, then needed the bank's help in the Asian financial crisis. It remained eligible for further loans until 2016, when its income per person was almost three times China's current level.

The bank will, however, lend to China more selectively. The country now owes it about \$14.7bn. Over the next five years, it envisages lending \$1bn-1.5bn a year, 15-40% less than it averaged in 2015-19. The new money aims to encourage fiscal reforms, private enterprise, social spending and environmental improvements. If the bank can help nudge China towards cleaner growth that will benefit everyone, including China's geopolitical rivals. It also hopes to finance pilot projects that poorer countries can learn from. It has paid for Ethiopian officials to study China's irrigation and Indian officials to study its trains.

But would the money not be better spent in poorer countries themselves? The bank's friends point out that its lending to China earns a tidy profit (roughly \$100m last year). It charges China a higher interest rate than it pays on its own borrowing. That is money that can then be used to help poor people who live elsewhere.

In theory, its donor governments could do all this more cheaply and simply themselves. They could issue an equivalent amount of low-yielding sovereign bonds, buy higher-yielding emerging-market securities and donate any profits to low-income countries. But that is not what critics of China's lending are proposing.

Given the profits it can earn, the bank is eager to keep lending to China. Harder to explain is why China wants to keep borrowing from the bank. The sums are small (0.01% of GDP) and the process can be cumbersome. China may value the bank's expertise. But if so, why not buy it without a loan attached?

There are examples of China doing just that. It bought advice on how to improve in the bank's assessment of the ease of doing business. But China may feel a loan gives the bank more skin in the game. Consultants paid only for advice can always blame disappointments on poor implementation of their sound prescriptions. A lender has a greater stake in solving difficulties. Institutions like the bank and the IMF stress the importance of borrowers taking "ownership" of reform programmes. China may feel the same about the lenders it deigns to borrow from. ■



美中对阵

富家学子

世界银行还该不该贷款给中国？

圣基茨和尼维斯联邦这个加勒比岛国以豪华旅游业（游客包括梅丽尔·斯特里普和奥普拉·温弗瑞）、昂贵的公民身份（售价15万美元）以及一位世界短跑冠军（金·柯林斯）闻名。尽管该国资产不少（其中人均国民收入超过18,000美元），但仍有资格从世界银行这家以消除极端贫困为己任的机构申请贷款。

这个岛国太小了，所以它的贷款资格并未招来多少议论。中国就不一样了。它的人均收入是圣基茨和尼维斯联邦的一半，而且低于波兰、马来西亚、土耳其以及其他15个有资格借钱的国家。但许多美国人认为中国能向世行借钱有违常规，甚至可耻。

这些美国人包括特朗普。“世界银行为什么还贷款给中国？这怎么可能呢？”他在12月6日发推文写道。前一天，世行讨论向美国的劲敌中国提供新的五年贷款框架。世行行长戴维·马尔帕斯（David Malpass）当年担任美国财政部官员时也反对向中国提供贷款。2017年，他表示：“以美国政府担保……借钱给中国是没有道理的。”美国财政部长史蒂文·努钦在12月5日的国会听证会上也听到了类似的声音。“你有没有采取什么措施阻止那些贷款？”一位民主党的议员问他。“在我看来这简直没有天理，我们的纳税人竟然……在补贴中国的增长模式。”一位共和党的议员说。至少在这个问题上，美国的议会和谐一致如中国的人大。

努钦表示，美国已经反对过这个新贷款框架。但是，他本人不可能对它感到多吃惊。在去年达成的一项协议中，美国同意向世行增资，相应地，世行同意向较富裕的借款国开出较高的利率，更节制地向它们放贷，并鼓励其中的更多国家“毕业”（即不再有资格申请世行的贷款）。

但是，要从世行毕业就像要从德国的大学毕业那样，既不轻松麻利，也不

整齐划一，结果留下许多“永远的学生”（dauerstudenten）。一旦一个国家的人均国民收入达到6975美元，世行就会启动一轮“讨论”。它还会考虑该国对资本市场的利用情况及其体制的质量。根据摩洛哥智囊组织“新南方政策中心”（Policy Centre for the New South）的一项研究，1973年以来已毕业的17个国家中有五个后来又重获贷款资格。韩国于1995年离开，但之后在亚洲金融危机中又寻求世行协助。它之后一直享有这一资格，直到2016年——当时其人均收入几乎是中国目前水平的三倍。

然而，世行将更有选择性地向中国放贷。中国目前在世行的贷款总额约为147亿美元。未来五年，世行计划每年向中国放贷10亿至15亿美元，比2015年至2019年间的平均水平低15%至40%。新的贷款旨在鼓励财政改革、私企发展、社会性支出和环境改善。假如世行能助推中国实现更环保的增长，各方都将受益，包括中国的地缘政治竞争对手。世行还希望向可供贫穷国家借鉴的试点项目提供贷款。它已经资助埃塞俄比亚官员研究中国的灌溉系统，以及资助印度官员研究中国的铁路发展。

但是，这些钱如果直接花在穷国身上，收效是否会更大？世行支持者指出，世行通过贷款给中国获得了可观的利润（去年约为一亿美元）。它对中国收取的利率高于自身借款的利率，由此产生的资金可用于帮助其他地区的穷人。

理论上，其资金赞助国政府自己可以以更低的成本、更简单直接地做到这一切。它们可以发行同等数量的低收益主权债券，购买高收益的新兴市场证券，并把产生的任何利润捐赠给低收入国家。但这并不是质疑世行贷款给中国的批评者的提议。

鉴于有利可图，世行十分愿意继续向中国放贷。比较让人费解的是中国为何一直要从世行借钱。这些借款的总额很小（占其GDP的0.01%），而且流程繁复。中国可能是看重世行的专业度。但若果真如此，直接购买它的服务就好了，何需借款呢？

中国确实也买服务。它曾为了改善自己在世行的营商环境评估中的成绩购

买咨询。但中国可能认为向世行借款会让后者共担风险。收钱提供咨询的顾问总能辩解自己的方案合理明智，最终结果不如意是因为对方执行不力。而贷方则有更大的利害关系去帮助借方排忧解难。世行和国际货币基金组织等机构强调借方须对自己的改革计划“负责”。中国对于自己屈尊求助的贷方可能也有同样的想法。 ■



India's economy

Searching for a landing site

Output is growing at its slowest pace since 2013

GLOBAL INVESTORS once fell in love with India's growth "story" because of people like Shanmuga Subramanian. Educated in mechanical engineering, he became a computer programmer, working with Cognizant, an outsourcing firm, and Lennox, which makes heaters and air-conditioners. But that was not enough to exhaust his technological enthusiasms. He recently devoted four days of his spare time to scrutinising images of the Moon's surface, provided by NASA, searching for any sign of an Indian moon lander that disappeared in September. He eventually spotted an incongruously bright pixel, which NASA early this month confirmed was debris from the craft's crash-landing.

Unfortunately, India's growth story is in danger of repeating the lander's ill-fated trajectory. The explanation offered by India's space agency for the crash ("the reduction in velocity was more than the designed value") might apply equally well to the economy. GDP grew by just 4.5% in the 12 months ending in September. That is the slowest pace since 2013 (see chart).

Back then, India suffered from chronic inflation, high oil prices and an unsustainable current-account deficit, fragilities that were all cruelly exposed by a sudden deterioration in global investor sentiment known as the "taper tantrum". The present slowdown, though similar in its gravity, is quite different in its origins. Inflation is low, external imbalances are modest and oil prices are bearable. The decline began with a loss of confidence not among foreign investors, but among the country's own consumers.

Their spending began slowing in early 2018, according to some measures. Matters then took a sharp turn for the worse in September 2018 with the default of Infrastructure Leasing and Financial Services (IL&FS), one of many lenders outside the traditional banking system that had become a growing source of credit. Its failure cast doubt on many similar institutions, interrupting the flow of financing for purchases of big-ticket items like homes and cars. Sales of passenger vehicles slumped by 32% in September compared with a year earlier, their 11th monthly decline in a row.

Other consumer-facing industries have also suffered. Mobile-phone operators have faced predatory pricing from deep-pocketed conglomerates and “tax terrorism” from overzealous revenue collectors. Vodafone Idea reported a record loss of \$7bn in the third quarter, prompting Nick Read, Vodafone’s boss, to complain about unsupportive regulation, excessive taxes and a Supreme Court decision that forced operators to share additional revenues with the government.

The government dawdled in its response to the economic slowdown, perhaps because it was too convinced by its own economic boasts. Rahul Bajaj, an industrialist, has said that business people are afraid of criticising the government openly. (A day after making his complaints, Vodafone’s Mr Read felt the need to apologise.) But for several months now, the economic debris has been too conspicuous to ignore. The government has responded, haphazardly at first, but with increasing force. It has slashed corporate taxes from 30% to 22% for existing firms (and to 15% for manufacturing startups), quickened the recapitalisation of government-owned banks, reversed an unpopular tax increase for foreign investors and offered some relief to telecoms firms, among other things.

The government has also broached a judicious reform of labour laws. Last month it introduced a bill that would consolidate three existing laws, making it easier for firms to hire workers on fixed-term contracts (rather

than employing them on open-ended contracts that can be almost impossible to terminate). The new bill would still require firms with more than 100 employees to obtain government permission before laying anyone off. But it would give the government discretion to raise that threshold in future without further legislation.

Combined with five interest-rate cuts from the Reserve Bank of India, the central bank, these efforts should help stabilise the economy. Consumption is already growing faster than it was earlier in the year. Although it will take years to unclog the financial system properly, some of the panic over India's new breed of lenders has also dissipated. Financial institutions with good credit ratings can now borrow almost as cheaply as they did in early 2018 before the default of IL&FS.

One side-effect, however, is that the government's own borrowing is raising eyebrows. Last month Moody's said the outlook for India's credit rating was "negative" (although a downgrade would merely move Moody's assessment of India into line with rival rating agencies). The government is almost certain to miss its deficit target of 3.3% of GDP for this fiscal year, which ends on March 31st. And if the states and government-owned enterprises are included in the total, the combined fiscal deficit could reach 8.2% of GDP, according to Goldman Sachs.

The government's reputation for economic management is also now in deep deficit. In response to the latest growth figures, one member of parliament for the ruling party said it was wrong to treat GDP as the truth like the "Bible, Ramayana or Mahabharat". Unfortunately, many economists now agree with him—doubt in the veracity of the official figure has grown since a new methodology was introduced in 2015. Arvind Subramanian, who previously served as the government's chief economic adviser, has argued that India's growth may have been overstated by 2.5 percentage points a year over the five-year period from 2011-12 to 2016-17. If any consolation can be drawn

from the latest miserable GDP number, it is only that the official data are not so flawed that they cannot register the bad news.

India's space agency was slow to acknowledge that its lander had been destroyed (insisting at first that it was still trying to communicate with it). After NASA confirmed Mr Subramanian's discovery of the crash site, the Indian agency said that it had found it weeks ago. But for some reason it neglected to reveal the location to the outside world. India's dogged and passionate professionals are one reason global investors fell in love with the country's growth story. Its unhelpful government institutions are one reason their ardour has since dimmed. ■



印度经济

搜寻坠落点

经济增速跌至2013年以来的最低点

全球投资者一度爱上了印度的成长“故事”，因为那里有像尚穆加·苏布拉马尼安（Shanmuga Subramanian）那样的人。他机械工程专业出身，后来成为计算机程序员，供职于外包公司高知特（Cognizant）和暖通空调制造商雷诺士（Lennox）。不过这还不能满足他对技术的热爱。最近他花了四天的闲暇时间仔细研究NASA提供的月球表面图片，寻找9月失联的印度登月着陆器的蛛丝马迹。最终他发现了一个异常的像素亮点，NASA在本月初证实这正是坠毁的着陆器的残骸。

遗憾的是，印度的成长故事有可能重蹈这个着陆器的覆辙。印度航天机构对坠毁的解释是“降落时的减速超过了设计值”，这恐怕同样适用于印度经济。在截至9月底的12个月里，印度GDP增速仅为4.5%，跌至2013年以来的最低值（见图表）。

回到2013年，当时全球投资者患上了“量化宽松缩减恐慌症”，市场情绪突然恶化，导致印度那时的各种薄弱因素迅速发酵，包括长期通胀、高油价以及不可持续的经常帐户赤字。眼下经济减缓的程度与当年相似，原因却大不相同。目前印度通胀较低、对外收支不平衡的程度较轻，油价也可承受。触发此轮衰退的信心丧失并不发生在外国投资者中间，而在本国消费者当中。

部分指标显示，印度消费支出自2018年初就已开始放缓。2018年9月印度基础设施租赁和金融服务公司（Infrastructure Leasing and Financial Services，以下简称IL&FS）发生违约后，情况更是急转直下。以IL&FS为代表的传统银行体系以外的众多信贷机构在信贷供应中的份额不断扩大，IL&FS的违约让市场对大量同类机构感到忧虑，导致住房和汽车等大额消费的融资流中断。乘用车销量已经连续11个月下降，9月同比锐减32%。

其他面向消费者的行业也不景气。移动电话运营商一方面遭遇大财团掠夺式定价的竞争，另一方面苦于税收机关疯狂的“征税恐怖主义”。沃达丰印度子公司Vodafone Idea第三季度亏损达到前所未有的70亿美元，促使沃达丰CEO尼克·里德（Nick Read）发声抱怨缺乏支持性监管、税负过高，以及最高法院的裁定强迫运营商增加给政府的收入分成。

面对经济放缓，印度政府磨磨蹭蹭，也许是因为对自己在经济方面的自吹自擂深信不疑。实业家拉胡尔·巴贾吉（Rahul Bajaj）曾表示企业家不敢公开批评政府。（沃达丰CEO里德在发出抱怨后的第二天就向印度政府道歉。）但是最近几个月以来经济的破败实在已无法视而不见。政府开始做出反应，起初很谨慎，之后逐渐加大了力度。它把既有公司的税率从30%降至22%（制造业创业公司降至15%），加快了国有银行资本重组，取消了备受诟病的对外国投资者加税，为电信公司提供了一定的舒缓措施，等等。

此外，政府还提出了对劳动法审慎而明智的改革。上个月提出的一条法案将合并现有的三部法律，方便公司以固定期限合同来招聘员工（而不是几乎无法解雇员工的无固定期限合同）。根据新法案，雇员超过100人的企业仍然需要获得政府批准方可解雇员工。但它给予了政府日后放宽这一限制的裁量权，而无需再次立法。

结合印度央行实施的五次降息，这些措施应该有助稳定经济。消费增速现已高于今年前期。虽然还需要几年时间才能理顺金融体系，但对新兴借贷机构的恐慌已部分平息。信用评级良好的金融机构现在的借款利率已经降低，几乎回到了2018年早期IL&FS违约前的水平。

然而这一轮操作并非没有副作用，政府自身的债务规模引发了关注。上个月穆迪表示印度信用评级展望转为“负面”（不过这番下调也只是让穆迪的评级与其他评级机构的持平而已）。在截至明年3月31日的当前财政年度，印度政府几乎肯定无法实现占GDP3.3%的赤字目标。据高盛估算，如果将各个邦和国有企业纳入统计，合计财政赤字可能达到GDP的8.2%。

印度政府在管理经济方面的声誉如今也深陷赤字。一位执政党议员谈到最新的经济增长数据时宣称，不应将GDP奉为如同“圣经、《罗摩衍那》或《摩诃婆罗多》”一般的真理。很不幸，许多经济学家现在也这么认为——自2015年印度采用新方法计算GDP以来，他们对印度官方数据的真实性日益表示怀疑。政府前首席经济顾问阿文德·苏布拉玛尼安（Arvind Subramanian）曾提出，印度经济在2011-12至2016-17的五年间的增长速度可能每年被夸大了2.5个百分点。最新的GDP数据虽然惨淡，但可聊以自慰的是，官方数据至少还没有失真到无法反映糟糕的现状。

印度航天机构迟迟不肯承认着陆器已经坠毁（一开始它坚称仍在尝试与之联络）。直到苏布拉玛尼安发现撞击点并得到NASA证实之后，该机构才表示其实早在几周前就已找到残骸。但出于某种原因它未向外界透露坠毁点。印度执着热忱的专业人士是全球投资者爱上印度经济成长故事的原因之一，但它不给力的政府部门却让投资者的热情渐渐冷却。 ■



Buttonwood

More in Lahore

The perils and rewards of investing in economies in rehab

A RECENT EDITION of “The Joe Rogan Experience”, a popular podcast, features the comedian Artie Lange. Mr Lange is an engaging personality who, as he candidly admits, has battled with drugs and gambling. Not long out of his umpteenth period in rehab, he is working in stand-up again. “This business keeps taking me back,” he says with something like amazement.

Forgiveness for recidivists is found outside show business, too. In July the IMF approved a \$6bn bail-out for Pakistan. As the fund acknowledged at the time, with something like weariness, Pakistan is back in rehab less than three years after completing its previous programme. But the fund has not abandoned it. And nor have investors. Pakistan is enjoying a flood of foreign capital on the promise of reform. The Karachi stock index is up 25% since the start of October.

This may seem hard to fathom. The IMF regards the chance that its programme will fail as “particularly high”. Yet a band of investors are prepared to bet on success. A rehab economy such as Pakistan offers a rare opportunity. It is one of the few places where investors can find high interest rates, a devalued currency and cheap-looking stocks. True, things could go very wrong. Look at Argentina, which was embraced by investors after Mauricio Macri was elected in 2015 on a platform of orthodox economics, only to be abandoned when his reforms failed. But if things go right, the returns can be substantial.

Rehab economies follow a familiar pattern. The cycle begins when the economy bumps up against a budgetary or balance-of-payments constraint.

The trigger may be external: an oil-price shock, say, or a shift in policy by the Federal Reserve. Funding dries up. Then comes capital flight. Foreign-exchange reserves are run down so that the government can sustain the illusion that the local currency is worth more than it really is. Hard currency is then rationed. That leads to shortages of essential imports, which further hamper the economy.

With luck, at this point the authorities recognise the hole they are in. To get out of it, they must embrace more orthodox economics. In practice, this means letting the currency fall, getting rid of subsidies in order to cut the budget deficit, and starting to use monetary policy as a way to tame inflation rather than finance the government. Sometimes (but not always) the IMF is brought in to lend hard currency and give policy advice.

This, more or less, describes events in Pakistan leading up to mid-2019. It also describes the cycle in Egypt up to the start of 2016 when it entered its (successful) IMF programme. And, for that matter, it is the same pattern seen in Pakistan in 2012-13.

At this stage of the rehab cycle, if things are to go well, the fund's money needs to act as a catalyst for other sources of capital. This is needed as a kind of bridge finance—to pay for essential imports and allow the rebuilding of foreign-exchange reserves, until exports pick up in response to a cheaper currency. That might seem a big task. Economies in rehab are typically unstable places (Ireland in 2010 was a rare exception). Pakistan is unlikely to threaten Denmark's place at the top of global rankings of security, governance and development. But investors are not betting that a rehab economy will become a paragon, only that it will improve, at least a bit.

A first task is to lure back capital shifted offshore by rich locals when they saw the crisis coming. The twin attractions are the high interest rates needed to curb inflation and a cheaper currency, which acts as reassurance

against a further devaluation. Once the locals come back, yield-hungry foreigners will follow. And before long, so will stockmarket investors. Like Egypt, Pakistan has a wide range of listed companies for investors to buy—from industrial firms to banks to consumer stocks, says Andrew Brudenell of Ashmore, a fund manager. It may take a while for firms to see the benefits of improved economic stability. But investors are tempted to buy when stocks are trading at attractive price-to-earnings multiples.

Such bets can pay off handsomely. Reforms to improve macroeconomic stability have led to bountiful investment returns in surprising places. An obvious danger is that hardship and social unrest derail the reform process. Another is that reformed characters have a tendency to fall from grace again. But progress is never in a straight line. When the potential is great and the price is right, there will always be people willing to bet that next time will be different. ■



梧桐

加注拉合尔

投资正在康复治疗中的经济体的风险和回报

流行播客“乔·罗根的经历”（The Joe Rogan Experience）最新一期的主角是喜剧演员阿迪·兰格（Artie Lange）。兰格的个性很吸引人，他坦率承认自己曾与毒品和赌博作斗争。眼下，在第N次戒毒后不久，他重又演起了单口秀。“这一行总能重新接纳我。”他有点不可置信地说。

娱乐业之外也有一些地方对惯犯保持宽仁。今年7月，国际货币基金组织（IMF）批准了对巴基斯坦60亿美元的纾困。IMF当时也承认（口气不无厌倦），距巴基斯坦上一次完成康复治疗还不到三年，它就又回到了康复中心。不过IMF没有放弃它。投资者也没有。因为承诺改革，巴基斯坦正享受着外国资本的滚滚流入。卡拉奇股市指数自10月初以来上涨了25%。

这看似令人费解。IMF认为它此次康复计划失败的可能性“特别高”。但一些投资者准备好了押注成功。像巴基斯坦这样处于康复治疗中的经济体是个难得的机会。在这里，投资者可以找到高利率、贬值的货币和看上去不贵的股票，这样的地方现在很少。的确，情况可能会变得非常糟糕。看看阿根廷，毛里西奥·马克里（Mauricio Macri）在2015年凭借一套正统经济学的主张当选后，投资者对该国热情有加，但他的改革失败后他们就弃之不理了。但是，如果事情往好的方向发展，回报就会相当可观。

康复治疗经济体遵循一个熟悉的模式。当经济体遇到预算限制或国际收支平衡的制约时，这个周期就开始了。触发因素可能来自外部，比如油价冲击，或是美联储的政策转变。资金会枯竭。然后是资本外逃。外汇储备减少，这样政府可以维持本国货币的价值高于其实际价值的假象。接着政府会对硬通货实行定量配给。这导致基本进口商品短缺，进一步阻碍经济体的发展。

幸运的话，这个时候当局会意识到自己所处的困境。为了解困，他们必须

接受更正统的经济学理论。在实际操作中，这意味着让货币贬值，取消补贴以削减预算赤字，并且开始用货币政策来抑制通胀而不是为政府融资。有时（但并非所有时候）IMF会参与进来，提供硬通货贷款和政策建议。

这或多或少描述了2019年年中之前在巴基斯坦发生的情况。同时这也描述了埃及直至2016年初的周期，它在那时开始加入IMF的康复项目（获得了成功）。而巴基斯坦在2012至2013年也一样进入了这个康复中心。

到了康复治疗周期的这个阶段，如果一切顺利，IMF的资金需要充当其他资金来源的催化剂。需要用它作为一种过渡性融资来支付基本进口商品，并借助它重建外汇储备，直到出口因货币贬值而回升。这似乎是一项艰巨的任务。处于康复治疗中的经济体通常是不稳定的地方（2010年的爱尔兰是个罕见的例外）。巴基斯坦不太可能赶上丹麦在安全、治理和发展方面的全球高排名。但投资者并不是在押注这个康复中的经济体会成为一个典范，而是押注它会改善，至少会有一点点。

首要任务是把当地富人在看到危机来临时转移到海外的资本吸引回来。两大吸引力是抑制通胀所需的高利率和更便宜的货币，后者是防止进一步贬值的保证。一旦本地人的资本回来，渴望收益的外国人就会跟随。不久之后，股市投资者也将如此。基金管理公司Ashmore的安德鲁·布鲁德内尔（Andrew Brudenell）说，和埃及一样，巴基斯坦也有很多上市公司可供投资者购买，从工业企业、银行到消费品股票。企业可能需要一段时间才能看到经济稳定度改善的好处。但当股票以吸引人的市盈率倍数交易时，投资者就会忍不住买入。

这样的押注可能会获得不俗的回报。改善宏观经济稳定性的改革在一些意想不到的地方带来了丰厚的投资回报。一个明显的危险是困难和社会动荡会扰乱改革进程。另一个危险是经过改革的经济体往往回再次误入歧途。但是进步从来就不是一条直线。当潜力巨大且价格合适时，总有人愿意押注下一次会有所不同。■



Aviation

The panic button

An automatic landing system that passengers can use in an emergency

ON NOVEMBER 9TH 2018 a Piper Dakota light aircraft flying over Iowa broadcast a distress call. The pilot seemed to have suffered a heart attack. One of the other three people on board, a student aviator, had taken over the controls, but to no avail. The plane crashed shortly afterwards, killing all four.

How often such things happen is not well recorded. But an Australian report published in 2016 listed 15 cases in the five years from 2010 to 2014 of the pilots of small aircraft being incapacitated. In three of these the aircraft suffered what is known euphemistically in aviation circles as a “collision with terrain”. Occasionally, an instructor on the ground, perhaps assisted by a pilot flying alongside in another aircraft, has been able to provide an instant flying lesson to someone on board a plane that has lost its pilot, and talk them down successfully. But not often. It is tricky enough for a neophyte to keep an aircraft flying straight, level and on an appropriate bearing to arrive at a suitable airfield. Landing the thing safely takes a miracle. What small aircraft need in these circumstances is a panic button. And a firm called Garmin has now created one.

Garmin, a Swiss-registered, American-operated technology company, is best known for its GPS satellite-based navigation systems. But the firm also makes electronic control systems for aircraft. Autoland, as they dub the kit attached to their panic button, is a result of putting the two together.

Pressing the button switches control of the plane to its flight computers, in a manner similar to engaging an autopilot. Garmin’s system, however,

goes far beyond being a standard autopilot. It transmits an emergency radio code to alert air-traffic control and other planes in the area. It analyses weather conditions, winds and the amount of fuel available before selecting a suitable airfield to divert to. It then flies to that airport, descends, lines up on the runway, sets the flaps and lowers the landing gear. As it approaches touchdown, it crabs the plane slightly sideways to cope with any crosswinds and aligns the nose with the centre of the runway, just as a human pilot would. Once landed, it applies the brakes to bring the plane to a halt. It then turns the engine off.

Passengers are kept informed about what is happening via messages on a screen and voice announcements. They are advised not to touch the controls, but to sit back and fasten their seat belts. Simplified buttons that appear on a touchscreen let them operate the radio and talk to air-traffic controllers directly.

After around 1,000 successful test landings, Autoland is now going into service. It is about to become a standard feature on the Piper M600/SLS, a six-seater single-engined turboprop, and the Cirrus Vision Jet, a single-engined personal jet. Other aircraft are expected to follow. And Garmin is also looking at making a version which could be employed in smaller planes, such as those used at flying clubs.

Eventually, a beefier variant might also be developed for jet airliners. Though these operate with a co-pilot to backup the captain, there have been instances of both pilots being taken ill—for instance with hypoxia caused by insufficient oxygen. In such a case a member of the cabin crew or a passenger might be able to switch the system on. Alternatively, it could be activated automatically or remotely.

If an unsupervised system like this can fly and land an aircraft in an emergency, it does raise the question of why it should not do so routinely.

Bailey Scheel, the manager of the project is firm that, for the moment, Autoland is purely an emergency system. Nevertheless, it does look like another step on the road to dropping the co-pilot—and eventually the pilot, too. ■



航空

紧急按钮

一种在紧急情况下可由乘客启用的自动着陆系统

去年11月9日，一架Piper Dakota轻型飞机在美国爱荷华州上空发出遇险呼救。驾驶员似乎心脏病发作。机上另外三人中有一人是飞行学员，他接手控制飞机，但无济于事，不久后飞机坠毁，四人全部丧生。

还没有详尽的记录显示这类事件发生的频率。但2016年澳大利亚发布了一份报告，列出了2010年到2014年的五年间发生的15起小飞机飞行员丧失操控能力的案例。其中三例中，飞机遭到了被航空界委婉称为“与地形碰撞”的厄运。有时，地面的教练能够向失去飞行员的飞机上的某位乘客提供即时飞行教学（可能还有另一架伴飞飞机上的飞行员协助），指导他们控制飞机安全降落。但这并不常见。对新手来说，能操纵飞机保持直线水平飞行，并以正确的方向飞往合适的机场就已经很难了。要能安全着陆更是个奇迹。在这种情况下，小飞机需要的是一个紧急按钮。现在，佳明公司（Garmin）做出了一个。

佳明是一家在瑞士注册、在美国运营的科技公司，以制造GPS卫星导航系统闻名。其实该公司还生产飞机的电子控制系统。把这两者结合，就做成了与紧急按钮相连的系统，他们称之为“自动着陆”（Autoland）。

按下紧急按钮，飞机的控制权便由飞行计算机接管，类似于启动了自动驾驶仪。不过佳明的飞控系统远非一般自动驾驶仪可比。它会发送紧急无线电代码，通知该地区的空中交通管制中心和其他飞机。它会分析天气状况、风向和剩余燃料，以选择合适的机场降落。随后，系统会控制飞机飞到选定的机场，下降，进入跑道，设置襟翼档位并放下起落架。飞机快要着陆时，系统会像飞行员那样，让机身稍微侧倾以应对任何侧风，并让机头对齐跑道中心线。降落后，系统会启动刹车，使飞机停下来，然后关闭引擎。

系统通过机舱屏幕上的消息及语音通知让乘客了解飞行进程，并提示乘客不得触碰控制装置，而应该坐在座位上系好安全带。触摸屏上的简化按钮可让他们操作无线电系统，直接与空中交通管制员通话。

经过约1000次成功的着陆测试后，Autoland现已开始投用，即将成为六座单引擎涡轮螺旋桨飞机Piper M600/SLS和单引擎私人飞机Cirrus Vision Jet的标准配置。预计其他飞机随后也会加入。另外，佳明正在研究打造另一个适用于更小型飞机的版本，比如飞行俱乐部所用的飞机。

最终该公司可能还会针对喷气式客机开发更强大的版本。尽管这些客机有副驾协助机长，但也曾经出现过两名飞行员同时不适的个案，例如因氧气不足引起缺氧。在这种情况下，机组人员或乘客就可以启动上述飞控系统，或者也可以自动或远程激活这个系统。

如果这类无人值守系统可以在紧急情况下操控飞机飞行并降落，显然会促使人们发问：何不在正常状况下也用它们来驾驶飞机？项目主管贝利·斯格利（Bailey Scheel）坚称目前Autoland只是个应急系统。尽管如此，这看来确实像是朝着舍弃副驾乃至最终舍弃机长的方向又迈进了一步。■



Auto-history

A severe contest

Has The Economist made history, as well as reporting it? In his new history of the newspaper, Alexander Zevin says it has

“I AM NOT a dedicated reader of *The Economist*,” confessed Roy Jenkins, a British statesman who died in 2003; it is “essentially a journal for foreigners”. Luckily for the newspaper, most people are foreigners. This may be one reason why it thrives at the age of 176, with a largerprint circulation than it had before the internet.

According to Alexander Zevin, a historian at the City University of New York, *The Economist* is not merely a spectator of global affairs but an actor in them. It “shaped the very world its readers inhabit”, because of its links to politicians and financiers. “Liberalism at Large: The World According to the Economist” is based on his doctoral dissertation, which examined the weekly from its birth in 1843 to 1938. It supplements and updates Ruth Dudley Edwards’s more-or-less official account, “The Pursuit of Reason: The Economist 1843-1993”.

Yet the two authors tell very different tales. Ms Dudley Edwards identified *The Economist*’s creed as the belief that governments are more imperfect than markets. Mr Zevin is more oblique. He aims to present the annals of *The Economist* as “a history of liberalism”. The paper, he argues, has been guided by “the universal virtues of capital and...necessities of empire”. Since this brand of “liberal” thought has, he says, been the most consequential one, *The Economist*’s history is also that of “actually existing liberalism”—a nod to a Marxist term for the ugly realities of capitalism.

Ms Dudley Edwards thought *The Economist*’s main defects were “arrogance, priggishness, absence of doubt, frequent failures of imagination and too-

clever-by-halfery". Mr Zevin's judgment is harsher. The result of following *The Economist's* advice about the Irish famine of the 1840s was "on par with the better-known holocausts of the twentieth century". A decade later, the paper was "just as ruthless with Indians as with the Irish or Chinese". And after championing light regulation in the late 20th century, its response to the crash of 2008 was "breathtakingly unrepentant". Mr Zevin does not actually say the post-war *Economist* has been a market-fundamentalist lickspittle of Western intelligence agencies, but that is the politely expressed drift.

If *The Economist* has ever got anything right, readers don't hear much about it. Nor is there much acknowledgment that markets ever work—for example, by delivering a seismic drop in global poverty since the 1980s. A parodic gibe at globalisation's critics from an editorial in 2003 springs to mind: "Show us an economic miracle, and we will show you the failure of capitalism."

Given its heartless perfidy, it is perhaps odd that *The Economist* is read by anyone outside the ermined ranks of "the aristocracy of finance", to quote Marx's description of its audience in 1852. Yet it is. And according to the Pew Research Centre, an American think-tank, its readership in its largest market skews left. Pew classifies 18% of American readers as mostly or consistently conservative, and 59% as mostly or consistently "liberal" (in the American sense, left-wing in the British one).

"Ideas have mattered most" to *The Economist's* success, Mr Zevin believes. That is questionable. Engaging with its editorials is no doubt part of its appeal. Yet they account for only around 5% of articles; what most distinguishes the rest is their way of dealing with the news. Brevity abounds. So do charts. Dispatches from 21 foreign bureaus are, in a good week, put in a global and historical context. There are, in short, more facts per square inch than in perhaps any other weekend reading matter.

Mr Zevin is not the first to tie himself in knots trying to define liberalism. *The Economist* sometimes does the same. He is to be thanked for a critique of the paper which, though skewed, pays it the compliment of taking it very seriously. ■

Anthony Gottlieb We identify the reviewers of books connected to *The Economist* or its staff. Anthony Gottlieb worked at the paper from 1984 to 2006 and is the author of a multi-volume history of philosophy. ■



自家历史

殊死较量

《经济学人》在报道历史的同时，是否也创造了历史？在有关本刊历史的新作中，亚历山大·泽文认为的确如此【《大致是自由主义：〈经济学人〉眼中的世界》书评】

“我不是《经济学人》的忠实读者，”2003年去世的英国政治家罗伊·詹金斯（Roy Jenkins）坦承，它“本质上是一本给外国人看的刊物”。幸好，对于本刊来说，世界上大部分人都是外国人。这可能是它在176岁高龄还能长盛不衰的原因之一，它目前的印刷发行量比互联网出现之前还要大。

纽约市立大学的历史学家亚历山大·泽文（Alexander Zevin）认为，《经济学人》不仅是全球事务的旁观者，也是其中的参与者。因为它与政客和金融家之间的联系，它“塑造了它的读者身处的这个世界”。《大致是自由主义：眼中的世界》（Liberalism at Large: The World According to the Economist）一书是在他的博士论文的基础上写就的，论文研究了这本周刊自1843年创刊到1938年走过的历程。它补充并更新了露丝·达德利·爱德华兹（Ruth Dudley Edwards）差不多可算官方论述的著作：《追求理性：1843到1993年的〈经济学人〉》（The Pursuit of Reason: The Economist 1843-1993）。

不过两位作者讲述的故事迥然不同。达德利·爱德华兹认为《经济学人》的信条是笃信政府比市场更不完美。泽文则比较隐晦。他的目标是把《经济学人》的编年史呈现为“一部自由主义的历史”。他认为，这份刊物一直以“资本的普遍优点和...帝国的必要性”为指导。既然这一招牌式的“自由主义”思想一直都是最重要的，那么《经济学人》的历史也就是“实存自由主义”的历史。作者在此致敬了马克思主义者对资本主义丑陋现实的一个表述。

达德利·爱德华兹认为《经济学人》的主要缺点是“傲慢、自负、缺乏怀疑、经常缺乏想象力和聪明过头”。泽文的评价就更不客气了。他称《经济学人》对19世纪40年代爱尔兰饥荒的建议“堪比20世纪那些更广为人知

的大屠杀”。十年后，该刊“对印度人就像对爱尔兰人和中国人一样冷酷无情”。在20世纪末倡导“放松监管”之后，该刊对2008年金融危机的反应是“惊人地不思悔悟”。泽文没有明言战后的《经济学人》是一个对西方情报机构溜须拍马的市场原教旨主义者，但委婉地表达了这层意思。

如果《经济学人》曾经做对过什么，读者也没听说过多少。就像人们也没有怎么认可市场的作用一样，例如自上世纪80年代以来市场帮助大幅降低了全球贫困率。这让人不禁想起这本刊物在2003年的一篇社论中对那些批评全球化的人们的戏谑嘲讽：“向我们展示一个经济奇迹，我们就会向你展示资本主义的失败。”

考虑到它无情的背信弃义，《经济学人》的读者中如果有人不属于披貂戴裘的“金融贵族”（马克思在1852年对这些读者的称呼），或许有些奇怪。然而的确有这样的读者。据美国智库皮尤研究中心称，该刊最大的市场上的读者群偏左派。皮尤将18%的美国读者归为大体上或坚定的保守派，59%归为大体上或坚定的“自由派”（美国人认为的自由派就是英国人认为的左派）。

泽文认为对《经济学人》的成功“至关重要的是观点”。这有待考证。品评社论无疑是其吸引力的一部分。不过社论只占所有文章的5%左右；最能令其余部分与众不同的是它们处理新闻的方式。处处简洁。图表也是。普通的一周里，来自21个外国分社的报道被置于全球和历史的背景下。简单来说，每平方英寸版面上的事实密集度可能比其他任何周末读物都要多。

努力定义自由主义却让自己陷入了混乱——泽文并非第一人。《经济学人》有时也这样。他对本刊的批评值得感谢，尽管有偏颇之处，但他非常认真，这就是对本刊的恭维。





China's economy

Life after tariffs

As America raises its walls, China's exporters find new terrain

A YEAR AGO an economic forecasting unit in the Chinese government published an outlook for the coming year. The big worry, it concluded, was the external environment. Shipments to America, China's biggest customer, would suffer as the trade war dragged on. China had maxed out its exports to other big countries, and others were too small to make a difference.

So China's boffins are, like many others, surprised by how things have gone. Exports to America are indeed down, by nearly 15% so far this year. But exports to the rest of the world have been much stronger (see chart). China, it turns out, had more to sell to its big customers: exports to Europe are on track to surpass exports to America this year. Meanwhile exports to smaller markets in South-East Asia, such as Vietnam and Malaysia, have boomed.

According to data from CPB World Trade Monitor, China's share of global exports has reached 11.9%, slightly higher than in July 2018, when the first American tariffs hit. Sluggish imports—in part because of a domestic slowdown—mean the trade surplus is set to be about a quarter bigger in 2019 than in 2018.

One explanation for China's resilient exports is the yuan's 6% depreciation against the dollar since the trade war began. That has blunted the tariffs' impact. China's currency has also weakened against other major trading partners.

A second is goods routed through other countries to avoid tariffs. Some sent to South-East Asia have ended up in America. Vietnamese customs

officials have stepped up checks of everything from seafood to aluminium to ensure that they are not relabelled Chinese goods. Julian Evans-Pritchard of Capital Economics, a research firm, estimates that American tariffs have cut Chinese GDP growth by about 0.6 percentage points, but that trans-shipments through South-East Asia may have lifted it back up by 0.3 percentage points.

There is also a third, more positive explanation: Chinese companies are highly competitive. Once an assembly centre, China now makes more of the inputs that go into final goods. Its efforts in high-tech sectors such as semiconductors are well-known. But it is making lower-tech progress more broadly. The Chinese light-industry council, representing toymakers, food firms and the like, estimates that its 100 most technologically advanced members invest 2.5% of revenues in research and development, high by international standards; it is pressing them to hit 3%.

The road ahead will not be easy for Chinese exporters. The longer American tariffs last, the more likely American buyers are to find alternatives. The fall in Chinese sales to America has accelerated recently.

On December 4th Chinese exporters of machinery and electronics met for their annual conference. The theme was “flourishing together along One Belt, One Road”, in line with the government’s policy of promoting economic ties with Asia, Africa and Europe. In previous years that might have been politically astute positioning. Now it looks like a survival strategy.





中国经济

征收关税之后

当美国竖起围墙时，中国的出口商发现了新大陆

一年前，中国政府的一个经济预测部门发布了一份对来年的经济展望。报告总结说最大的担忧是外部环境。随着贸易战的持续，中国对其最大客户美国的出口将受到影响。中国对其他大国的出口已经达到了极限，而对其余国家的出口量太小，无足轻重。

因此，中国的研究人员和其他许多人一样，对形势的发展感到惊讶。对美出口确实下降了——今年到目前为止下降了近15%。但中国对世界其他地区的出口变得强劲了许多（见图表）。事实证明，中国有更多的东西可以卖给它的那些大客户：对欧洲的出口今年有望超过对美出口。与此同时，对越南和马来西亚等东南亚较小市场的出口也在蓬勃发展。

荷兰经济政策分析局（CPB）的“世界贸易监测”（World Trade Monitor）的数据显示，中国占全球出口的份额已达到11.9%，略高于2018年7月美国首次加征关税时的水平。进口呈现疲软，一定程度上是因为国内经济放缓，这意味着2019年的贸易顺差将比2018年高出四分之一左右。

中国出口之所以有韧性，一个可能的原因是自贸易战开始以来人民币兑美元贬值了6%。这削弱了关税的影响。人民币兑其他主要贸易伙伴货币的汇率也有所下降。

第二个原因是有些货物经由其他国家转运以避开关税。一些被发往东南亚的商品最终到了美国。越南海关官员已经加强了对从海鲜到铝的各种商品的检查，确保它们不是重新贴上标签的中国商品。研究公司凯投宏观（Capital Economics）的朱利安·埃文斯-普里查德（Julian Evans-Pritchard）估计，美国的关税导致中国的GDP增速降低了约0.6个百分点，但通过东南亚的转运可能又将它拉回了0.3个百分点。

还有第三个更积极的解释：中国企业的竞争力非常强。中国曾经是一个组装中心，如今它生产了更多进入最后制成品的部分。它在半导体等高科技领域的努力人所共知。而在更大的范围内，它正在推动低技术产业的进步。代表玩具制造商、食品公司等企业的中国轻工业联合会估计，其100个技术最先进的会员企业将2.5%的收入用于研发，按国际标准这已然不低，该联合会正推动它们将这一比重提高到3%。

对中国出口商来说，前路并不平坦。美国征收关税的时间越长，美国买家找到替代方案的可能性就越大。近期，中国对美出口下滑的速度已经加快。

中国机械和电子产品出口商在12月4日召开了年度会议。会议的主题是“一带一路共创繁荣”，这符合政府促进与亚非欧经济联系的政策。在前几年，这可能是一种精明的政治表态。现在看起来则像是一种生存策略。 ■



Diabetes

Sugar high

As China puts on weight, type-2 diabetes is soaring

MORE THAN 30 years ago, doctors in the northern city of Daqing began a pioneering long-term study into the prevention of type-2 diabetes, a disease which was then thought to affect about 1% of Chinese. When doctors, academics and officials convened there this autumn to discuss the conclusions and promote prevention work, they faced a very different reality. About 11% of Chinese adults now have the condition, nearly the proportion in America and twice the level in Britain. Type-2 diabetes is becoming more common globally, but in recent years its prevalence has been growing fastest in China.

Diabetes is a dysfunction in the body's regulation of blood-sugar levels. Type 1 is rare and usually shows up early in life, triggered by factors that are not yet well understood. It can kill swiftly unless managed with daily injections of insulin. Type 2 is far more common, accounting for more than 90% of cases worldwide. It tends to develop in adults, especially if they are overweight or do not exercise much. It can usually be controlled with pills and lifestyle changes, and can sometimes be reversed. Both types, if not well-treated, can cause complications such as organ damage, blindness, strokes and heart attacks.

China has an estimated 116m diabetics, by far the highest number of any country. Twenty years ago it had fewer than 25m. The dramatic increase, almost entirely involving type 2s, worries the government. The study in Daqing showed how lifestyle changes can prevent type 2 among people with impaired glucose tolerance, which is sometimes a prelude to the condition. But the country's health-care system is ill-equipped to ensure symptoms are

detected, let alone help people with them.

A big reason for the increase is that as people get richer they often consume more processed foods and sugary drinks. One in seven Chinese adults is obese, including a quarter of adults in Beijing, China's fattest city. The urban share of the population has grown from less than 20% to about 60% since 1980. City dwellers tend to be less physically active than people in rural areas.

There may be a genetic link, too. Research finds that ethnic-Han Chinese are acquiring type 2 diabetes while younger and thinner than Caucasians. Smoking is another factor. China has one-fifth of the world's population but consumes one-third of its cigarettes. About half the country's men smoke daily. The speed of China's recovery from Mao-era destitution may also be relevant. Chinese experts have found that people underfed as children are more likely to acquire diabetes in later life.

China's health system is not coping well. The most recent national survey, in 2013, found that nearly 65% of China's diabetics were unaware of their condition (in America it is about 25%). Only about one-third were getting treatment. Among those receiving it, only about half were keeping their blood-sugar levels within a healthy range. Another study showed that the proportion of diabetics who were managing not only to control their blood sugar, but also their blood pressure and cholesterol—measures that also help avoid complications—was lower still. Some of them turn to quack remedies.

Despite the prevalence of type 2, public understanding of the condition is woeful. There is little appreciation of how modern medicine can control it. Poorly educated people in remote communities sometimes worry that it is infectious, says Yang Lijun, the manager of a website for diabetics.

Such views lead to discrimination. The civil service refuses to hire people with diabetes. Official guidelines allow universities to do so, too. This is more likely to affect type-1 diabetics, because their form of the condition is more common in the age group applying for university places or junior government jobs. But the rules make no distinction between the types.

Managing patients with diabetes requires a health-care system that can help them understand their condition, adhere to prescribed treatments and encourage regular check-ups. This is costly. In recent years the number of people with state health-insurance has grown hugely. This has reduced out-of-pocket spending on health from 60% of the total in 2001 to around 30% today. It has made it more affordable for many diabetics to get the treatment they need. But the government's insurance still does not cover some essentials, such as blood-sugar test strips and injection devices.

In July the government published a list of priorities for health-care reform in the coming decade. They include a pledge to improve support for diabetics. The plan says officials must nudge Chinese into leading healthier lives.

The single best medicine for type-2 diabetes would be more investment in primary health care. Many people do not have easy access to family doctors or specialist nurses, who are best able to provide the kind of regular advice and check-ups that type-2 patients need. Even if they do, Chinese patients often prefer to use big-city hospitals, believing that specialists there will do a better job because of their greater expertise. Such hospitals account for nearly 55% of health-care spending in China, compared with less than 40% in rich countries. But in China they are neither equipped nor inclined to co-ordinate the education, screening and monitoring required to deal with chronic conditions such as diabetes. Building a primary-care structure that patients trust will require enormous effort, including finding doctors willing to work as general practitioners (who have fewer money-making

opportunities than hospital doctors) and devising better incentives for GPs to promote preventive measures, such as healthy diets and physical exercise.

Without an overhaul, China's health-care system will be crushed by the burden of coping with the chronic diseases that will burgeon as the population ages. In recent years annual increases in total health-care spending have been 5-10 percentage points higher than GDP growth. About 13% of China's health spending goes toward treating diabetes, and perhaps four-fifths of that is spent treating complications that could be avoided. China has an opportunity to save both money and lives. ■



糖尿病

高糖之殇

随着中国人体重增加，2型糖尿病患者正在激增

三十多年前，中国北方城市大庆的医生们开始了一项开创性的预防2型糖尿病的长期研究。当时认为在中国罹患这种疾病的人数约占总人口的1%。今年秋天，医生、学者和官员们齐聚大庆，讨论这项研究的结论并推动预防工作，此时他们面对的现实较之以前已经大不相同。目前约有11%的中国成年人患有这种病，接近美国的比例，是英国的两倍。2型糖尿病在全球越来越普遍，但近年来在中国的患病率增长最快。

糖尿病是人体对血糖水平的调节出现功能障碍。其中1型比较少见，多发于生命早期，病因尚不十分清楚。这类病人必须每天注射胰岛素，否则可迅速死亡。2型糖尿病要常见得多，占全世界糖尿病病例的90%以上。它通常在成年人中发病，特别是肥胖或缺乏运动的人群。一般可通过药物和改变生活方式来控制2型糖尿病，有时甚至可以逆转。而如果不做适当治疗，两种糖尿病都可能导致器官损伤、失明、中风和心脏病等并发症。

据估计，中国有1.16亿糖尿病患者，人数已稳居全球第一。而20年前患者数量还不到2500万。糖尿病患者激增，且几乎完全属于2型，令政府担忧。大庆的研究表明，改变生活方式可以在糖耐量受损人群中预防2型糖尿病。糖耐量受损有时是糖尿病的前期表现。但中国的医疗体系尚不能保证及时发现症状，更不要说及时做出干预了。

发病增长的一个重要原因是人们在变得富裕之后往往会消费更多加工食品和含糖饮料。七分之一的中国成年人有肥胖问题，而北京的成人肥胖率更是高达四分之一，是中国“最胖的城市”。自1980年以来，中国城市人口比例从不足20%增加到60%左右，而与农村居民相比，城市居民的体力活动相对较少。

遗传因素可能也有影响。研究发现，汉族人在比白种人更年轻、体重更低

的情况下就可能罹患2型糖尿病。吸烟是另一个因素。中国占世界人口的五分之一，却消费了全球三分之一的香烟。全国约一半男性每天吸烟。中国从毛时代的赤贫中迅速崛起的速度可能也有关系。中国专家发现，儿童时期营养不良的人在成年后更容易患上糖尿病。

中国的卫生系统对此应对不及。最近的一次全国性调查是在2013年，当时发现中国近65%的糖尿病患者并不知道自己的病情（在美国该比例约为25%）。只有约三分之一的人在接受治疗。在接受治疗的人群中，只有一半左右将血糖水平控制在了健康范围内。而另一项研究显示，患者当中既成功控制了血糖、又控制了血压和胆固醇（这些干预措施有助避免并发症）的比例就更低了。还有一些病人求助于江湖郎中。

尽管2型糖尿病如此盛行，公众对这种疾病的认识却极为欠缺，对现代医学可以控制它这一点也知之甚少。管理着一个糖尿病网站的杨立军（音译）称，在教育水平低下的偏远地区，人们有时甚至担心这种病会传染。这些偏见导致了歧视。公务员招考不录取糖尿病患者。根据官方指导方针，大学也可以拒招。这些规定更可能影响1型糖尿病患者，因为这一型在报考大学或初级公务员的年龄段更常见。但有关规定对两种类型并不作区分。

要有效管理糖尿病患者，就需要有一个医疗系统来帮助他们了解自己的病情、坚持规范治疗，并鼓励定期复查。但这成本高昂。近年来，国家医疗保险的参保人数大幅增长，使得医疗费用的自付比例从2001年的60%降低到今天的30%左右。许多糖尿病患者因而能够负担所需的治疗。但一些必需品仍不在政府医保报销的范围内，例如血糖试纸和注射器械。

今年7月，中国政府公布了未来十年卫生健康改革的重点任务，其中就包括承诺提高对糖尿病患者的支持。该计划要求政府官员推动中国人向更健康的生活方式转变。

治疗2型糖尿病的最佳良方莫过于加大对初级医疗保健的投入。许多人缺乏条件求助于家庭医生或专科护士，而他们最能提供2型患者所需的日常

建议和定期检查。但即便有这样的条件，中国患者通常还是更愿意去大城市的医院就诊，因为他们认为那里的专科医生专业水平更高，治疗效果更好。这类医院占中国医疗总体支出的近55%，而在发达国家不到40%。但是在中国，这些医院既没有条件也没有意愿去协调开展各种宣教、筛查和监测活动，而这些是管理糖尿病等慢性疾病的必要手段。要建立起一个受病人信任的初级医疗保健体系需要付出巨大的努力，包括鼓励更多人从事全科医生的工作（与住院医生相比挣钱的机会较少），以及制定更好的激励措施来推动全科医生倡导预防糖尿病的措施，如健康饮食和体育锻炼。

如果不开展全面改革，中国的医疗体系将随着人口老龄化而被慢性病高发的负担压垮。近年来，医疗卫生总开支的年增速比GDP增速还要高5到10个百分点。中国的医疗支出当中约有13%用于治疗糖尿病，而其中可能约有五分之四都用于治疗本可能避免的并发症。中国有机会在节省金钱和拯救生命方面一举两得。 ■



By the numbers

How US-China trade has changed

A year of disruption in charts

AFTER AN APPARENT detente between America and China in late 2018, trade relations soured again at the start of 2019. Over the course of the year America ratcheted up tariffs, and its bilateral trade deficit with China fell. But market forces are powerful, and trade finds a way. America's bilateral deficits with several other countries, including Mexico, rose. Meanwhile Chinese exporters found new homes for their goods, including Vietnam and the Philippines. Next year is likely to see trade patterns further disrupted, as Chinese policymakers aim for a Trump-pleasing increase in imports from America. ■



数字解读

中美贸易变化

一年纷扰见图示

二〇一八年年末，中美贸易关系貌似有所缓和，但到2019年初再次恶化。这一年，美国提高了关税，对华双边贸易逆差收窄。但是市场力量强大，贸易自会另寻出路。美国对墨西哥等其他几个国家的双边逆差上升了。同时，中国出口商为自家商品找到了新归宿，其中包括越南和菲律宾。随着中国政策制定者为满足特朗普的要求增加从美国进口商品，明年的贸易格局很可能再生乱象。 ■



Computing records

A trillion here, a trillion there

How to make a small supercomputer with a really big chip

SILICON CHIPS have lonely lives. They are born together, often as tens of thousands of identical siblings a few millimetres across, on a single wafer the size of an old-fashioned vinyl record. They are then broken from their natal wafers like squares of chocolate from a bar, and packaged individually in plastic and metal. Only after this is a chip reconnected to others of its kind, as the packages are wired up to work together on circuit boards and inserted into products.

Many inventors over the years have noted that if chips were instead wired together from the beginning, on the wafer itself, much expense and trouble would be avoided. But efforts to implement such wafer-scale integration have consistently failed, either because the technology just did not work or the resulting circuits could not compete with new versions of conventional designs.

Now Cerebras, a firm in Los Altos, California, thinks the time is right to try again. The heart of its new product, a supercomputer called the CS-1, could hardly be described as a “chip”. It is a slab of silicon measuring 21.5cm by 21.5cm that the firm refers to as a wafer-scale engine. But whatever name you give it, it is a record-breaker. A high-end modern computer chip might have billions of transistors on its surface. The wafer-scale engine has more than a trillion of them.

Cerebras’s creation breaks many records besides the trillion-transistor barrier (it actually has 1.2trn). Its transistors are organised into 400,000 individual processing units, known in the trade as cores, and it can shuttle

nine petabytes (9,000tn bytes) of data per second around inside itself. For comparison, Intel's i9-9900K chips, typical of those found in modern PCs, have a mere eight cores and can shuttle 40 gigabytes per second.

The CS-1 has some notably small numbers, too. Admittedly, IBM's Summit supercomputer, among the snazziest in the unclassified world, offers some 2.4m cores. However, Summit is constructed conventionally, using package-laden circuit boards. It weighs over 340 tonnes and occupies 520 square metres of floor space. A CS-1 weighs around 250kg and is the size of a domestic refrigerator. It also consumes a mere 15-20kW of electricity. Summit requires 1,000 times as much.

The purpose of all this computational heft is to run linear algebra, the mathematics of data processing in general and machine learning in particular. Machine learning is at the heart of the trendy and lucrative field of computing branded “artificial intelligence”.

The CS-1's compiler—the software that turns programs written by human beings into binary code which a computer can understand—is tuned to keep the flow of data from core to core as efficient as possible. It does this by matching the structure of the code generated to that of the hardware. Also, as the cores are positioned within fractions of a millimetre of the memory they use, that flow of data is already much faster from one part of a circuit board to another than the long-distance trip which would normally be required.

The wafer-scale engines themselves are made by TSMC, a Taiwanese firm, using a process claimed to be so accurate that each has just 150-200 defects. These are easily worked around, given the number of other transistors available. Wafer-scale integration has many other challenges, such as keeping everything synchronised, pumping in enough electric power, pumping out the resultant heat, and efficiently moving gigabytes of data to

and from other parts of a machine. But if the CS-1 survives contact with the real world of commercial use, then wafer-scale integration will at last have proved itself, and the days of the lonely chip may be numbered. ■



计算记录

万亿级芯片

如何用超大芯片打造小型超级计算机

硅芯片的一生很孤独。它们通常与几万个一模一样的兄弟姐妹一起出生，每个只有几毫米宽，排列在与老式黑胶唱片一般大小的一片晶圆上。然后，它们从自己的晶圆出生地上被拆下来——就像是从一板巧克力上掰下小块，再用塑料和金属一个一个封装起来。只有在这之后，芯片才又与其他同类芯片重新连接起来，因为封装好的芯片要连接在一起，在电路板上协同运作，并被置入产品中。

多年来，许多发明家已经注意到，如果一开始在晶圆上就连接好芯片，便可省去很多成本和麻烦。但是，在晶圆上集成芯片的努力始终没能成功，原因要么是技术不到位，要么是做出来的电路板无法与传统设计的新版本竞争。

位于加州洛斯阿尔托斯市（Los Altos）的公司Cerebras觉得现在可以再试一次了。该公司的新产品CS-1超级计算机的核心很难说是一块“芯片”。那是一块21.5厘米见方的硅片，该公司称它为晶圆级引擎（wafer-scale engine，简称WSE）。但不管叫什么名字，这都是一项突破性技术。高端现代计算机芯片的表面可能有数十亿个晶体管，而WSE上有超过一万亿个。

Cerebras的芯片除了突破了一万亿个晶体管的门槛（实际上它有1.2万个）之外，还打破了其他许多记录。它的晶体管构成了40万个独立处理单元（行话叫“核心”），每秒可在内部传输9PB（9000万亿个字节）的数据。相比之下，现代个人电脑中最典型的芯片、英特尔的i9-9900K只有八个核心，每秒传输40GB的数据。

CS-1还有一些参数之小令人瞩目。诚然，IBM的Summit有约240万个核心，在已公开的超级计算机中属于最炫目的一类。但Summit是按传统方

式用封装电路板打造的。它重340多吨，占地520平方米。CS-1仅重约250公斤，只有一台家用冰箱那么大。CS-1的耗电量仅为15至20千瓦，Summit是它的1000倍。

打造这样庞大的计算能力是为了运行线性代数运算，这是用于一般数据处理的数学方法，在机器学习中尤其常用。在风行又赚钱的“人工智能”计算领域，机器学习处于核心地位。

CS-1的编译器（将人类编写的程序转换为计算机可以理解的二进制代码的软件）经过调整，将生成的代码结构与硬件结构相匹配，以此实现核心之间尽可能高效的数据传输。而且，由于核心与它们使用的内存相距不到一毫米，数据在电路板上不同位置间的传输已经远快于通常所需的远距离传输。

WSE本身由台湾公司台积电制造，据称采用了非常精密的工艺，每个WSE只有150至200个缺陷。由于有大量其他可用的晶体管，这些缺陷可被轻松绕过。晶圆级集成还面临许多其他挑战，例如保持所有部分同步、保证输入功率、散热，以及有效地与计算机的其他部分传输GB级的数据。但是，如果CS-1投入商用后能经受住实际应用的挑战，那么晶圆级集成最终将证明自己的实力，“孤单芯片”的日子可能也就屈指可数了。■



Schumpeter

Conquistadors in a quandary

The agonising dilemma of Spanish firms in Latin America

THIS IS A year of poignant anniversaries in Spain's relationship with Latin America. Exactly 500 years ago Hernán Cortés launched his conquest of Mexico. In 1939 Mexico's left-wing president, Lázaro Cárdenas, opened the door to Spaniards fleeing fascism at the end of the civil war. It might have been a celebratory year for Spanish business, too. In 1989 Telefónica, Spain's biggest telecoms firm, made its first incursion into Latin America by bidding for a Chilean counterpart, unleashing a flood of Spanish investment into the region in the 1990s known as *la reconquista*. Instead, it has been a year of pot-banging protests and economic turmoil in the region. It says a lot that 30 years after it planted the flag, Telefónica has decided to cut its losses in the former Spanish colonies, and may sell its businesses there altogether.

Telefónica's new strategy, announced late last month, is part of a rethink of the company by its boss, José María Álvarez-Pallete. Its market value has almost halved over the past five years to €35bn (\$39bn). It carries a whopping €38bn of net debt. And, common to all global telecoms firms, it faces the challenge of offering customers much faster wireless speeds via 5G and more digital services. As a result it plans to refocus on four core markets, Spain, Brazil, Germany and Britain, and create separate digital and infrastructure businesses. On December 4th Orange, its French rival, announced similar plans to reinvent itself for the digital age.

Yet it is the prospect that Telefónica may sell its businesses in Argentina, Colombia, Mexico, Chile, Peru and other so-called Hispano-American countries, that is most significant. They account for 21% of its revenues. Their sale, which could raise €13bn or more, represents a historic U-turn

that is likely to reverberate in Spain's boardrooms. Like Telefónica, Spanish banks, energy firms and other companies have reason to agonise over the slow growth and currency volatility across the Atlantic. Their industries, too, are in the throes of technological disruption. For some Latin America is no longer a land of opportunity, but a distraction.

For years Spaniards celebrated the revival of their imperial ties to the New World. When Latin American countries started to liberalise their economies in the late 1980s, Spain was a country with a meagre population, inward-looking companies, and a pressing need to globalise. Few Europeans believed that it would fulfil its aim of becoming a bridge to Latin America. However, as Lourdes Casanova of Cornell University recalls, its companies needed quickly to build scale there to resist other European firms breathing down their necks at home. Latin America helped turn Spanish firms into global ones.

Within a few decades Spain had become the second-biggest foreign investor in the region after America. Its firms have investments today worth €156bn there. The biggest, such as Telefónica, Santander and BBVA in banking, Iberdrola in utilities, and Repsol in oil and gas, accounted for most of Spain's investment in the region. Their shared language, as well as passable *Portuñol* in Brazil, enabled them to operate service industries in places where telecommunications, banking and utilities were hopelessly backward. Profits from Latin America during a commodities boom helped Spanish firms through the financial crisis of 2008-09.

That is only half of the story, though. After underbidding in 1990 for Telmex, the Mexican telecoms monopoly that turned Carlos Slim into one of the world's richest men, Telefónica went on to overpay elsewhere, sinking over €140bn in the region, a fortune compared with what the assets are worth now. The ride since then has been a rollercoaster. From the tequila crisis in Mexico in 1994-95, through mega-devaluations and political upheaval

in Brazil and Argentina, to left-wing dictatorship in Venezuela, Spanish investors have had a crash course in disaster management. Repsol may have suffered the worst. In 2012 Peronists in Argentina—who beat a reformist incumbent in October's presidential election—expropriated Repsol's stake in YPF, the national oil company. It was only partially compensated for the almost \$16bn it had paid for the holding in 1999. More recently it has had such trouble sourcing heavy crude from Venezuela and Mexico, it is reportedly considering carrying it from western Canada to its European refineries.

Yet even without crisis, day-to-day business has been a struggle. BBVA and Santander have used their big Latin America subsidiaries to help offset zero interest rates closer to home, and have no plans to pull out. Now Mexico, where BBVA is the biggest bank, is flirting with recession. Santander has done well recently in Brazil, where it is the largest foreign bank. But it suffers from currency weakness in many parts of Latin America. Telefónica's revenues, returns and cash flows in Peru, Chile and Colombia have flagged owing to competition from scrappy new entrants putting market share ahead of profitability.

Spain is not yet in full retreat. Telefónica's moves could be a combination of selling assets, as it is doing in Central America, and forming alliances, as it has recently done in Mexico by agreeing to use part of AT&T's network as a way to reduce losses. But it may sell up altogether to reduce debt quickly. Firms such as Liberty Latin America and Millicom are expanding fast around the region, largely through acquisitions. China Mobile is showing interest in Latin America as well. Telefónica's decision to stay put in Brazil, by far its biggest market, suggests that its new mantra is focus.

Other Spanish firms have made similar calculations: BBVA by concentrating mainly on Mexico, and Santander on Brazil. As pressure increases on banks to adapt to the fintech era, and on energy firms like Repsol and Iberdrola

to reduce carbon emissions, focus makes more sense than empire-building. Even Cortés was forced to make a tactical retreat in 1520 in what is called “La Noche Triste”. For Telefónica, this is undoubtedly a “sad night”. But if its retreat is more than tactical, other firms may sound one, too. ■



熊彼特

征服者进退维谷

西班牙公司苦战拉美

今年是西班牙与拉丁美洲关系史上多个令人感伤的整数周年纪念。整整500年前，埃尔南·科尔特斯（Hernán Cortés）发起征战，殖民墨西哥。1939年，墨西哥左翼总统拉萨罗·卡德纳斯（Lázaro Cárdenas）敞开大门，接纳在西班牙内战尾声阶段逃离法西斯主义的西班牙人。对西班牙商界来说，今年本来也应该是值得庆祝的一年。1989年，西班牙最大的电信公司西班牙电信（Telefónica）首次进军拉美市场，竞标智利同行企业，开启了上世纪90年代西班牙公司投资拉美的大潮，被喻为“重新征服”（*la reconquista*）。但事实上，拉美地区今年充斥着激烈抗议和经济动荡。西班牙电信在拉美竖立大旗的30年后，决定要在这片前西班牙殖民地采取止损行动，可能会将它在该地区的全部业务悉数出售，这很能说明问题。

西班牙电信于上月末宣布了新战略，这是其老板何塞·玛丽亚·阿尔瓦雷斯-帕莱特（José María Álvarez-Pallete）反思公司现状的一部分。过去五年，该公司的市值几乎腰斩，现为350亿欧元（390亿美元），还背负了高达380亿欧元的净债务。而且，与所有全球性电信公司一样，西班牙电信面临要通过5G技术向客户提供更快的无线传输以及推出更多数字化服务的挑战。为此，它计划重新聚焦于四个核心市场——西班牙、巴西、德国和英国，并打造独立的数字及基础设施业务。12月4日，其法国竞争对手Orange宣布推出类似的计划，以期面向数字时代重塑自我。

然而，西班牙电信可能会出售在阿根廷、哥伦比亚、墨西哥、智利、秘鲁和其他“西班牙语美洲”国家的业务，这一点将是最显著的变化。这些业务占西班牙电信公司营收的21%，出售后能带来至少130亿欧元，这意味着一次历史性的大掉头，很可能在各大西班牙企业的董事会中产生巨大反响。与西班牙电信一样，西班牙的银行、能源公司及其他企业也有理由为大西洋彼岸的缓慢增长和货币波动苦恼。这些行业也正处于技术颠覆的阵

痛中。对某些公司而言，拉丁美洲已不再是充满机遇之地，反而成了让人心烦的负累。

多年来，西班牙人欣喜于他们与拉美新大陆之间“帝国纽带”的复兴。上世纪80年代后期，当拉美国家开始启动经济自由化时，西班牙是一个人口不多、企业主要为内向型、迫切需要实现全球化的国家。很少有欧洲人相信西班牙会实现目标，成为通往拉美的桥梁。但是，正如康奈尔大学的卢尔德·卡萨诺瓦（Lourdes Casanova）回忆所言，西班牙的公司需要迅速在拉美扩展规模，以抵御其他欧洲公司在本国的步步进逼。拉丁美洲帮助西班牙公司发展成了全球企业。

几十年后，西班牙已成为该地区仅次于美国的第二大外国投资者。西班牙公司在当地的投资目前已达1560亿欧元。其中大部分来自最大的一些西班牙公司，包括西班牙电信、桑坦德银行和西班牙对外银行（BBVA）、电力公司伊比德罗拉（Iberdrola）以及石油公司雷普索尔（Repsol）。由于和当地人使用共同的语言，以及在巴西有尚可用来沟通的“西葡语”（Portuñol），这些公司能在电信、银行和公用事业极度落后的地方运营服务。靠着在大宗商品贸易繁荣期从拉美获取的利润，西班牙企业安然度过了2008年至2009年的金融危机。

但那只是故事的一半。西班牙电信公司在1990年竞标收购墨西哥电信公司（Telmex，这家电信寡头公司令卡洛斯·斯利姆[Carlos Slim]成为全球最富有的人之一），因出价较低而告败，这促使它在之后其他竞购中出价过高，在拉美总共砸下超过1400亿欧元。与它收购的这些资产如今的价值相比，当年可谓耗费巨资。此后的情况就像坐上了过山车。从1994年至1995年墨西哥的龙舌兰酒危机，到巴西和阿根廷货币大幅贬值及政局动荡，再到委内瑞拉的左翼独裁政权上台，西班牙投资者被迫上了一堂灾难管理的速成课。其中雷普索尔所受的打击也许最为沉重。2012年，阿根廷的庇隆主义者（在今年10月的总统大选中击败了在位的改革派总统）征收了雷普索尔在阿根廷国家石油公司（YPF）中的股份。1999年雷普索尔为购买这些股份支付了近160亿美元，但它只获得了部分补偿。而最近，由于从委内瑞拉和墨西哥采购重质原油太过困难，据报道雷普索尔正考虑改为从加

拿大西部采购并运输至欧洲的炼油厂。

但即使没有危机，维持日常业务也相当不易。西班牙对外银行和桑坦德银行一直在利用拉美的大型子公司来帮助抵消欧洲地区零利率对业务造成的冲击，因而没有撤离拉美的计划。西班牙对外银行是墨西哥最大的银行，而现在墨西哥正徘徊于衰退边缘。桑坦德银行作为巴西最大的外资银行，最近在当地的业绩不俗，但它在拉美其他许多地方正饱受货币疲软的困扰。由于强势的、置抢占市场份额于盈利之上的新竞争者登场，西班牙电信在秘鲁、智利和哥伦比亚的收入、回报及现金流均出现下滑。

西班牙尚未全面撤退。西班牙电信的对策可能是出售资产（像它在中美洲所做的那样）与结盟（就像最近在墨西哥与AT&T达成协议，使用其部分网络以减少亏损）双管齐下。但它也可能出售全部业务以迅速减少负债。自由拉丁美洲公司（Liberty Latin America）和瑞典的米雷康姆（Millicom）等公司正主要通过收购在该地区快速扩张。中国移动也显现出对拉美的兴趣。西班牙电信决定坚守巴西（它的绝对第一大市场）表明其新的座右铭是聚焦。

其他西班牙公司也有类似的盘算：西班牙对外银行主要聚焦墨西哥，桑坦德则紧盯巴西。银行要适应金融科技时代的压力在加大，雷普索尔和伊比德罗拉等能源公司要减少碳排放的压力也在加大。相比打造帝国，聚焦更为明智。即便是科尔特斯也在1520年被迫采取过战术撤退，那被称为“悲痛之夜”（La Noche Triste）。对于西班牙电信来说，当前无疑是一个“悲痛之夜”。但如果它的撤退并非缓兵之计，其他公司可能也会随之鸣金收兵。 ■



Our books of the year

Word up

The best books of 2019 were about the IRA, Harper Lee's lost work, rational economics and an Ohio housewife

Dignity: Seeking Respect in Back Row America. By Chris Arnade. *Sentinel; 304 pages; \$30 and £25.* Over several years the author of this book, a former Wall Street trader, conducted thoughtful interviews in neglected communities across America, and took moving photographs of his subjects. The result is a quietly revelatory portrait of what he calls the country's "back row".

An American Summer: Love and Death in Chicago. By Alex Kotlowitz. *Nan A. Talese; 304 pages; \$27.95.* Chicago has suffered 14,000 murders in the past two decades; overwhelmingly the victims are African-American or Hispanic. This is an intimate and sympathetic depiction of several people involved in, and affected by, deadly crime. The killings seem senseless, but, says the author, the city can do more to grasp their causes.

Winners Take All: The Elite Charade of Changing the World. By Anand Giridharadas. *Knopf; 304 pages; \$26.95. Allen Lane; £12.99.* A timely polemic against philanthrocapitalism, which argues that supposedly do-gooding companies merely offer sticking-plaster solutions to social problems that they have helped create. Such efforts, the author says, do little to make up for a winner-takes-all philosophy that is holding down wages and transferring the burden of risk onto employees.

No Visible Bruises. By Rachel Louise Snyder. *Bloomsbury; 320 pages; \$28.* It is the dark matter of violent crime: unseen but everywhere. This investigation into domestic violence in America blends harrowing testimony with persuasive recommendations on how to help victims and

perpetrators. A book that manages to be both personal and panoramic, angry and hopeful.

Assad or We Burn the Country. By Sam Dagher. *Little, Brown; 592 pages; \$29 and £25.* Although the horrors of Syria's civil war are well documented, this chronicle by a *Wall Street Journal* correspondent still offers new insights into a struggle that has reshaped the Middle East. Many are based on his rare access to Manaf Tlass, a one-time confidant of Bashar al-Assad, who charts the accidental president's metamorphosis into a blood-soaked dictator.

The Light that Failed. By Stephen Holmes and Ivan Krastev. *Pegasus Books; 256 pages; \$26.95. Allen Lane; £20.* When the Soviet Union collapsed and communism fell, the countries of eastern Europe set out to emulate Western democracies. But, as the authors of this perceptive book eloquently relate, their attitude to liberal democracy soured amid globalisation and the financial crisis—forces that also fed the rise of nationalism in the West. Russia, meanwhile, replaced Soviet rule with a revanchist autocracy.

Presidential Misconduct: From George Washington to Today. Edited by James Banner junior. *New Press; 512 pages; \$29.99.* In 1974 the special counsel to the impeachment inquiry commissioned a survey of presidential misconduct from Washington to Lyndon Johnson. Brought up-to-date with chapters on presidents from Richard Nixon to Barack Obama, this useful study supplies the scales on which more recent wrongdoing can be weighed.

Say Nothing. By Patrick Radden Keefe. *Doubleday; 464 pages; \$28.95. William Collins; £20.* Framed as an inquiry into the death of Jean McConville, a mother of ten who was abducted and murdered by the IRA in 1972, this is a masterful exploration of the motives of terrorists, the stories they tell themselves and how they make the transition to peace—or, in some cases, fail to.

Remembering Emmett Till. By Dave Tell. *University of Chicago Press; 312 pages; \$25 and £19.* A fine history of racism, poverty and memory in the Mississippi Delta told through the lynching of Emmett Till, a black 14-year-old from Chicago whose murder in 1955—and his mother's determination to display his mutilated features in an open coffin—made him an early martyr of the civil-rights movement.

Amritsar 1919: An Empire of Fear and the Making of a Massacre. By Kim Wagner. *Yale University Press; 360 pages; \$32.50 and £20.* At least 379 people were killed by British soldiers in the Amritsar massacre on April 13th 1919, making that one of the darkest days in the history of the empire. On the event's centenary, this book persuasively argues that it was less of an aberration than apologists for empire, including Winston Churchill, have chosen to believe.

Maoism: A Global History. By Julia Lovell. *Knopf; 610 pages; \$37.50. Bodley Head; £30.* Mao Zedong was a despot who caused tens of millions of deaths; yet his name does not attract the same opprobrium as Hitler's or Stalin's. Indeed, his legend and ideas have inspired revolutionaries around the world. As the author of this book shows, his manipulated image retains a powerful allure in China and beyond. "Like a dormant virus", she writes, "Maoism has demonstrated a tenacious, global talent for latency."

The Regency Years. By Robert Morrison. *W.W. Norton; 416 pages; \$29.95. Published in Britain as "The Regency Revolution"; Atlantic Books; £20.* "I awoke one morning and found myself famous," Lord Byron, a Regency poet, once said. The period itself has suffered from the opposite problem—eclipsed by the more solemn and substantial Georgian and Victorian ones that preceded and followed it. Arguing that Britain truly started to become modern in the Regency era, this delightful book explains why it deserves to be better known.

How to be a Dictator. By Frank Dikötter. *Bloomsbury; 304 pages; \$28 and £25.* What do Mussolini, Hitler, Stalin, Mao, Kim Il Sung, Nicolae Ceausescu, Papa Doc Duvalier and Mengistu Haile Mariam have in common? This insightful handbook for gangsters is written by a distinguished historian of 20th-century China.

An Impeccable Spy: Richard Sorge, Stalin's Master Agent. By Owen Matthews. *Bloomsbury; 448 pages; \$30 and £25.* Richard Sorge's bravery and recklessness in the Soviet cause in Tokyo—where boozing and seduction were among his main espionage techniques—were matched by the venality and cowardice of his masters in Moscow. Despite their brutal incompetence, his intelligence helped turn the course of the second world war. A tragic, heroic story, magnificently told with an understated rage.

The Education of an Idealist. By Samantha Power. *Dey Street Books; 592 pages; \$29.99. William Collins; £20.* An engaging insider's account of foreign-policymaking in what now seems like a different era of diplomacy. It describes the efforts of its author—Barack Obama's Irish-born ambassador to the United Nations—to juggle idealism with the realities of governing, while also juggling motherhood with the demands of representing America on the world stage.

Family Papers: A Sephardic Journey Through the Twentieth Century. By Sarah Abrevaya Stein. *Farrar, Straus and Giroux; 336 pages; \$28.* This history of the Levy family of Salonika follows its subjects through interwar Greece to the present day. It is a painstaking feat of reconstruction that draws on correspondence in Ottoman Turkish, Hebrew, French and especially Ladino, the language of Sephardic Jewry. Much of the clan was murdered in Auschwitz in 1943; those who survive are now spread across the globe. And yet, the author says, they retain a family resemblance.

The Last Stone. By Mark Bowden. *Atlantic Monthly Press; 304 pages; \$27. Grove Press; £16.99.* True-crime writers in America face a high bar, set by illustrious predecessors such as Truman Capote. The author of “Black Hawk Down” rises to the challenge in this reconstruction of how a horrific crime—the disappearance of two sisters from a mall in Maryland in 1975—was partially solved 40 years later. Dogged and ingenious interrogation of a mendacious suspect finally gets at the truth.

Good Economics for Hard Times. By Abhijit Banerjee and Esther Duflo. *PublicAffairs; 432 pages; \$30. Allen Lane; £25.* The real meaning of this book by a Nobel-prizewinning duo of economists lies in its method—a patient attempt to take on tough problems through empirical evidence. Known for pioneering the use of randomised controlled trials, the pair offer insights into thorny global issues ranging from inequality to corruption, all with refreshing humility.

Open Borders. By Bryan Caplan. Illustrated by Zach Weinersmith. *First Second; 256 pages; \$19.99. St. Martin’s Press; £15.99.* An enlightened polemic in cartoon format, this book—by a team comprising an economics professor and an illustrator—persuasively rebuffs the arguments against migration commonly made by politicians. At the same time it shows how an accessible and respectful case can be made on a neuralgic subject.

Narrative Economics. By Robert Shiller. *Princeton University Press; 400 pages; \$27.95 and £20.* The author, another Nobel laureate, explores how the public’s subjective perceptions can shape economic trends. The result is a sensible and welcome escape from the dead hand of mathematical models of economics.

Schism. By Paul Blustein. *CIGI Press; 400 pages; \$27.95. McGill-Queen’s University Press; £27.99.* A fascinating, detailed account of the history of tensions in America’s trade relationship with China. It explains the back

story to today's conflict—and reveals how difficult it will be to escape it.

Capitalism, Alone. By Branko Milanovic. *Belknap Press; 304 pages; \$29.95 and £23.95.* A scholar of inequality warns that while capitalism may have seen off rival economic systems, the survival of liberal democracies is anything but assured. The amoral pursuit of profit in more liberal capitalist societies has eroded the ethical norms that help sustain openness and democracy, he argues; now that tendency threatens to push such places in the direction of more authoritarian capitalist societies, such as China.

Furious Hours: Murder, Fraud and the Last Trial of Harper Lee. By Casey Cep. *Knopf; 336 pages; \$26.95. William Heinemann; £20.* An ingeniously structured, beautifully written double mystery—one concerning the Reverend Willie Maxwell, who was accused of murdering five relatives for the insurance money in Alabama in the 1970s (before being fatally shot himself); the other, Harper Lee's abortive efforts to write a book about the case. Tom Radney, a lawyer who is the story's third main character, defended Maxwell—and his killer.

Kafka's Last Trial: The Case of a Literary Legacy. By Benjamin Balint. *W.W. Norton; 288 pages; \$26.95. Picador; £14.99.* An account of the struggle over Kafka's papers between competing archives in Israel and Germany—plus a woman who inherited them from a friend of his editor, Max Brod—which played out after most of the writer's family had died in the Holocaust. A book about the provenance of art, and how much, in the end, it matters.

Underland: A Deep Time Journey. By Robert Macfarlane. *W.W. Norton; 384 pages; \$27.95. Hamish Hamilton; £20.* A haunting examination of the world below the surface—a place that has always been envisioned as a zone of treasure and of dread. From the Paris catacombs to the soil of Epping Forest to caverns in remotest Norway, the author, a celebrated nature-writer, re-envisiones the planet from the ground down.

Three Women. By Lisa Taddeo. *Simon & Schuster*; 320 pages; \$27. *Bloomsbury Circus*; £16.99. Eight years of reporting went into this portrait of American sexuality from a female perspective. The author's three subjects "stand for the whole of what longing in America looks like"; she spent time in their home towns to study their daily routines, jobs and, above all, their desires. With a novelist's eye for detail, she captures the pain and powerlessness of sex, as well as its heady joys.

A Month in Siena. By Hisham Matar. *Random House*; 126 pages; \$27. *Viking*; £12.99. The author's life and writing have been shaped by his Libyan father's kidnapping in 1990 by the regime of Muammar Qaddafi. In previous work he tried to uncover what happened; in this slim, bewitching book he finds answers, of a sort, by travelling to Siena. Meditating on art, history and the relationship between them, this is both a portrait of a city and an affirmation of life's quiet dignities in the face of loss.

This is Shakespeare. By Emma Smith. *Pelican*; 368 pages; £20. A brilliant and accessible tour of Shakespeare's plays that is also a radical manifesto for how to read and watch his work. Witty, irreverent and searching, this book, by a professor at Oxford University, shines dazzling new light on the oeuvre of the world's greatest literary genius.

Stalingrad: A Novel. By Vasily Grossman. Translated by Robert and Elizabeth Chandler. *NYRB Classics*; 1,088 pages; \$27.95. *Harvill Secker*; £25. At last, the Russian novelist-journalist's mighty prequel to "Life and Fate", his epic of the battle of Stalingrad and its aftermath, has received a definitive—and hugely powerful—English translation. A seething fresco of combat, domestic routine under siege and intellectual debate, it confirms that Grossman was the supreme bard of the second world war.

Ducks, Newburyport. By Lucy Ellmann. *Biblioasis*; 1,040 pages; \$22.95. *Galley Beggar Press*; £14.99. The year's unlikeliest literary triumph: a

1,000-page fictional monologue delivered by a worried Ohio housewife and baker, much of which is made up of a single sentence. A prize-garlanded novel that is funny, angry, erudite, profound—and full of great cake recipes.

10 Minutes 38 Seconds in This Strange World. By Elif Shafak. *Bloomsbury; 320 pages; \$27. Viking; £14.99.* The protagonist of this story is dead when it begins. The body of “Tequila Leila” has been dumped in a wheelie bin on the outskirts of Istanbul; yet, somehow, her mind remains active. While it does, she scrolls back through her life—a pained childhood, stalwart friends in adulthood—in a powerful, unflinching novel that, like all of the Turkish author’s work, is political and lyrical at once.

Homeland. By Fernando Aramburu. Translated by Alfred MacAdam. *Pantheon; 608 pages; \$29.95. Picador; £16.99.* A monumental novel—and a bestseller in Spanish—which explores how ETA’s terrorism divided families and lifelong friends in a claustrophobic Basque town. Empathetic but morally acute, this may be the definitive fictional account of the Basque troubles; it suggests that redemption is hard but not impossible.

The Volunteer. By Salvatore Scibona. *Penguin Press; 432 pages; \$28. Jonathan Cape; £16.99.* This intricate novel spans decades and continents and incorporates multiple, looping stories. After being captured in Cambodia, Vollie returns to America and is dispatched to New York to conduct surveillance on a supposed renegade Nazi. This assignment will come to haunt him, too. “Who among us”, he asks, “has lived only once?” A searing yet poetic record of war and the lies people live by.

The Far Field. By Madhuri Vijay. *Grove Press; 448 pages; \$27 and £14.99.* A courageous, insightful and affecting debut novel—and the winner of the prestigious JCB prize for Indian literature—which places a naive upper-class woman from southern India in the midst of far messier realities in Kashmir.

Along the way, the story challenges Indian taboos ranging from sex to politics.

Trust Exercise. By Susan Choi. *Henry Holt; 272 pages; \$27. Serpent's Tail; £14.99.* The title of this tricksy, beguiling novel, winner of a National Book Award, refers to the relationship between writer and reader, as well as to the bonding exercises undertaken by the theatre students in the story—and to the trust between teenage girls and predatory men. A tale of missed connections and manipulation, and of willing surrender to the lure and peril of the unknown.

Black Sun. By Owen Matthews. *Doubleday; 320 pages; \$26.95. Bantam Press; £16.99.* Based on real events—the bid by Andrei Sakharov to develop a bomb to end all bombs—this story is set in a secret Soviet city in 1961. Featuring murder and betrayals, and a flawed but principled KGB man as its hero, it unfolds in the aftermath of Stalinism, amid the scars left by the purges, denunciations and Great Patriotic War. The prolific author, a former Moscow correspondent, knows his terrain inside out.

The Uninhabitable Earth: Life After Warming. By David Wallace-Wells. *Tim Duggan Books; 320 pages; \$27. Allen Lane; £20.* One of the most persuasive of the many books that spell out the consequences of climate change—and one of the most terrifying. As Earth moves beyond the conditions that allowed people to evolve, the author warns, “the end of normal” has arrived. Yet amid the rising seas, floods, fires, droughts and hurricanes, both current and impending, he remains optimistic about humanity’s ability to deal with the havoc it has caused.

The New Rules of War: Victory in the Age of Durable Disorder. By Sean McFate. *William Morrow; 336 pages; \$29.99.* A former paratrooper and mercenary makes the case that the American armed forces are ill-equipped for the conflicts of the 21st century. To keep the country safe, he contends,

the top brass need to modernise their thinking, and respond to the information warfare that is now waged by their adversaries.

Good Reasons for Bad Feelings. By Randolph Nesse. *Dutton; 384 pages; \$28. Allen Lane; £20.* A fascinating study of the evolutionary roots of mental illness. The author, a professor of psychiatry, argues that, in the right proportion, negative emotions may be useful for survival in a similar way to physical pain. Humans, he says, may have “minds like the legs of racehorses, fast but vulnerable to catastrophic failures”.

Novacene: The Coming Age of Hyperintelligence. By James Lovelock with Bryan Appleyard. *MIT Press; 160 pages; \$22.95. Allen Lane; £14.99.* In a brief but thought-provoking book, the scientist who developed the “Gaia Theory” about the Earth’s life and climate—and who this year turned 100—predicts that cyborgs may eventually evolve to supplant carbon-based humankind. But don’t despair: the robots, he suggests, might decide to keep people around as pets. ■



《经济学人》年度书单

看过来！

2019年度最佳图书涉及的内容包括爱尔兰共和军、哈珀·李的未竟之作、理性经济学，以及俄亥俄州的一名家庭主妇

《尊严：在美国“后排”寻求尊重》，克里斯·阿纳德著。Sentinel出版社；304页；30美元；25英镑。作者曾是华尔街交易员。他用了几年时间走遍美国各地，在那些被遗忘的社区里展开深度采访，并给采访对象拍下了感人的照片。本书为他称之为美国“后排”的地区描绘了一幅众生相，平和克制却引人深思。

《美国的夏天：芝加哥的爱与殇》，亚历克斯·科特勒维兹著。Nan A. Talese出版社；304页；27.95美元。过去20年里，芝加哥发生了1.4万起凶杀案，受害者绝大多数都是非裔或西裔美国人。作者以同情的笔调，详尽刻画了几名命案涉事人和受影响者。这些凶案看似是毫无来由的愚蠢暴行，但作者指出，芝加哥可以有更多作为，弄清它们的起因。

《赢家通吃：改变世界的戏精精英》，阿南德·格里哈拉达斯著。克诺夫出版社；304页；26.95美元。艾伦·莱恩出版社；12.99英镑。本书适时抨击了慈善资本主义。它认为，那些据说在行善的公司只不过是为自己参与制造的社会问题提供敷衍了事的解决办法。作者指出，“赢家通吃”的信条正在压低工资并将风险负担转嫁给员工，而那类慈善之举几乎于事无补。

《无可见瘀伤》，蕾切尔·路易斯·斯奈德著。布鲁姆斯伯里出版社；320页；28美元。它是暴力犯罪的暗物质：鲜为人知却又无所不在。这本书是对美国家庭暴力的调查，不仅展示了触目惊心的证据，还就如何帮助受害者和施暴者双方提出了令人信服的建议。本书既呈现个例，又反映全景；既表达愤怒，又点燃希望。

《要么阿萨德，要么烧毁叙利亚》，萨姆·达格尔著。利特尔&布朗出版社；592页；29美元；25英镑。尽管有关叙利亚内战的恐怖惨状已经可以

找到大量详实的记录，但《华尔街日报》记者的这部叙事著作还是让人们对中国重塑中东的战争有了新的认识。作者难得地接触到了巴沙尔·阿萨德（Bashar al-Assad）从前的密友马纳夫·塔拉斯（Manaf Tlass）。书中许多内容都基于塔拉斯提供的信息，描绘出意外当选总统的阿萨德转变为血腥独裁者的过程。

《消失的光芒》，斯蒂芬·霍姆斯和伊凡·克勒斯特夫著。*Pegasus Books*出版社；256页；26.95美元。艾伦·莱恩出版社；20英镑。当苏联解体、共产主义垮台时，东欧国家开始效仿西方民主国家。但是，正如作者在这本具洞察力的著作中有力地讲述道，在全球化和金融危机的影响下，东欧国家对自由民主制的态度趋于冷淡。而这两种影响力也在西方助长了民族主义的兴起。与此同时，俄罗斯用复仇主义的独裁取代了苏维埃的统治。

《总统的不当行为：从华盛顿至今》，小詹姆斯·班纳编著。*New Press*出版社；512页；29.99美元。1974年，负责弹劾调查的特别检察官对从华盛顿到林登·约翰逊的美国总统的不当行为展开了委托调查。本书在此基础上加以更新，增加了从尼克松到奥巴马的章节。这项研究很有价值，为审视当下总统的不当行为提供了借鉴。

《噤声》，帕特里克·拉登·基夫著。道布尔戴出版社；464页；28.95美元。威廉·柯林斯出版社；20英镑。10个孩子的母亲珍·麦康维尔（Jean McConville）在1972年被爱尔兰共和军绑架并杀害。围绕对麦康维尔之死的调查，作者以精湛的写作手法探究了恐怖分子的动机、他们的“信仰”，以及他们如何归于平静——或者，有时候并不能。

《追忆埃米特·蒂尔》，戴夫·特尔著。芝加哥大学出版社；312页；25美元；19英镑。埃米特·蒂尔（Emmett Till）是芝加哥一名14岁的黑人少年，他在1955年因遭受私刑致死，而他母亲执意开棺将他被损毁的面容公之于众。蒂尔由此成为民权运动早期的殉道者。本书以此为线索，精彩讲述了密西西比河三角洲一段有关种族主义、贫困和回忆的历史。

《阿姆利则1919：惶惶不安的帝国和大屠杀的缘起》，金姆·瓦格纳著。耶

鲁大学出版社；360页；32.50美元；20英镑。1919年4月13日，至少有379人在阿姆利则大屠杀中被英国士兵杀害。这是大英帝国历史上最黑暗的日子之一。在该事件的百年纪念之际，本书令人信服地指出，大屠杀并不像丘吉尔等帝国辩护者选择相信的那样，是一次失常的举动。

《毛泽东主义的全球史》，蓝诗玲著。克诺夫出版社；610页；37.50美元。Bodley Head出版社；30英镑。在毛泽东的专制统治下，数千万人丧生。但毛泽东并没有像希特勒或斯大林那样背负骂名。实际上，他的传奇和思想激励了世界各地的革命者。正如本书作者所指出的那样，经过精心塑造的毛泽东形象在中国乃至中国以外的地方仍然具有强大的吸引力。“就像蛰伏的病毒，”她写道，“毛泽东主义展现出一种顽强且覆盖全球的潜伏力。”

《摄政年代》，罗伯特·莫里森著。W.W.诺顿出版社；416页；29.95美元。英国版书名为《摄政革命》；Atlantic Books出版社；20英镑。“我一朝醒来，发现自己已经成名。”摄政时期的诗人拜伦曾说。而这一时期本身的遭遇与拜伦的经历正相反——之前的乔治王朝和之后的维多利亚王朝都更为庄严、显赫，令它黯然失色。然而这本书认为，英国真正开始走向现代化却是在摄政时期，并解释了为什么这一时期值得人们更好地去了解。读来兴致盎然。

《如何成为独裁者》，冯克著。布鲁姆斯伯里出版社；304页；28美元；25英镑。墨索里尼、希特勒、斯大林、毛泽东、金日成、尼古拉·齐奥塞斯库（Nicolae Ceausescu）、“爸爸医生”杜瓦利埃（Papa Doc Duvalier）、门格斯图·海尔·马里亚姆（Mengistu Haile Mariam），这些人有什么共同点？请看看这本见解精辟的暴徒手册，作者是一位在研究20世纪的中国方面成绩斐然的历史学家。

《完美间谍：理查德·佐尔格，斯大林的王牌特工》，欧文·马修斯著。布鲁姆斯伯里出版社；448页；30美元；25英镑。理查德·佐尔格是苏联派驻东京的间谍，他惯用的间谍手段包括豪饮和诱骗。佐尔格在职业生涯中有多英勇和不顾一切，他在莫斯科的主子们就有多贪腐和懦弱。尽管主子们

极其无能，但佐尔格的情报还是帮助扭转了二战的进程。作者克制地表达了自己的义愤，绝妙地讲述了一个悲壮的英雄故事。

《一个理想主义者的有教益的经历》，萨曼莎·鲍尔著。*Dey Street Books*出版社；529页；29.99美元。威廉·柯林斯出版社；20英镑。作者萨曼莎·鲍尔出生于爱尔兰，曾担任奥巴马政府的驻联合国大使。她引人入胜地讲述了那个看起来与如今很不相同的外交时代的外交决策内幕。本书还记述了作者努力在理想主义与担任治理职务的现实之间寻求平衡，同时还要兼顾身为人母与美国在世界舞台上的代言人的双重角色。

《家族文件：穿越20世纪的塞法迪犹太人之旅》，萨拉·阿布雷维亚·斯泰因著。*Farrar, Straus and Giroux*出版社；336页；28美元。本书记叙了希腊萨洛尼卡（Salonika）的莱维家族（Levy）从两次世界大战之间至今的历史。这是一次艰苦的重建历史的壮举，素材来自各种语言的往来书信，包括奥斯曼土耳其语、希伯来语、法语，特别是塞法迪犹太人使用的拉迪诺语。这个家族的大部分成员都于1943年在奥斯维辛集中营被害，幸存者如今散布世界各地。不过，作者指出，在他们身上依然能看到相似的家族印记。

《最后一块石头》，马克·鲍登著。大西洋月刊出版社；304页；27美元。格洛夫出版社；16.99英镑。美国纪实犯罪题材的作家们在提笔之前，都要思量一下杜鲁门·卡波特（Truman Capote）等杰出前辈树立的高标杆。而《黑鹰坠落》（Black Hawk Down）的作者鲍登选择迎难而上。1975年，一对姐妹在马里兰州一家商场人间蒸发，他再现了这一骇人听闻的犯罪事件在40年后得以部分告破的过程。经过对满口谎言的嫌犯锲而不舍的机智审讯，真相最终浮出水面。

《艰难时代的优良经济学》，阿比吉特·班纳吉和埃斯特·迪弗洛著。*PublicAffairs*出版社；432页；30美元。艾伦·莱恩出版社；25英镑。该书为诺贝尔经济学奖伉俪得主的合著。其真正价值在于它描述的研究方法——耐心地尝试通过实证去攻克难题。这对夫妻档因率先使用随机对照实

验而闻名，他们为不平等、腐败等各种棘手的全球问题提供了洞见，贯穿全书的谦逊让人如沐春风。

《开放边境》，布莱恩·卡普兰著。扎克·韦纳史密斯绘图。第一秒出版社；256页；19.99美元。圣马丁出版社；15.99英镑。本书由一位经济学教授和一位插画家合作完成，以漫画的形式呈现了一场开明的激烈辩论，有理有据地驳斥了政客常常宣扬的反移民论调。与此同时，它展示了如何用浅显易懂又足够尊重的方式破解伤脑筋的议题。

《叙事经济学》，罗伯特·席勒著。普林斯顿大学出版社；400页；27.95美元；20英镑。作者也是一位诺贝尔奖得主，他探索了经济趋势如何被公众的主观看法所左右。本书是他的研究成果，摆脱了数学模型对经济学的禁锢，明智务实，令人欣喜。

《分裂》，保罗·布鲁斯坦著。CIGI出版社；400页；27.95美元。麦吉尔-女王大学出版社；27.99英镑。本书详尽叙述了美中贸易紧张关系的历史，引人入胜。它介绍了当今冲突的由来，并揭示了避免冲突的难度之大。

《单打独斗的资本主义》，布兰科·米兰诺维奇著。Belknap出版社；304页；29.95美元；23.95英镑。作者是一名研究不平等问题的学者。他警告称，尽管资本主义可能击垮了与之竞争的经济制度，但自由民主政体的续存却绝非理所当然。他认为，在自由程度更高的资本主义社会中，唯利是图已经侵蚀了有助于维持开放和民主的道德规范；如今，这种趋势可能会让这些地方发展成像中国那样更专制的资本主义社会。

《狂怒时分：谋杀、欺诈以及哈珀·李的最后审判》，凯西·塞普著。克诺夫出版社；336页；26.95美元。威廉·海涅曼出版社；20英镑。这部结构巧妙、文笔优美的作品讲述了两个谜团。一个围绕牧师威利·马克斯韦尔（Willie Maxwell）。上世纪70年代，在美国的亚拉巴马州，马克斯韦尔被指控为骗保而杀害了五名亲属（之后他被人开枪打死）。另一个谜团围绕哈珀·李（Harper Lee），他曾试图就这桩案件写一本书，但未能如愿。

本书的第三个主要人物是律师汤姆·拉德尼（Tom Radney），他不仅为马克斯韦尔辩护，还为杀害他的凶手辩护。

《卡夫卡的最后审判：一起文学遗产案》，本杰明·巴林特著。W.W.诺顿出版社；288页；26.95美元。骑马斗牛士出版社；14.99英镑。本书讲述了以色列和德国的档案馆对卡夫卡手稿的争夺；另外还有一名女性参与其中，她从卡夫卡的编辑马克斯·布罗德（Max Brod）的一位朋友那里继承了这些手稿。这场争夺在卡夫卡的大多数家人于犹太人大屠杀中丧生后开启。这是一部有关艺术作品的出处，以及这种“发源”最终具有重要性的书。

《地下世界：一场深度时光旅行》，罗伯特·麦克法兰著。W.W.诺顿出版社；384页；27.95美元。哈米什·汉密尔顿出版社；20英镑。在人们通常的想象中，地下世界埋藏着珍宝，同时也令人生畏。作者对地下世界的探索让人过目难忘。从巴黎的地下墓穴到伦敦艾坪森林的土壤，再到挪威最偏远地区的洞穴，这位知名自然作家带领读者从地表之下重新展望这个世界。

《三个女人》，丽莎·塔代奥著。西蒙与舒斯特出版社；320页；27美元。Bloomsbury Circus出版社；16.99英镑。作者以女性的视角，经过八年的深入报道，描述了美国人的性现状。三名受访者“代表了性渴望在美国的全貌”。作者住在受访者的家乡，研究她们的日常生活、工作，尤其是她们的欲望。她以小说家对细节的洞察力，捕捉到性在带来令人陶醉的欢愉的同时，也携带着痛苦和无力感。

《在锡耶纳的一个月》，希沙姆·马塔尔著。兰登书屋；126页；27美元。维京出版社；12.99英镑。1990年，作者的父亲——一名利比亚人——被穆阿迈尔·卡扎菲政府绑架。这件事塑造了作者的人生和写作。在之前的作品中他试图揭开真相，而在这本篇幅不长却引人入胜的书中，他通过在锡耶纳的旅行找到了某种答案。本书沉思艺术、历史以及两者的关系，它既是对一座城市的画像，也是作者在痛失亲人之时对生命无声的尊严发出的确认。

《这就是莎士比亚》，艾玛·史密斯著。鹈鹕丛书；368页；20英镑。这部精彩纷呈、浅显易懂的著作不仅带领读者领略了莎士比亚的戏剧，还就如何阅读和观赏莎翁作品提出了全新的主张。作者是牛津大学的教授，本书言语诙谐、玩世不恭、刨根究底，让人对这位世界上最伟大的文学天才的全部作品有了耳目一新的认识。

《斯大林格勒：一部小说》，瓦西里·格罗斯曼著；英译者：罗伯特·钱德勒、伊丽莎白·钱德勒。NYRB Classics出版社；1088页；27.95美元。Harvill Secker出版社；25英镑。苏联小说家兼记者格罗斯曼的史诗巨著《生活与命运》（Life and Fate）讲述了斯大林格勒战役及其余波。它恢宏的前传终于迎来了最权威同时也极具感染力的英译本。沸腾喧嚣的宏大战斗场面、被围攻下的日常生活，以及充满智慧的辩论——格罗斯曼的确是无可匹敌的二战画师。

《鸭子，纽伯里波特》，露西·埃尔曼著。Biblioasis出版社；1040页；22.95美元。Galley Beggar出版社；14.99英镑。今年最让人难以置信的文学成就当属一段长达1000页的虚构的独白，源自小说主人公——俄亥俄州一名焦虑的家庭主妇——在厨房烘焙蛋糕时的心理活动，整段独白却只分成了几个句子。这部获奖小说风趣，愤怒，博学，深刻，而且还提供了大量制作蛋糕的妙方。

《这个陌生世界里的10分38秒》，埃利芙·沙法克著。布鲁姆斯伯里出版社；320页；27美元。维京出版社；14.99英镑。故事的主人公“龙舌兰·利拉”一出场就已身亡。她的尸体被丢弃在伊斯坦布尔郊区的一个有轮垃圾箱里。然而不知何故，她的思维依然活跃。主人公回顾了自己的一生——苦难的童年、成年后结交的忠实朋友。这部有力而直言无畏的小说与这位土耳其作家所有其他作品一脉相承，兼具政治性与抒情性。

《家园》，费尔南多·阿兰布鲁著；英译者：阿尔弗雷德·麦克亚当。万神殿图书；608页；29.95美元。骑马斗牛士出版社；16.99英镑。这是一部不朽之作，也是西班牙语畅销书。小说探究了在一个幽闭恐怖的巴斯克小

镇，恐怖主义组织埃塔（ETA）是如何割裂亲情和终身友情的。字里行间充满同情，却又不失道义上的敏锐，这可能是描述巴斯克问题的最佳虚构作品。它让人们认识到，救赎虽难，但并非不可能。

《志愿兵》，萨尔瓦托雷·希博纳著。企鹅出版社；432页；28美元。*Jonathan Cape*出版社；16.99英镑。这部错综复杂的小说在时间上跨越了几十年，在空间上横跨几大洲，并且包括多个连环故事。沃利（Vollie）曾经在柬埔寨被俘，后来回到美国，被派往纽约去监视一名据称是纳粹叛逃者的人。这项任务也将对他本人造成无法摆脱的困扰。“我们中间，有谁只活过一次？”他问道。这本书是对战争以及人们赖以生存的谎言犀利无情而又充满诗意的记录。

《远场》，马杜里·维杰著。格洛夫出版社；448页；27美元；14.99英镑。这部处女作小说勇于直言，富有见地，感人至深。它获得了印度久负盛名的JCB文学奖。小说主人公是一名来自印度南部上层社会的天真女性。作者将她置身于克什米尔的混乱现实中。一路发生的故事向印度从性到政治的各种禁忌提出了挑战。

《信任练习》，苏珊·崔著。Henry Holt出版社；272页；27美元。*Serpent's Tail*出版社；14.99英镑。这部获得美国国家图书奖的小说构思精巧，引人入胜，书名不仅指故事中戏剧学校的学生之间为建立友谊而进行的练习，还指作者与读者之间的关系——以及少女与色狼之间的信任。小说讲述了错失的关系和操纵，以及心甘情愿屈服于未知的诱惑和危险。

《黑太阳》，欧文·马修斯著。Doubleday出版社；320页；26.95美元。*Bantam*出版社；16.99英镑。小说取材于真实事件——安德烈·萨哈罗夫（Andrei Sakharov）试图研发一颗核弹来终结所有炸弹，故事发生在1961年苏联的一个秘密城市。在斯大林主义的余波中，到处都是肃反、告发和伟大的卫国战争留下的创伤，小说就是在这样的背景中围绕谋杀、背叛展开，主人公是一个有缺点但又有原则的克格勃特工。本书作者著述颇丰，他曾是驻莫斯科的记者，对自己描写的领域了如指掌。

《无法居住的地球：气候变暖后的生活》，大卫·华莱士-威尔斯著。Tim Duggan Books出版社；320页；27美元。艾伦·莱恩出版社；20英镑。在众多阐述气候变化后果的书籍中，本书是最有说服力、同时也是最骇人听闻的作品之一。作者警告称，随着地球的变化超出适合人类进化的条件范围，“常态生活的末日”已经到来。然而，面对正在发生或即将出现的海平面上升、洪水、火灾、干旱以及飓风，对于人类能否应对自己造成的破坏，作者仍然持乐观态度。

《战争新规则：持久动乱时代的胜利》，肖恩·麦克法特著。William Morrow出版社；336页；29.99美元。曾经当过伞兵和雇佣兵的作者论证道，在21世纪的冲突中，美国武装力量准备不足。他认为，为了维护美国国家安全，高级将领需要更新思维，回应对手已经发动的信息战。

《坏情绪的好理由》，兰道夫·内瑟著。Dutton出版社；384页；28美元。艾伦·莱恩出版社；20英镑。本书探索了精神疾病在进化上的起因，生动有趣。作者是一名精神病学教授，他认为，如果程度适当，负面情绪和肉体上的疼痛一样，可能有益于维续生命。他说，人类可能拥有“像赛马的腿一样的头脑，转得快，但难以承受巨大的灾难性的挫折”。

《新星世：即将到来的超智能时代》，詹姆斯·洛夫洛克和布赖恩·阿普尔亚德著。麻省理工学院出版社；160页；22.95美元。艾伦·莱恩出版社；14.99英镑。今年已百岁高龄的科学家洛夫洛克提出了有关地球生命和气候的“盖娅理论”。在这本简短却发人深省的书中，他预测赛博格可能终将逐步取代碳基的人类。但人类也不必绝望——他认为，机器人或许会将人类留作宠物。■



Exchange rates

One-way baht

For 15 years two currencies have reliably outperformed all others

THE PAST decade and a half has seen boom and bust, inflation and deflation, globalisation and trade tensions. Through such economic and political cycles you might expect currencies to go in and out of fashion. In fact the two that have strengthened the most against the dollar over this period—Thailand's baht and Israel's shekel—have done so consistently. They have outshone other currencies over one, five and ten years, too. What explains their popularity?

Inflation is part of the answer. Exchange rates partly reflect relative purchasing power, so a country with low inflation should see its currency strengthen against that of a country where prices are rising fast. Both Israel and Thailand have had low annual inflation: 1.4% and 2.2% respectively, on average, over the past 15 years.

Another factor that causes exchange rates to move is one country becoming relatively more productive than another. Economic growth is a reasonable proxy of productivity, and Israel and Thailand have had fast growth. (China has also grown quickly, but the yuan has been hit hard by the trade war.)

One curiosity is why both currencies have performed well over each of the four time horizons. The answer may reflect policy. Both Israel and Thailand intervene in markets to limit upward pressure on their currencies. If they are very strict, currency regimes can end abruptly, as when Switzerland abandoned its peg in January 2015. But Israel and Thailand have been more flexible, which has strung out their appreciations over time. ■



汇率

单向泰铢

过去15年，有两种货币的表现持续优于其他所有货币

过去15年见证了繁荣与萧条、通胀与通缩、全球化和贸易冲突的更替。在这样的经济和政治周期中，你可能觉得各国货币也会随之起起落落。而实际上，在此期间兑美元最为强势的两种货币——泰国铢和以色列谢克尔——一直保持稳定。论一年、五年和十年期表现，它们也超越了其他货币。该如何理解它们受到的追捧？

通胀是原因之一。汇率在一定程度上反映相对购买力，因此，低通胀国家的货币相对价格快速上涨国家的货币会有所升值。以色列和泰国的年通胀率都较低：过去15年的平均年通胀率分别为1.4%和2.2%。

一国生产率变得相对高于另一国也会导致汇率起伏。经济增速是衡量生产率的合理指标，而以色列和泰国的经济增速很快。（中国也增长迅速，但人民币汇率受到了中美贸易战的沉重打击。）

令人好奇的是，为何这两种货币在四个时间区间内均表现不俗？答案可能是政策的影响。以色列和泰国政府都会干预市场以抑制本国货币的汇率上行压力。如果政策非常严格，汇率制度可能会突然终结，就像瑞士在2015年1月放弃瑞士法郎挂钩欧元那样。但以色列和泰国的政策较为灵活，这就使得货币长期持续升值。 ■



Culture and development

God and Mammon

Medieval Catholicism nudged Europe towards democracy and development

WHY SOME countries are rich and others are poor is an enduring debate in economics. Natural resources and friendly climates help only a bit. In contrast, robust political institutions and a steady rule of law seem essential. But why did these precursors evolve in just a few dozen states?

One oft-cited theory, advanced by Robert Putnam of Harvard University, is that the crucial ingredient is “social capital”, the affinity people feel for members of their society whom they do not know. Proxies for this sentiment, such as blood-donation rates or propensity to return a stranger’s lost wallet, closely track GDP per person.

Social capital can take centuries to amass. Mr Putnam has shown that parts of Italy that were ruled by a feudal monarchy around 1300AD have low levels of social trust and are relatively poor today. In contrast, the Italian regions that formed city-states in that era, where citizens banded together for commerce and self-defence, are now unusually rich and well-run.

A recent study by Jonathan Schulz, Joseph Henrich and two other scholars proposes an explanation that delves even further back in time. They focus on family structure. Until recent human history, people lived in small groups and often married relatives. These habits reinforced family ties, but made people wary of outsiders.

In Europe this started to change around 500AD, when the Catholic church began banning polygamy and marriages between cousins, or between widows or widowers and their dead spouses’ siblings. These edicts forced unmarried men to venture out and meet women from different social

groups. The paper says that this reduced Christians' "conformity and in-group loyalty", and made them trust strangers more. By expanding the community beyond clans, it helped create the broad solidarity on which development may depend.

To show that Christian dogma caused this shift, the authors match historical data on the spread of religion with modern indicators. In places where Catholicism was generally the leading religion from 500-1500AD, people score highly on measures of independence, impartiality and trust—such as agreeing to testify against a friend whose reckless driving killed a pedestrian. The same pattern occurs in countries settled mostly by Christian migrants, such as America. In contrast, social trust is lower and marriage between cousins is relatively common in areas whose populations do not descend from medieval Catholics.

This effect distinguishes Catholicism from other strands of medieval Christianity. Years spent before 1500AD under Eastern Orthodoxy, which the authors say did less to police marriage within families, was a weaker predictor of "pro-social" survey responses than exposure to Catholicism was. Moreover, the trend holds up both between and within countries. Among Italian regions, those with high social capital (as measured by data like using cheques over cash) were influenced by Catholicism for longer than those lacking it were.

The study's subject limits the strength of its findings. Barring an experiment to assign religions to countries at random and monitor them for 1,500 years, no one can prove whether incest bans built social trust or merely coincided with it. Nonetheless, the paper bolsters the case for studying ancient history to understand the present. ■



文化与发展

天主与财神

中世纪的天主教帮助推动了欧洲走向民主与发展

为什么有些国家富，有些国家穷？这是经济学一直在争论的议题。自然资源和宜人气候的影响很有限。相比之下，健全的政治体制和稳固的法治似乎至关重要。但为什么这些前提条件仅在几十个国家得以形成呢？

哈佛大学的罗伯特·普特南（Robert Putnam）提出的一项理论常常被引用。他认为，决定一国富裕与否的关键要素是“社会资本”，即人们对自己不认识的社会成员是否有亲近感。衡量这种情感的指标（例如献血率或拾金不昧的习惯）与人均GDP水平密切关联。

社会资本可能需要几个世纪的积累。普特南指出，意大利部分地区在公元1300年左右被封建君主统治，如今那里社会信任度低且相对贫困。相比之下，意大利另一些地区在那个时代形成了城邦，居民为了商业和自卫而团结在一起，如今这些地区非常富裕，且治理水平高。

乔纳森·舒尔茨（Jonathan Schulz）、约瑟夫·亨里希（Joseph Henrich）和其他两位学者最近的一项研究提出了另一种解释，把原因追溯到更久以前。他们的研究重点是家庭结构。在人类历史的大部分时间里，人们都生活在小群体中，经常近亲结婚。这些习俗强化了家庭纽带，但也让人们提防外人。

在欧洲，这种情况在公元500年左右开始改变，当时的天主教会开始禁止一夫多妻制以及表亲婚姻，并禁止寡妇或鳏夫与其死去的配偶的兄弟姐妹再婚。这些法令迫使未婚男性走出自己的小圈子，结识来自不同社会群体的女性。该论文认为这降低了基督教徒的“依从性和圈内忠诚度”，让他们更加信任陌生人。社群扩大到宗族以外帮助建立了广泛的团结，而这种大范围的团结可能是实现发展所倚赖的。

为了表明是基督教教义引起了这一转变，作者将有关宗教传播的历史数据与现代指标对应起来。在那些公元500至1500年间以天主教为主要宗教的地方，人们在独立、公正和信任方面的得分很高，比如他们会愿意指证自己的朋友鲁莽驾驶导致行人死亡。在美国等居民主要为基督徒移民的国家也有相同的情况。相反，如果一个地方的居民的先人并非中世纪的天主教徒，那里的社会信任度更低，表亲联姻也更普遍。

这种影响把天主教与中世纪基督教的其他分支区分开来。相比天主教，在公元1500年前以对近亲结婚限制更少的东正教为主导的社会历史与“亲社会”的调查结果的关联更弱。而且，这种影响模式在国家之间和国家内部都成立。在意大利，社会资本较高的地区（通过使用支票多于现金等数据衡量）受天主教影响的时间长于缺乏社会资本的地区。

该研究的对象限制了研究结果的说服力。如果无法通过实验将不同宗教与国家随机配对并连续追踪1500年，就没有人能证明禁止近亲结婚与形成社会信任之间是有因果关系，还是纯属巧合。尽管如此，该论文仍为通过研究古代史了解当下社会提供了依据。 ■