



2021年合集

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P1 2021-01-04 The life cycle of a cup of coffee - A.J. Jacobs

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=1>)

How many people does it take to make a cup of coffee? For many of us, all it takes is a short walk and a quick pour. But this simple staple is the result of a globe-spanning process whose cost and complexity are far greater than you might imagine. It begins in a place like the remote Colombian town of Pitalito. Here, family farms have clear cut local forests to make room for neat rows of Coffea trees. These shrub-like plants were first domesticated in Ethiopia and are now cultivated throughout equatorial regions. Each shrub is filled with small berries called "coffee cherries." Since fruits on the same branch can ripen at different times, they're best picked by hand, but each farm has its own method for processing the fruit. In Pitalito, harvesters toil from dawn to dusk at high altitudes, often picking over 25 kilograms per shift for very low wages. The workers deliver their picked cherries to the wet mill. This machine separates the seeds from the fruit, and then sorts them by density. The heaviest, most flavorful seeds sink to the bottom of the mill, where they're collected and taken to ferment in a tub of water for one or two days. Then, workers wash off the remaining fruit and put the seeds out to dry. Some farms use machines for this process, but in Pitalito, seeds are spread onto large mesh racks. Over the next three weeks, workers rake the seeds regularly to ensure they dry evenly. Once the coffee beans are dry, a truck takes them to a nearby mill with several specialized machines. An air blower re-sorts the seeds by density, an assortment of sieves filter them by size, and an optical scanner sorts by color. At this point, professionals called Q-graders select samples of beans to roast and brew. In a process called "cupping," they evaluate the coffee's taste, aroma, and mouthfeel to determine its quality. These experts give the beans a grade, and get them ready to ship. Workers load burlap sacks containing up to 70 kilograms of dried and sorted coffee beans onto steel shipping containers, each able to carry up to 21 metric tons of coffee. From tropical ports, cargo ships crewed by over 25 people transport coffee around the world. But no country imports more coffee than the United States, with New York City alone consuming millions of cups every day. After the long journey from Colombia to New Jersey, our coffee beans pass through customs. Once dockworkers unload the container, a fleet of eighteen-wheelers transport the coffee to a nearby warehouse, and then to a roastery. Here the beans go into a roasting machine, stirred by a metallic arm and heated by a gas-powered fire. Nearby sensors monitor the coffee's moisture level, chemical stability, and temperature, while trained coffee engineers manually adjust these levels throughout the twelve-minute roasting cycle. This process releases oil within the seed, transforming the seeds into grindable, brewable beans with a dark brown color and rich aroma. After roasting, workers pack the beans into five-pound bags, which a fleet of vans deliver to cafes and stores across the city. The coffee is now so close you can smell it, but it needs more help for the final stretch. Each coffee company has a head buyer who carefully selects beans from all over the world. Logistics teams manage bean delivery routes, and brave baristas across the city serve this caffeinated elixir to scores of hurried customers. All in all, it takes hundreds of people to get coffee to its intended destination—and that's not counting everyone maintaining the infrastructure that makes the journey possible. Many of these individuals work for low pay in dangerous conditions—and some aren't paid at all. So while we might marvel at the global network behind this commodity, let's make sure we don't value the final product more than the people who make it.

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翻译人员: Alexis Young 校对人员: Helen Chang 煮杯咖啡需要多少人? 对于许多人来说, 只要走一小段路, 然后将咖啡倒杯里。但这种简单的大众饮料 经过了跨越全球的历程, 其成本和复杂性远远大于你想象的。它始于如哥伦比亚偏远的 皮塔利托镇这样的地方。在这里, 家庭农场砍伐当地森林, 为整齐的科菲亚树排腾出空间。这些灌木状植物 最初在埃塞俄比亚驯化, 现在于整个赤道地区种植。株灌木都装满了小浆果, 叫做“咖啡樱桃”。由于同一枝上的果实 会在不同的时间成熟, 最好以手工采摘但每个农场都有自己的加工法。在皮塔利托, 收割工人从黎明到黄昏 在高海拔地区辛勤劳作, 经常每班采摘超过 25 公斤, 但工资极低。工人们把他们采摘的果实 送到潮湿的磨坊。这台机器将种子从果实中分离, 然后按密度进行分类。最重, 最有味道的种子沉入底部, 在那里它们被收集, 并放到一缸水中发酵一两天。然后工人洗掉剩下的果肉, 把种子晾干。一些农场使用机器进行这个过程, 但在皮塔利托, 种子被散置在大网架上。在接下来的三周里, 工人们定期翻耙种子, 以确保它们均匀干燥。干燥后会有卡车将咖啡豆 运到附近的工厂, 工厂配备了几台专用机器: 吹风机按密度进行重新分类, 各种筛子按大小过滤, 光学扫描仪按颜色分类。此时, 所谓的 Q 级专业人士会选择豆类样品来烘烤和酿造。在一个叫做“杯测”的过程中, 他们评估

咖啡的味道、香气和口感，以确定咖啡的质量。这些专家给豆子分级，让它们准备好发货。工人们将装有多达 70 公斤 分级咖啡豆的粗麻袋入钢制集装箱，每个集装箱最多可装载 21 公吨咖啡。货船载着超过 25 名船员从热带港口出发，将咖啡运输到在世界各地。但进口咖啡最多的国家莫过于美国，仅纽约市每天就消耗数百万杯。从哥伦比亚到新泽西的长途旅行后，我们的咖啡豆通过海关。一旦码头工人卸下集装箱，一队十八轮货车将咖啡运到附近的仓库，然后运到烘烤厂。在这里，豆子进入烘烤机，由金属手臂搅拌并以燃烧气体的火加热。附近的传感器监控咖啡的水分、化学稳定性和温度，而训练有素的咖啡工程师在整个 12 分钟的烘烤周期中会以手动调整。这个过程让种子内的油释放，将种子转化为可研磨可冲泡的豆子，色呈深棕，香气浓郁。烘烤完后，工人们把豆子以五磅的袋子分装，再由货车队送到了全市的咖啡馆和商店。现在咖啡已经离你很近了，你几乎闻得到它的香味，但还有最后一关需要帮它一把。每家咖啡公司都有一位采购主管，他精心挑选来自世界各地的咖啡豆，物流团队管理豆子递送路线，全市勇敢的咖啡师为来去匆匆的顾客提供这种含咖啡因的甘露。总之，咖啡需要数百人才能送到预定目的地，这还不包括维护运输基础设施的人。其中许多人在危险的条件下赚取微薄工资，有些人根本没有报酬。因此，尽管我们惊叹于这商品背后的全球网络，我们应确保我们不要将最终产品比背后辛劳的人们看得更重。

P3 2021-01-11 These squids can fly... no, really - Robert Siddall

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=3>)

In the spring of 1947, six Scandinavian explorers noticed a strange phenomenon while crossing the Pacific Ocean. Somehow, small squid known to live deep beneath the waves kept appearing on the roof of their boat. The crew was mystified—until they saw the squids soaring above the sea for roughly 50 meters. On land, people could barely believe the explorers. It seemed impossible that sea creatures without wings or bones could fly at all, let alone travel half the length of a football field. But over the next several decades, more reports began to surface. Sailors described airborne squid keeping pace with motor boats. Researchers reported captive squid escaping their tanks overnight. And as cameras became widespread, seafarers finally began capturing proof of these high-flying cephalopods. But how and why do these marine creatures take to the sky? While only a few squid species have been recorded taking flight, most squid are alike in the way they traverse the ocean. The outside of a squid's body is a massive tube of muscle called the mantle. Water enters that tube through small openings around the squid's head. Then, muscles clamp these openings shut, and the squid forcefully pumps the water through the base of their body. In practice, this makes the mantle a miniature jetpack, propelling squid through the water at 10 kilometers per hour. This process is also how squid breathe. Squid gills rest inside the mantle, and siphon oxygen from the water being pushed past them. With gills full of air and a mantle full of water, squid can outpace predators and pursue their prey. Or, in the case of some species, they can smash through the ocean's surface, and attempt an epic flight. Without the resistance of water, a squid's acceleration is the same as a car going from zero to 100 kilometers per hour in just over a second. At speeds of 40 kilometers per hour, squid quickly generate aerodynamic lift. But to stay in the air they'll need something like wings. Fortunately, our soaring cephalopod has a plan. Squid tentacles are "muscular hydrostats," meaning the tissue can be held firm by muscle tension. Splaying its tentacles in a rigid formation, the squid transforms them into flexible wing-like structures that stabilise its flight. At the opposite end of its body, two fins typically used for gentle swimming find new purpose as a second set of wings. And by folding these fins down, a squid can streamline itself and dip back into the ocean. There have been too few observations to establish what a squid's typical flight trajectory looks like. Based on their flying speed, a 10 centimeter squid could hypothetically launch itself six meters above the water. But from what scientists have seen, flying squid tend to glide low, keeping close to the surface. This trajectory allows squid to cover the most horizontal distance possible over a typical several second flight. It also makes it easy to dive back into the water for more fuel—or to make a quick escape from predatory birds. But why do squids fly at all? Leading theories suggest that flight is an escape behaviour, as flying squid generally seem to be fleeing a nearby predator or ship. Other researchers think their flight may be an energy-saving migration strategy, because it takes less energy to move quickly through the air than through water. However, it's also possible that learning to fly may be a vital part of surviving adolescence. Young, smaller squid can potentially fly faster and farther than their larger relatives. And since adult squid tend to cannibalize juveniles, soaring above the surf can help ensure these young squid will live to fly another day.

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翻译人员: jack white 校对人员: Helen Chang 1947 年春, 六名斯堪的纳维亚探险家在穿越太平洋时 注意到了奇怪的现象不知道为什么 生活在海洋深处的小乌贼不断出现在他们的船顶上船员们很困惑——直到他们看到乌贼在海面上 飞行了大约 50 米在陆地上, 几乎没有人相信探险家们没有翅膀和骨头的海洋生物 根本不可能飞行更不用说飞跃半个足球场了但在接下来的几十年里 出现了更多的报道水手们描述, 空中的乌贼 与摩托艇齐头并进研究人员报告, 捕获的鱿鱼 一夜之间逃离了他们的鱼缸随着照相机的普及 海员们终于开始抓拍这些头足类动物飞行的证据但是这些海洋生物是如何做到 以及为什么要飞行呢? 虽然只有少数品种的乌贼被记录到飞行但大多数乌贼穿越海洋的方式是相似的乌贼身体的外面是一根 巨大的肌肉管, 称为“地幔”水通过乌贼头部周围的小开口 进入肌肉管然后, 肌肉将这些开口夹住乌贼用力将水泵入身体底部实际上, 这使得“地幔” 成为一个微型喷气背包以 10km/h 的速度在水中推动乌贼前进这也是乌贼的呼吸方式乌贼的鳃位于“地幔”内从流经它们的水中吸取氧气凭借充满空气的鳃和充满水的地幔乌贼可以甩开捕食者以及追捕猎物某些品种可以冲破海洋表面并尝试进行史诗般的飞行没有水的阻力乌贼的加速度就像汽车一样从 0 到 100km/h 只需要一秒多一点乌贼以 40km/h 的速度 迅速产生空气动力升力但是为了留在空中 它们需要像翅膀这样的东西幸运的是, 我们会飞的 头足类动物已经有了计划乌贼的触手是“肌肉凝水器”这意味着组织能通过肌肉张力保持牢固乌贼以僵硬的形式张开触手将它们变成灵活的翅膀状结构稳定它的飞行在它身体的另一端 通常用于轻微摆动的两个鳍找到了新的用途——作为第二对翅膀通过将这些鳍向下折叠乌贼可以使自己呈流线型潜回大海由于观测资料太少无法确定乌贼的典型飞行轨迹的模样根据它们的飞行速度 一条 10 厘米长的乌贼大概可以在离水面 6 米的地方飞行但从科学家们的观察来看乌贼往往会在靠近水面处滑翔该轨迹能让乌贼在几秒的飞行中越过尽可能多的水平距离它还可以轻松地潜回水中 获取更多能量——或者快速躲避掠食性鸟类但是乌贼为什么要飞呢? 主流理论认为飞行是一种逃避行为乌贼似乎经常是在逃离 附近的捕食者或船只时飞行其他研究人员认为它们的飞行可能是一种节能迁移策略因为在空气中快速移动比在水中需要更少的能量然而, 学习飞行也可能是度过成长期的重要组成部分年轻的、较小的乌贼 可能比它们较大的亲戚飞得更快、更远而且由于成年乌贼 往往会蚕食未成年乌贼因此在海上飞行可以帮助这些年轻的乌贼 活到可以自由飞翔的那一天

P4 2021-01-05 Why should you read Toni Morrison's "Beloved" - Yen Pham

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=4>)

A mirror that shatters without warning. A trail of cracker crumbs strewn across the floor. Two tiny handprints that appear on a cake. Everyone at 124 Bluestone Road knows their house is haunted— but there's no mystery about the spirit tormenting them. This ghost is the product of an unspeakable trauma; the legacy of a barbaric history that hangs over much more than this lone homestead. So begins "Beloved," Toni Morrison's Pulitzer Prize-winning novel about the suffering wrought by slavery and the wounds that persist in its wake. Published in 1987, "Beloved" tells the story of Sethe, a woman who escaped enslavement. When the novel opens, Sethe has been living free for over a decade. Her family has largely dissolved— Sethe's mother-in-law died years earlier, and her two sons ran away from fear of the specter. Sethe's daughter Denver remains in the house, but the pair live a half-life. Shunned by the wider community, the two have only each other and the ghost for company. Sethe is consumed by thoughts of the spirit, whom she believes to be her eldest daughter. When a visitor from Sethe's old life returns and threatens the ghost away, it seems like the start of a new beginning for her family. But what comes in the ghost's place may be even harder to bear. As with much of Morrison's work, "Beloved" investigates the roles of trauma and love in African-American history. Morrison writes about black identities in a variety of contexts, but her characters are united by their desire to find love and be loved— even when it's painful. Some of her novels explore when love challenges social conventions, like the forbidden affection that grows between the townsfolk of "Paradise" and their fugitive neighbors. Other works examine how we can be blind to the love we already possess. In "Sula," one character realizes that it's not her marriage, but rather, one of her friendships that embodies the great love of her life. Perhaps Morrison's most famous exploration of the difficulty of love takes place in "Beloved." Here, the author considers how the human spirit is diminished when you know the things and people you love most will be taken away. Morrison shows that slavery is destructive to love in all forms, poisoning both enslaved people and their enslavers. "Beloved" examines the dehumanizing effects of the slave trade in numerous ways. Some are straightforward, such as referring to enslaved people as animals with monetary value. But others are more subtle.

Sethe and Paul D.— the visitor from her old plantation— are described as trying to “live an unlivable life.” Their coping mechanisms are different; Sethe remains mired in her past, while Paul D. dissociates himself completely. But in both cases, it’s clear each character has been irreparably scarred. Morrison also blends perspectives and timelines, to convey how the trauma of slavery ripples across various characters and time periods. As she delves into the psyche of townspeople, enslavers, and previously enslaved people, she exposes conflicting viewpoints on reality. This tension shows the limitations of our own perspectives, and the ways in which some characters are actively avoiding the reality of their actions. But in other instances, the characters’ shifting memories align perfectly; capturing the collective trauma that haunts the story. Though "Beloved" touches on dark subjects, the book is also filled with beautiful prose, highlighting its characters’ capacity for love and vulnerability. In a stream-of-consciousness sequence written from Sethe’s perspective, Morrison unspools memories of subjugation alongside moments of tenderness; like a baby reaching for her mother’s earrings, spring colors, and freshly painted stairs. Sethe’s mother-in-law had them painted white, she recalls, “so you could see your way to the top... where lamplight didn’t reach.” Throughout the book, Morrison asks us to consider hope in the dark, and to question what freedom really means. She urges readers to ponder the power we have over each other, and to use that power wisely. In this way, "Beloved" remains a testimony to the destructiveness of hate, the redeeming power of love, and the responsibility we bear to heed the voices of the past.

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翻译人员: psjnmz mz 校对人员: Helen Chang 无任何征兆破裂的镜子。洒满饼干屑的地板。印在蛋糕上的两个小手印。蓝石路 124 号的每个人 都知道他们的房子闹鬼——但折磨他们的幽灵并不神秘。这个幽灵是一种 无法言说的创伤的产物，是一段野蛮历史的遗留物，它所笼罩的不仅仅是这个孤独的家。托妮·莫里森获得普利策奖的小说 《宠儿》就是这样开头的，它讲述了奴隶制度带来的 痛苦和持续的创伤。该书出版于 1987 年，《宠儿》讲述了一位逃离奴役的女性塞丝的故事，小说开始时，塞丝 已经自由生活十多年了。她的家庭基本解体了—— 婆婆早在几年前就去世了，她的两个儿子因为害怕 这个幽灵而离家出走。塞丝的女儿丹芙仍然待在家中，但两个人的生活半死不活。被更广泛的社区排斥，她们只有彼此和鬼魂作伴。塞丝被精神上的幽灵折磨着，她认为是她的大女儿。当一个来自塞丝过往生活之处的 访客到来，并威胁赶走鬼魂时，她的家庭看起来有了新的开始。但是，来自幽灵的地方的东西 可能更令人难以忍受。与莫里森的许多作品一样，《宠儿》讲述了创伤和爱 在非裔美国人历史上的角色。莫里森在各种背景下写黑人故事，但她的人物都渴望找到爱和被爱——即使爱很痛苦。她的一些小说探讨了挑战世俗的爱情，比如“天堂”镇民与逃亡的邻居之间生长的禁忌之爱。其他作品则审视我们 对拥有的爱是如何地盲目。在《秀拉》中，主人公意识到，生命中最伟大的爱情 不是婚姻，而是一段友谊。可能莫里森对爱的艰难最著名的探索发生在《宠儿》这本书中。在这里，作者思考了 当你清楚你最爱的东西和人将被带走时， 人类的精神是如何被削弱的。莫里森展示了奴役 对所有的爱都是摧毁的，毒害被奴役和奴役她们的人。《宠儿》以多种方式审视 奴隶贸易的非人性化影响。一些很直接，比如把被奴役的人比作有货币价值的动物。但还有一些要更微妙。塞丝和来自她原来种植园的保罗·D 都被描述为试图过 一种“无法生存的生活”。他们的应对机制不同； 塞丝仍陷在过去的泥潭里，而保罗·D 则将自己完全分离。但这两个人，显然两个角色 都受到了无法弥补的伤害。莫里森还融合了视角和时间线，表达了奴隶制的创伤如何波及不同的人物和时期。她深入研究了城镇居民、奴役者和之前被奴役的人的心理，她表达了对现实矛盾的观点。这种紧张反映了我们自身观点以及一些角色积极逃离现实行为方式的局限性。但在其他例子中， 角色完美腾挪了记忆；捕捉了故事中挥之不去的集体创伤。尽管“宠儿”涉及黑暗题材，这本书也充满了美丽的散文，凸显了书中角色爱和脆弱的能力。从塞丝的角度意识流中，莫里森将压制的记忆 与温柔的时刻交织在一起，比如婴儿伸手去拿母亲的耳环、 春天的色彩和刚刚粉刷过的楼梯。塞丝的婆婆把楼梯刷成白色， 她回想起，“这样你就能看到没有灯光的山顶。”通过该书，莫里森让我们 思考黑暗中的希望，并且追问自由的真正意义。我敦促读者思考我们 对彼此拥有的力量，并去明智地使用这种力量。用这种方式，《宠儿》是 仇恨的毁灭性的显示，是爱的救赎性力量，是我们倾听过去声音的责任。

P5 2021-01-12 Savitri and Satyavan - The legend of the princess who outwitted Death

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=5>)

Princess Savitri of the Madra Kingdom was as benevolent, brilliant, and bright as the Sun God she was named for. Her grace was known throughout the land, and many powerful princes and wealthy merchants flocked to her family's palace to seek her hand in marriage. But upon witnessing her blinding splendor in person, the men lost their nerve. Unimpressed with these suitors, the princess determined to find a husband herself. Mounting her golden chariot, she travelled through rolling deserts, glittering cities and snow-capped mountains—rejecting many men along the way. Eventually, Savitri ventured deep into the jungle, where she met a young man chopping wood. His name was Satyavan, and like her, he loved the tranquil forest—but the princess saw he was not at peace. After talking for hours, Satyavan told her of his plight. His parents had once been wealthy rulers, until his father was blinded and overthrown in a violent coup. Now Satyavan worked tirelessly to support their meager new life. His determination and devotion moved the princess. As they gazed into each other's eyes, she knew she'd finally found an equal. Savitri rushed home to tell her father the good news, only to find him conversing with Narada a traveling sage and wisest messenger of the Gods. At first her father was thrilled to learn of Satyavan, but Narada revealed a tragic prophecy: her betrothed had only a year to live. Savitri's blood ran cold. She'd waited so long to find her partner—was she already doomed to lose him? The princess would not accept these terms. She swore before Narada, her family, and Savitri himself that she would never marry another. Satyavan was her one true love, and their fates were entwined forever. Moved by her powerful words, the sage told the princess to follow an ancient spiritual regimen. With regular prayer, periods of fasting, and preparation of special herbs and plants, she might be able to prolong Satyavan's life. After a simple wedding, the couple returned to the jungle to live in keeping with the sage's instructions. This modest existence was a far cry from her lavish upbringing, but they were happy in each other's company. A year passed, and the fated day arrived. On their first anniversary, the sun grew horribly hot, and Satyavan's brow began to burn. Savitri barely had time to drag him into the shade, before he grew still and cold. Through her tears, the princess saw an immense figure on the horizon. This was Yamraj, the God of Death, come to escort Satyavan's soul to the afterlife. But Savitri was not giving up yet. She followed the god for hours in the beating sun. Yamraj thundered at the princess to leave him in peace. But even as her feet bled and throat burned, Savitri would not turn back. Eventually, Yamraj paused. He would grant her one wish as reward for her persistence, but she couldn't ask for her husband's life. Without hesitating, Savitri asked the God to restore her father-in-law's sight. The wish was granted, and Yamraj rode on. But still Savitri's footsteps echoed behind him. Exasperated, the God granted her a second wish. This time, she asked for Satyavan's kingdom to be restored. Again the wish was granted, and Yamraj began his descent into his subterranean kingdom. But when he glanced back, he was astounded to see the bedraggled princess stumbling along. He'd never seen such devotion to the dead, and he honored her dedication with one final wish. Savitri wished to be the mother of many children. The God agreed, and waved to dismiss her. But the princess only repeated the vow she'd made one year earlier: her fate was forever entwined with Satyavan. How could she bear many children, if Yamraj would not return her husband? Hearing this clever question the god relented, knowing he'd been beaten. With Yamraj's blessing and respect, Satyavan was returned to Savitri, and the two walked back to the land of the living, united in a love that not even death could destroy.

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翻译人员: Lexi Ding 校对人员: Helen Chang 摩达国的 Savitri 公主乐善好施、才华横溢又冰雪聪明,就像太阳神一样,她的名字也是由此得来。她的风姿家喻户晓,许多有钱有势的王子、富商蜂拥而至求娶公主。但当亲眼看到公主那不可逼视的绝世风采时,男人们都不知所措了。这些追求者们并未打动公主,她决定亲自去寻找自己未来的夫婿。登上华丽的车架,她越过此起彼伏的沙漠,灯火辉煌的城池和白雪皑皑的群山——一路上拒绝示爱者无数。最终, Savitri 冒险进入丛林深处,在那里,她看到一个砍木头的年轻人。他的名字叫 Satyavan, 和她一样,他也热爱宁静的森林——但公主发现他内心并不平静。聊了几个小时后, Satyavan 向她讲述了自己的遭遇。他的父母曾是富有的统治者,但后来父亲眼盲了,在惨烈的政变中被推翻。现在 Satyavan 不知疲倦的工作,来贴补他们贫寒的新生活。他的坚韧和奉献感动了公主。当他们凝视彼此的双眼,公主知道她终于找到了自己的另一半。Savitri 风风火火地赶回家要告诉父亲这个好消息,但却发现他正在跟那罗陀交谈那罗陀是一个云游的仙人,也是众神最智慧的信使。得知 Satyavan, 起初国王十分兴奋,但那罗陀吐露了一个悲剧的预言:公主的未婚夫只有一年寿命了。Savitri 不寒而栗。她花了那么久才找到的伴侣——难道注定要失去了吗?公主不愿接受这样的结果。她当着那罗陀、她的家人,和娑维德利发誓,她绝不改嫁他人。Satyavan 是她唯一的真爱,他们永远休戚与共。被她坚定

的话语所感动，仙人告诉公主一种古老的宗教养生法。定时祈祷，时常斋戒，准备特殊的草药和植物，或许可以延长 Satyavan 的生命。一场简单的婚礼之后，这对新婚夫妇回到了丛林生活，遵从着仙人的指示生活。这种贫寒的日子与她过去奢华的生活相距甚远，但有彼此相伴，两人甘之如饴。一年过去，命定的日子到来了。他们一周年纪念日这天，天气热得可怕，Satyavan 的眉毛烧了起来，Savitri 甚至没来得及把他拖到阴凉处，他就已经变得僵直冰冷了。透过朦胧的泪眼，公主看到天边一个巨大的身影。那是死神阎摩，他来押送 Satyavan 的灵魂去往阴间。但 Savitri 并未放弃。她在灼灼烈日下跟随了死神好几个小时。阎摩朝公主怒吼，要她不要再跟着。但即使双脚流血喉咙灼烧难忍，Savitri 却绝不回头终于，阎摩停了下来。他同意满足她一个愿望，奖赏她的坚持不懈，但是她不能要求复活她的丈夫。毫不犹豫地，Savitri 要求死神令她的公公重见光明。阎摩满足了她的愿望，然后继续上路了。但是 Savitri 的脚步声仍然回响在他的身后。死神气急败坏，答应再满足她一个愿望。这次，她要求死神重建 Satyavan 的王国。这个愿望也被满足了，阎摩也开始进入自己的地下王国。但他回头一看，惊愕地发现公主还在后面跟着，满身泥污，踉踉跄跄。他从未见过这样的奉献精神，于是他用最后一个愿望对她的奉献表示敬意。Savitri 许愿要生许多孩子。死神同意了，挥了挥手要她离开。但是公主只是重复着自己一年前许下的誓言：她的命运永远与 Satyavan 休戚与共。如果阎摩不复活她的丈夫，她如何能够生下许多孩子呢？听到这样聪明的问题，死神大发慈悲，承认自己被打败了。带着祝福和敬意，阎摩把 Satyavan 还给了 Savitri，这对夫妇回到了人世，他们情比金坚，连死亡都无法摧毁。

P7 2021-01-19 Who decides how long a second is - John Kitching

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=7>)

In 1967, researchers from around the world gathered to answer a long-running scientific question— just how long is a second? It might seem obvious at first. A second is the tick of a clock, the swing of a pendulum, the time it takes to count to one. But how precise are those measurements? What is that length based on? And how can we scientifically define this fundamental unit of time? For most of human history, ancient civilizations measured time with unique calendars that tracked the steady march of the night sky. In fact, the second as we know it wasn't introduced until the late 1500's, when the Gregorian calendar began to spread across the globe alongside British colonialism. The Gregorian calendar defined a day as a single revolution of the Earth about its axis. Each day could be divided into 24 hours, each hour into 60 minutes, and each minute into 60 seconds. However, when it was first defined, the second was more of a mathematical idea than a useful unit of time. Measuring days and hours was sufficient for most tasks in pastoral communities. It wasn't until society became interconnected through fast-moving railways that cities needed to agree on exact timekeeping. By the 1950's, numerous global systems required every second to be perfectly accounted for, with as much precision as possible. And what could be more precise than the atomic scale? As early as 1955, researchers began to develop atomic clocks, which relied on the unchanging laws of physics to establish a new foundation for timekeeping. An atom consists of negatively charged electrons orbiting a positively charged nucleus at a consistent frequency. The laws of quantum mechanics keep these electrons in place, but if you expose an atom to an electromagnetic field such as light or radio waves, you can slightly disturb an electron's orientation. And if you briefly tweak an electron at just the right frequency, you can create a vibration that resembles a ticking pendulum. Unlike regular pendulums that quickly lose energy, electrons can tick for centuries. To maintain consistency and make ticks easier to measure, researchers vaporize the atoms, converting them to a less interactive and volatile state. But this process doesn't slow down the atom's remarkably fast ticking. Some atoms can oscillate over nine billion times per second, giving atomic clocks an unparalleled resolution for measuring time. And since every atom of a given elemental isotope is identical, two researchers using the same element and the same electromagnetic wave should produce perfectly consistent clocks. But before timekeeping could go fully atomic, countries had to decide which atom would work best. This was the discussion in 1967, at the Thirteenth General Conference of the International Committee for Weights and Measures. There are 118 elements on the periodic table, each with their own unique properties. For this task, the researchers were looking for several things. The element needed to have long-lived and high frequency electron oscillation for precise, long-term timekeeping. To easily track this oscillation, it also needed to have a reliably measurable quantum spin— meaning the orientation of the axis about which the electron rotates— as well as a simple energy level structure— meaning the active electrons are few and their state is simple to identify. Finally, it needed to be easy to vaporize. The winning atom? Cesium-133. Cesium was already a popular element for atomic clock research, and by 1968, some cesium clocks were even commercially available. All that was left was to

determine how many ticks of a cesium atom were in a second. The conference used the most precise astronomical measurement of a second available at the time— beginning with the number of days in a year and dividing down. When compared to the atom's ticking rate, the results formally defined one second as exactly 9,192,631,770 ticks of a cesium-133 atom. Today, atomic clocks are used all over the Earth— and beyond it. From radio signal transmitters to satellites for global positioning systems, these devices have been synchronized to help us maintain a globally consistent time— with precision that's second to none.

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翻译人员: Lexi Ding 校对人员: Helen Chang 1967 年, 世界各地的科研人员齐聚一堂, 共同研究一个 困扰学界已久的问题——一秒究竟多长呢? 乍听之下似乎答案很明显。一秒不就是时钟滴答一声, 钟摆摆动一下, 数一个数花费的时间。但这些测量方法精确吗? 时长又是基于什么而定的呢? 我们如何科学地定义 秒这个最基础的时间单位呢? 人类历史上很长的一段时间, 古代文明都在使用一种记录夜空稳步变化的特殊日历来计时。事实上, 直到 16 世纪, 随着英国殖民主义发展, 公历得以在全球普及这才有了秒这个概念。公历将一天定义为地球绕轴自转一周。一天分为 24 小时, 每小时 60 分钟, 一分钟 60 秒。然而, 最开始, 秒更像一个数学概念, 而非实用的时间单位。在乡村, 靠天和小时计时 就已经够用了。直到四通八达的高速铁路 将人类社会紧密联系起来, 城市之间才需要 在精准计时方面达成一致。到了 20 世纪 50 年代, 无数的全球体系要求每一秒钟都要准确计算, 每秒钟都要尽可能地精准。那么还有什么能比原子标度更精准呢? 早在 1955 年, 科研人员 就开始开发原子钟了, 这种时钟基于物理学的不变性原理为计时打下了新的基础。原子内带负电荷的电子周期性地绕带正电荷的原子核转动。量子力学定律将电子 保持在固定的距离, 但如果原子暴露在电磁场中如光或无线电波, 电子的朝向会受到轻微干扰。如果按照正确的频率, 短暂地拉扯电子, 就能创造出像嘀嗒摆动的 钟摆一样的震动。一般的钟摆能量衰减地很快, 但电子却能运转几百年之久。为了保持一致, 并更易于测量电子的摆动, 科研人员将原子汽化把其转化为一种 交互性低且稳定的状态。但这并未减缓原子惊人的运转速度。一些原子可以 每秒振荡超 90 亿次, 原子钟因而具备 无与伦比的计时精准度。由于特定元素的同位素的 每个原子完全相同, 两个科研人员使用 相同元素和相同的电磁波应该可以制作出 完全一致的钟表。但原子计时完全实现之前, 各国首先要找出 哪个原子最好用。1967 年, 第十三届国际度量衡委员会大会便是围绕这个问题展开的。元素周期表上有 118 种元素, 每种元素都有其独特的特性。对于计时这项任务, 科研人员的要求有如下几点。这种元素的原子振荡需要持久且高频, 这样才能精准长期地计时。为了便于追踪其振荡, 这种元素的量子自旋——即电子旋转所绕的轴的方向——和一种简单的能级结构——即活性电子少且状态易辨认, 都需要可靠易测。最后, 还要容易汽化。那么获胜的是哪种原子呢? 铯-133。铯原子此前就已经是原子钟研究的大热元素之一。到了 1968 年, 在市面上 已经可以买到一些铯原子钟了。最后要做的就是决定 铯原子摆动多少下算作一秒钟。大会使用了当时最精密的天文测量方法计算一秒的长度——由一年中的天数开始, 往下进行时间分割。对比原子的摆动速度, 最终确定一秒钟为铯-133 号原子正好摆动 9,192,631,770 的用时。如今, 原子钟风靡全球—— 甚至用到了太空。从无线电信号发射器到定位卫星, 这些设备全部协调同步用于维持时间的全球一致性——且精准度无可比拟。

P8 2021-01-21 The rise of the Ottoman Empire - Mostafa Minawi

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=8>)

In the late 13th century, Osman I established a small beylik, or principality, in what is now Turkey. In just a few generations, this beylik outmaneuvered more powerful neighbors to become the vast Ottoman empire. What enabled its rapid rise? In Osman's time, the Anatolian peninsula was a patchwork of Turkic principalities sandwiched between a crumbling Byzantine Empire and weakened Sultanate of the Seljuk of Rum. Osman quickly expanded this territory through a mixture of strategic political alliances and military conflicts with these neighbors, attracting mercenaries first with the promise of booty, then later through his reputation for winning. Osman was the first in a line of Ottoman rulers distinguished by their political shrewdness. Often prioritizing political and military utility over ethnic or religious affinity, they expanded their influence by fighting along certain sides when needed, and fighting against them when the time was right. After Osman's death his son Orhan established a sophisticated military organization and tax collection system geared towards funding quick territorial expansion. The

Ottomans' first major expansion was in the Balkans, in southeast Europe. The military employed a mixture of Turkic warriors and Byzantine and other Balkan Christian converts. They captured thousands of young Christian boys from villages from across the Balkans, converted them to Islam, and trained them to become the backbone of a fierce military elite force known as the Janissaries. The captured enslaved boys could rise to the high position of a vizier in the Ottoman government. Rulers of conquered areas were also allowed, even encouraged, to convert to Islam and take positions in the Ottoman government. Meanwhile, non-Muslims who belonged to Abrahamic religions were allowed religious freedom in exchange for a tax known as Jizye, among other strict conditions—for example, they were not allowed to join the army. By the end of the 14th century, the Ottomans had conquered or subordinated most of the Anatolian beyliks as well as the Balkans. But in the first half of the 15th century, as Sultan Beyazit I focused on Western expansion, the Central Asian ruler Timur attacked from the east. He captured Beyazit and carted him off in an iron cage, sparking a ten year struggle for succession that almost destroyed the Ottoman empire. Sultan Murad II turned this trend around, but fell short of one of his loftiest goals: capturing the Byzantine capital, Constantinople. His son, Sultan Mehmed II, or Mehmed the Conqueror, vowed to succeed where his father had failed. In preparation for the attack on Constantinople, he hired a Hungarian engineer to forge the largest cannon in the world, used Serbian miners to dig tunnels under the walls of the city, and ordered his fleet of ships to be carried overland, attacking the city from an unexpected direction. He laid siege to the city and in the spring of 1453, Constantinople fell to the Ottomans. It would become the Ottoman capital, known by its common Greek name, Istanbul, meaning “to the city.” By the time Mehmed II conquered Constantinople, the city was a shadow of its former glory. Under Ottoman rule, it flourished once again. On an average day in Istanbul, you could hear people speaking Greek, Turkish, Armenian, Persian, Arabic, Bulgarian, Albanian, and Serbian. Architects like the famous Sinan filled the city with splendid mosques and other buildings commissioned by the sultans. Through Istanbul, the Ottomans brought commodities like coffee to Europe. They entered a golden age of economic growth, territorial acquisition, art and architecture. They brought together craftspeople from across Europe, Africa, the Middle East and Central Asia to create a unique blend of cultural innovation. Iznik ceramics, for example, were made using techniques from China's Ming dynasty, reimagined with Ottoman motifs. The Ottomans would continue to expand, cementing their political influence and lucrative trade routes. The empire lasted for more than 600 years and, at its peak, stretched from Hungary to the Persian Gulf, from the Horn of Africa to the Crimean Peninsula.

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[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=8>)

翻译人员: Lexi Ding 校对人员: Helen Chang13 世纪末, 奥斯曼一世在如今的土耳其建立了一个小辖区, 或称之为公国。仅仅几代之后, 这个小辖区 运筹帷幄, 战胜了更为强大的邻国发展成为伟大的奥斯曼帝国。它是因何而得以快速崛起的呢? 在奥斯曼时代, 安纳托利亚半岛上 只是散布着一些土耳其的公国, 夹在摇摇欲坠的拜占庭帝国和辉煌不再的罗姆苏丹国之间。奥斯曼通过建立战略政治同盟以及对周边邻国进行军事打击, 实现了领地的快速扩张, 先是靠利诱吸引到一批雇佣兵, 后来则是依靠他战无不胜的威名。在一众精明的奥斯曼土耳其统治者中, 奥斯曼本人出类拔萃。对这些政客们来说, 政治军事效用 比种族和宗教亲缘更为重要, 他们奉行着有利则并肩作战, 时机成熟亦可反而为敌的政策, 不断扩大着自身的影响力。奥斯曼死后, 他的儿子奥尔汗创建了先进的军事组织和税收体系, 为急速的领土扩张备好了资金。奥斯曼帝国第一次大扩张 发生在欧洲东南部的巴尔干半岛。军队由土耳其勇士、拜占庭人和巴尔干基督教信徒组成。他们俘虏了上千个来自巴尔干半岛各个村镇的 基督教男孩, 迫使他们改信伊斯兰教, 并把他们训练成 凶猛的军事精英队伍的中坚力量, 也就是人们所知的禁卫军。这些被俘虏做奴隶的男孩可以一路高升到维齐尔的位置, 即奥斯曼政府的国家高官。被征服地的统治者 也被允许, 甚至被怂恿转而信奉伊斯兰教, 并在奥斯曼政府中任职。另外, 属于亚伯拉罕诸教的非穆斯林能够保有宗教自由, 但作为交换, 他们需要上缴 一种叫做吉兹亚的人头税, 此外, 还要遭受其他严格限制——比如, 他们不可以参军。14 世纪末期, 大部分安纳托利亚公国及巴尔干半岛国家, 已经或臣服或附属于奥斯曼帝国。但在 15 世纪上半叶, 当苏丹王巴耶塞特一世 致力于向西方扩张之时, 中亚统治者帖木儿从东面发起了进攻。他俘虏了巴耶塞特, 并把他关押在铁笼子里, 这一事件引发了 长达十年的王位争夺战, 几乎摧毁了奥斯曼帝国。苏丹王穆拉德二世力挽狂澜但他的崇高目标之一: 占领拜占庭首都君士坦丁堡, 却以失败告终。他的儿子, 苏丹王穆罕默德二世, 又被称为征服者穆罕默德, 发誓要实现父亲未竟的宏愿。在进攻君士坦丁堡的准备阶段, 他雇用了一位匈牙利工程师, 来锻造世界上最大的大炮, 让塞尔维亚矿工 在城墙下挖掘隧道, 并命令舰队经由陆路, 从出人意料的方向攻城。他的军队包围了这座城

市，于是在 1453 年春，君士坦丁堡落入奥斯曼人之手。这座城市后来成为了 奥斯曼帝国的首都，它更为人所知的希腊语名字 伊斯坦布尔，意思是“进城去”。穆罕默德二世占领君士坦丁堡之时，这座城市早已不复往日的辉煌。但在奥斯曼帝国统治下，它又重现昔日繁荣。在伊斯坦布尔普通的一天，你能听到人们说着希腊语、土耳其语、亚美尼亚语、波斯语、阿拉伯语、保加利亚语、阿尔巴尼亚语和塞尔维亚语。建筑师们如著名的锡南，受苏丹王委任，用壮丽的清真寺和其它建筑丰富着这座城市。经由伊斯坦布尔，奥斯曼人将咖啡等货物带到了欧洲。他们进入了经济增长、领土扩张、艺术和建筑蓬勃发展的黄金时期。他们将欧洲、非洲、中东和中亚的工匠人们聚到一起，创造出独特的文化创新融合。比如伊兹尼克陶瓷，既运用了中国明代的技法，又基于奥斯曼图案进行了二次创作。奥斯曼人继续扩张，巩固其政治影响力和获利颇丰的贸易路线。奥斯曼帝国延续了 600 多年，在其鼎盛时期，领土范围由匈牙利绵延到波斯湾，从非洲角一直到克里米亚半岛。

P9 2021-01-25 The Japanese myth of the trickster raccoon - Iseult Gillespie

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=9>)

On the dusty roads of a small village, a travelling salesman was having difficulty selling his wares. He'd recently traversed the region just a few weeks ago, and most of the villagers had already seen his supply. So he wandered the outskirts of the town in the hopes of finding some new customers. Unfortunately, the road was largely deserted, and the salesman was about to turn back, when he heard a high-pitched yelp coming from the edge of the forest. Following the screams to their source, he discovered a trapped tanuki. While these racoon-like creatures were known for their wily ways, this one appeared terrified and powerless. The salesman freed the struggling creature, but before he could tend to its wounds, it bolted into the undergrowth. The next day, he set off on his usual route. As he trudged along, he spotted a discarded tea kettle. It was rusty and old—but perhaps he could sell it to the local monks. The salesman polished it until it sparkled and shone. He carried the kettle to Morin-ji Temple and presented it to the solemn monks. His timing was perfect—they were in need of a large kettle for an important service, and purchased his pot for a handsome price. To open the ceremony, they began to pour cups of tea for each monk—but the kettle cooled too quickly. It had to be reheated often throughout the long service, and when it was hot, it seemed to squirm in the pourer's hand. By the end of the ceremony, the monks felt cheated by their purchase, and called for the salesman to return and explain himself. The following morning, the salesman examined the pot, but he couldn't find anything unusual about it. Hoping a cup of tea would help them think, they set the kettle on the fire. Within moments, the metal began to sweat. Suddenly, it sprouted a scrubby tail, furry paws and pointed nose. With a yelp, the salesman recognized the tanuki he'd freed. The salesman was shocked. He'd heard tales of shape-shifting tanuki who transformed by pulling on their testicles. But they were usually troublesome tricksters, who played embarrassing pranks on travellers, or made it rain money that later dissolved into leaves. Some people even placed tanuki statues outside their homes and businesses to trick potential pranksters into taking their antics elsewhere. However, this tanuki only smiled sweetly. Why had he chosen this unsuspecting form? The tanuki explained that he wanted to repay the salesman's kindness. However, he'd grown too hot as a tea kettle, and didn't like being burned, scrubbed, or polished. The monk and salesman laughed, both impressed by this honourable trickster. From that day on, the tanuki became an esteemed guest of the temple. He could frequently be found telling tales and performing tricks that amused even the most serious monks. Villagers came from far away to see the temple tanuki, and the salesman visited often to share tea made from an entirely normal kettle.

P9 2021-01-25 The Japanese myth of the trickster raccoon - Iseult Gillespie

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翻译人员: Zizhuo Liang 校对人员: Helen Chang 在一条尘土飞扬的乡间小道上，一个沿路叫卖的小贩卖不出杂货。几周前他才走过这一带，大多数村民已经看过他的货品。于是他在城郊游荡，希望能找到一些新顾客。不幸的是，这条路几乎空无一人，当小贩正要回头时，听到森林边缘传来尖锐的叫声。循声而去，他发现了一只掉进陷阱的狸猫。虽然这些像浣熊一样的生物以诡计多端著称，这一只却看起来害怕又孤立无助。小贩释放了这只挣扎的生物，但小贩还没来得及处理它的伤口，它就钻进了灌木丛。第二天他继续按着老路走。缓缓前行时，他发现一个被丢弃的茶壶。这只老旧的茶壶锈迹斑斑，但也许他可以把它卖给当地的和尚。小贩把它擦得闪闪发光。他把水壶带到茂林寺，交给庄严的僧侣们。他的时机恰到好处，僧人们正好需要一个大水壶来做一项重要的宗教仪式，于是他

们以可观的价格 买下了小贩的水壶。仪式开始时，僧人们开始 为每个和尚倒茶——但是水壶里的水凉的太快了。在冗长仪式过程中需要经常加热，茶水很烫的时候，茶壶似乎在倒茶者手中蠕动。仪式结束时，僧侣们觉得被骗了，于是他们召回小贩，讨个说法。次日早上，小贩检查茶壶，但是并未发现任何不寻常的地方。希望喝杯茶能带来灵感，他们将茶壶放在火上烧。不一会儿，茶壶开始冒汗。忽然长出一条粗糙的尾巴、毛茸茸的爪子和尖尖的鼻子。小贩大叫一声，认出了这是他释放的狸猫。小贩十分震惊。他听说过狸猫变形的故事，它们拉动自己的睾丸变身。但它们通常是麻烦的骗子，对旅行者恶作剧，或是让天上下钱，之后钱会变成树叶。有些人还在住家和行号外头 放置狸猫雕像，哄那些打算行骗的人 把鬼把戏带到别处。但是这只狸猫只是甜甜地笑了。狸猫为什么会选择变成 茶壶这种不起眼的物件？狸猫解释说它想回报小贩的善举。但是做茶壶实在是太热了，也不喜欢被火烧、被擦洗、被打磨。和尚和小贩都笑了，被这个可敬的骗子打动了。从那天起，狸猫成为了寺院尊贵的客人。人们经常看到它讲故事，耍花招，即使是最严肃的僧侣都觉得好笑。村民们自远处来参观狸猫神庙，小贩也经常来这里，共饮用普通茶壶泡的茶。

P10 2021-01-26 Why bats don't get sick - Arinjay Banerjee

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=10>)

If this bat were a human, she'd be in deep trouble. She's infected with several deadly viruses, including ones that cause rabies, SARS, and Ebola. But while her diagnosis would be lethal for other mammals, this winged wonder is totally unfazed. In fact, she may even spend the next 30 years living as if this were totally normal—because for bats, it is. So what's protecting her from these dangerous infections? To answer this question, we first need to understand the relationship between viruses and their hosts. Every virus has evolved to infect specific species within a class of creatures. This is why humans are unlikely to be infected by plant viruses, and why bees don't catch the flu. However, viruses do sometimes jump across closely related species. And because the new host has no established immune defenses, the unknown virus presents a potentially lethal challenge. This is actually bad news for the virus as well. Their ideal host provides a steady stream of resources and comes into contact with new parties to infect—two criteria that are best met by living hosts. All this to say that successful viruses don't typically evolve adaptations that kill their hosts—including the viruses that have infected our flying friend. The deadly effects of these viruses aren't caused by the pathogens directly, but rather, by their host's uncontrolled immune response. Infections like Ebola or certain types of flu have evolved to strain the immune system of their mammalian host by sending it into overdrive. The body sends hordes of white blood cells, antibodies and inflammatory molecules to kill the foreign invader. But if the infection has progressed to high enough levels, an assault by the immune system can lead to serious tissue damage. In particularly virulent cases, this damage can be lethal. And even when it's not, the site is left vulnerable to secondary infection. But unlike other mammals, bats have been in an evolutionary arms race with these viruses for millennia, and they've adapted to limit this kind of self-damage. Their immune system has a very low inflammatory response; an adaptation likely developed alongside the other trait that sets them apart from other mammals: self-powered flight. This energy-intensive process can raise a bat's body temperature to over 40°C. Such a high metabolic rate comes at a cost; flight produces waste molecules called Reactive Oxygen Species that damage and break off fragments of DNA. In other mammals, this loose DNA would be attacked by the immune system as a foreign invader. But if bats produce these molecules as often as researchers believe, they may have evolved a dampened immune response to their own damaged DNA. In fact, certain genes associated with sensing broken DNA and deploying inflammatory molecules are absent from the bat genome. The result is a controlled low-level inflammatory response that allows bats to coexist with the viruses in their systems. Even more impressive, bats are able to host these viruses for decades without any negative health consequences. According to a 2013 study, bats have evolved efficient repair genes to counteract the frequent DNA damage they sustain. These repair genes may also contribute to their long lives. Animal chromosomes end with a DNA sequence called a telomere. These sequences shorten over time in a process that many believe contributes to cell aging. But bat telomeres shorten much more slowly than their mammalian cousins—granting them lifespans as long as 41 years. Of course, bats aren't totally invincible to disease, whether caused by bacteria, unfamiliar viruses, or even fungi. Bat populations have been ravaged by a fungal infection called white-nose syndrome, which can fatally disrupt hibernation and deteriorate wing tissue. These conditions prevent bats from performing critical roles in their ecosystems, like helping with pollination and seed dispersal, and consuming pests and insects. To protect these animals from harm, and ourselves from infection, humans need to stop encroaching on bat habitats and ecosystems. Hopefully,

preserving these populations will allow scientists to better understand bats' unique antiviral defense systems. And maybe one day, this research will help our own viral immunity take flight.

P10 2021-01-26 Why bats don't get sick - Arinjay Banerjee

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=10>)

翻译人员: 校对人员: Helen Chang 如果这只蝙蝠是人类, 她就糟糕了。她感染了好几个致命的病毒, 包括了那些会引起狂犬病、非典, 和埃博拉的病毒。虽然她的诊断对其他哺乳动物来说是致命的, 但对于这个神奇的物种来说完全没有受到影响。事实上, 她甚至可能会在接下来的 30 年里继续活着, 仿佛完全正常, 因为对于蝙蝠来说, 确实如此。所以是什么在保护着她, 从而让她免受这些危险的感染呢? 为了回答这个问题, 我们首先需要明白病毒及其宿主之间的关联。(生物学分类) 每一种病毒 都进化成感染某一纲 (Class) 中的 特定一种 (Species)。这就是为什么人类 不太可能被植物病毒感染, 和为什么蜜蜂不会感染流感。但是, 病毒有时候会跨越 密切相关的物种。由于新的宿主没有建立免疫防御系统, 未知名的病毒就显现出了 潜在的致命挑战。这对病毒来说实际上也是个坏消息。理想的宿主提供源源不断的资源 和接触新宿主的机, 活宿主恰恰提供这两个机会。也就是说, 成功的病毒通常都不会进化到杀死它们的宿主, 包括感染了我们飞行朋友的病毒。这些病毒的致命影响 并不是由病原体直接引起的, 而是, 由它们的宿主 不受控制的免疫反应。埃博拉病毒或某些类型的感染已经进化成过度劳损 哺乳动物宿主的免疫系统, 使其变得超负荷。身体发送成群的白细胞, 抗体和炎症分子来杀死外侵者。但如果感染已经进化到够高的级别, 免疫系统的攻击 会导致自身组织的严重损伤。在特别严重的情况下, 这种损害可能致死。即使未致死, 该处也会很容易受到二次感染。但与其他哺乳动物不同的是, 蝙蝠一直在与这些病毒 进行军备竞赛有几千年了, 而且它们已经适应了 限制这种自我伤害。它们的免疫系统 具有非常低的炎症反应; 一种适应能力可能 与其他特征并列发展的从而使它们与其他哺乳动物区分开来: 自立飞行。这种能量密集型过程可以将蝙蝠的 体温升高到 40°C 以上。如此高的代谢率是有代价的; 飞行产生称为活性氧物种的废物分子会损坏和断裂 DNA 的片段。在其他哺乳动物中, 这个松散的 DNA 会像外来入侵者一样 受到免疫系统的攻击。但如果蝙蝠经常产生这些分子 就像研究人员想的那样, 它们可能已经减弱了免疫系统的反应来损坏它们自己的 DNA。事实上, 某些与断裂 DNA 相关的基因和炎症分子 是不存在蝙蝠基因组中的。这个结果是一个受约束的 低水平炎症反应, 允许蝙蝠与它们系统中的病毒共存。更令人惊讶的是, 蝙蝠能够携带这些病毒数十年而不会对健康造成任何负面影响。根据 2013 年的一项研究, 蝙蝠已经进化出有效的修复基因来抵消它们所承受的频繁的 DNA 损伤。这些修复基因可能也会 延长它们的寿命。动物染色体已一个 DNA 序列 结束的被端粒。这些序列在一个过程中 随着时间的推移而缩短许多人认为这会导致细胞老化。但是蝙蝠端粒的缩短速度要比 它们的哺乳动物表亲慢得多—赋予它们长达 41 年的寿命。当然了, 蝙蝠并不能 完全战胜所有的疾病, 无论是由细菌、不熟悉的病毒, 还是真菌引起的。蝙蝠种群受到过真菌感染的摧残被称为白鼻综合征, 就会致命地破坏冬眠系统 并致命地破坏其翅膀的组织。这些状况阻止蝙蝠发挥关键作用, 在它们的生态系统中, 例如帮助授粉和种子传播, 以及食用害虫和昆虫。为了保护这些动物免受伤害, 和我们自己免受感染, 人类需要停止侵占蝙蝠的 栖息地和生态系统。希望, 保护这些群体将使科学家更好地了解 蝙蝠独特的抗病毒防御系统。也许有一天, 这项研究将会帮助我们 提高自己的病毒免疫力。

P11 2021-01-28 A brief history of divorce - Rod Phillips

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=11>)

The earliest known divorce laws were written on clay tablets in ancient Mesopotamia around 2000 BCE. Formally or informally, human societies across place and time have made rules to bind and dissolve couples. Inca couples, for example, started with a trial partnership, during which a man could send his partner home. But once a marriage was formalized, there was no getting out of it. Among the Inuit peoples, divorce was discouraged, but either spouse could demand one. or they could exchange partners with a different couple— as long as all four people agreed. The stakes of who can obtain a divorce, and why, have always been high. Divorce is a battlefield for some of society's most urgent issues, including the roles of church and state, individual rights, and women's rights. Religious authorities have often regulated marriage and divorce. Muslims in Africa, the Middle East, and Asia began using the Quran's rules in the 7th century AD— generally, a husband can divorce his wife without cause or agreement, while a wife must secure her husband's agreement to divorce him. In Europe, Christian churches controlled divorce from the 11th century on, with the Catholic Church banning it entirely and Protestant churches

allowing it in restricted circumstances, particularly adultery. In the late 18th century, a series of changes took place that would eventually shape divorce laws around the world. Following centuries of religious conflict, Europeans pushed for state governance separate from religious control. Secular courts gradually took over education, welfare, health, marriage—and divorce. The French Revolution ushered in the first of the new divorce laws, allowing men and women to divorce for a number of grounds, including adultery, violence, and desertion, or simply mutual consent. Though progress was uneven, overall this sort of legislation spread in Europe, North America and some European colonies in the 19th century. Still, women's access to divorce often remained restricted compared to men. Adultery was considered more serious for women—a man could divorce his wife for adultery alone, while a woman would need evidence of adultery, plus an additional offense to divorce her husband. Sometimes this double standard was written into law; other times, the courts enforced the laws unequally. Domestic violence by a man against his wife was not widely considered grounds for divorce until the 20th century. And though new laws expanded the reasons a couple could divorce, they also retained the fundamental ideology of their religious predecessors: that a couple could only split if one person wronged the other in specific ways. This state of affairs really overstayed its welcome. Well into the 20th century, couples in the U.S. resorted to hiring actors to jump into bed with one spouse, fully clothed, and take photos as evidence of cheating. Finally, in the 1960s and 70s, many countries and states adopted no-fault divorce laws, where someone could divorce their spouse without proving harm, and importantly, without the other's consent. The transition from cultural and religious rules to state sanctioned ones has always been messy and incomplete—people have often ignored their governments' laws in favor of other conventions. Even today, the Catholic Church doesn't recognize divorces granted by law. In some places, like parts of India, Western-style divorce laws have been seen as a colonial influence and communities practice divorce according to other religious rules. In others, though the law may allow for equal access to divorce, bias in the legal system, cultural stigma, or community pressures can make it far more difficult for certain people, almost always women. And even in the places where women aren't disadvantaged by law or otherwise, social and economic conditions often make divorce more difficult for women. In the United States, for example, women experience economic loss far more than men after divorce. At its best, modern no-fault divorce allows people to leave marriages that make them unhappy. But dissolving a marriage is almost never as simple as sending two people their separate ways. What divorcing partners owe each other, and how they manage aspects of a once shared life remain emotionally and philosophically complex issues.

P11 2021-01-28 A brief history of divorce - Rod Phillips

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翻译人员: Meiqi Jia 校对人员: Yanyan Hong 早在约公元前 2000 年,最早的离婚法律就刻在了 古代美索不达米亚的泥板上。无论是正式的还是非正式的,不同时期、不同地方的人类社会都制定了约束和解除夫妻关系的规则。比如,印加族的情侣们 实行试验性伴侣关系。试验期间, 男性可以让他的伴侣回家。但双方一旦成为了法定夫妻,便不可分开了。因纽特人则不鼓励离婚,但是夫妻任何一方都可以要求离婚,或者他们可以与其他夫妻互换伴侣——只要四个人都同意。谁能离婚以及为何离婚 所投入的赌注一向很高。离婚是当今社会上 最棘手的问题们的战场,其中包括教堂和国家的作用, 个人权利和女性权利。宗教权威通常会去制约结婚与离婚。公元 7 世纪,居住在非洲、中东和亚洲的穆斯林们 开始参照《古兰经》中的规矩——丈夫往往可以在无理由 或无协议的情况下与妻子离婚,但是妻子却需要得到 丈夫的许可才可以离婚。从 11 世纪开始, 欧洲的天主教开始干涉离婚,天主教当时不允许离婚,而新教教会则在少数情况下允许离婚,例如通奸行为。18 世纪末,世界各地的离婚法律在一系列改变的推动下最终成型。经历了几个世纪的宗教斗争,欧洲人奋力争取了一个 与宗教分离的政治体系。法院掌管了教育、社会福利、 健康、婚姻——与离婚。法国大革命引领了第一批新离婚法,允许男性和女性在不同情况下离婚,例如通奸、暴力、遗弃家庭, 或者单纯双方同意。虽然进展并不平衡,这种立法很大程度上 在 19 世纪的欧洲、北美,以及一些欧洲的殖民地中传播。即便如此,女性的离婚权利 相比男性还是受到了限制。通奸对于女性来说更加的严重——男性可以单单因通奸与妻子离婚,但是女性却需要通奸的证据,加上辩护才可以与丈夫离婚。有时这个双重标准会被写进法律;而其他时候,法庭会不公平 地进行判决。直到 20 世纪,丈夫对妻子 实施的家庭暴力通常不被认为是一个决定离婚的因素。虽然新的法律扩充了 夫妻可以离婚的理由,它们还是保留了宗教前辈留下来的核心观念,夫妻只可以在另一方 有明确过错时离婚。这种状态存在过久而使人生厌。进入 20 世纪,美国的夫妻甚至通过 雇佣演员表演,并拍照取证,去制造另一方出轨的证据。最后,在 1960 和 70 年代,很多国家实行了无过错离婚法律,配偶不需要证明 另一方有过错便可以离婚。最重要的是, 不需要得到另一方的同意。从文

化和宗教条例到国家准许的转变，一直是棘手和残缺的——人们经常因更倾向其他惯例，而忽略政府的法律。直到今天，天主教仍旧不认可法律批准的离婚。在有些地方，例如印度的部分地区，西式的离婚法律被当作殖民的影响。社会里的人们按照其他宗教的规定实行离婚。在其他地区，即便法律给予夫妻双方离婚的资格，法律体系的偏见、文化歧视，或者社会施加的压力，都会让某些人群更难离婚，尤其是女性。即便在那些女性在法律上不处于劣势的地方，社会与经济因素通常使女性更难离婚。比如，离婚后的美国女性相比男性承受了更大的经济损失。幸运的是，现代的无过错离婚让人们远离不快乐的婚姻。但是，解除婚姻并不是让双方分道扬镳这么简单。离婚的双方对彼此有哪些亏欠，他们如何管理一个曾经与他人一起度过的人生，仍旧是情感与哲学上复杂难解的问题。

P12 2021-02-01 The world's most dangerous fart - Nick Caruso and Dani Rabaiotti

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=12>)

For most humans, farts are a welcome relief, an embarrassing incident, or an opportunity for a gas-based gag. But for many other creatures, farts are no laughing matter. Deep in the bowels of the animal kingdom, farts can serve as tools of intimidation, acts of self-defense, and even weapons of malodorous murder. The smelliest parts in the animal kingdom aren't lethal, but they might ruin your trip to the beach. Seals and sea lions are well-known for having truly foul farts due to their diet. Fish and shellfish are incredibly high in sulfur. And during digestion, mammalian gut bacteria breaks down sulfur and amino acids containing sulfur to produce hydrogen disulphide, a gas with a smell resembling rotten eggs. Seals and sea lions can't help their funky flatulence, But some animals deploy their farts strategically. Both the Eastern hognose snake and the Sonoran coral snake use a tactic called cloacal popping. This involves sucking air into their cloaca— a hole used for urinating, defecating and reproduction— and then shooting it back out with a loud pop. These pops are no more dangerous than a sea lion's stench, but they are effective at scaring off would-be predators. Meanwhile, the flatulence of beaded lacewing larvae are silent and deadly. Their farts contain a class of chemical known as allomone that has evolved specifically to paralyze termites. In fact, this allomone is so powerful, a single fart can immobilize multiple termites for up to three hours, or even kill them outright. Either way, these toxic farts give beaded lacewing larvae plenty of time to devour prey up to three times their size. For some other animals, however, holding farts in can be deadly. The Bolson pupfish is a small freshwater fish found in northern Mexico. These fish feed on algae and other small organisms in the sediment. But during the hottest days of the summer, this algae produces a lot of gas. If a pupfish doesn't fart this gas out, it becomes buoyant— making it easy prey for passing birds. And it isn't just predators they have to worry about. Excessive gas buildup can actually burst their digestive systems. Researchers have found groups of several hundred dead pupfish that failed to fart for their lives. Fortunately for humanity, animal farts can't directly harm a human— outside making us lose our lunch. But in the right circumstances, some animal flatulence can create surprisingly dangerous conditions. In the fall of 2015, a tripped smoke alarm forced a plane to make an emergency landing. Upon further inspection, officials found that there was no fire— just the burps and farts of over 2,000 goats being transported in the cargo bay. The change in air pressure had caused them to pass gas en masse. Thankfully, this story of farting goats had relatively low costs. But the most dangerous flatulence in the world may actually come from a similarly unassuming mammal: the humble cow. There are nearly one billion cows in the world, most of them raised specifically for milk and meat. Like goats, cows are ruminants, which means their stomachs have four chambers, allowing them to chew, digest and regurgitate their food multiple times. This process helps them extract extra nutrients from their food, but it also produces a lot of gas. This is particularly troubling because one of the gases cows emit is methane, a major greenhouse gas that contributes heavily to global warming. One kilogram of methane traps dozens of times more heat in the atmosphere than one kilogram of carbon dioxide. And with each cow releasing up to 100 kilograms of methane every year, these animals have become one of the biggest contributors toward climate change. So while other animals may have louder, fouler, or even more toxic farts, cow flatulence may be the most dangerous gas ever to pass.

P12 2021-02-01 The world's most dangerous fart - Nick Caruso and Dani Rabaiotti

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翻译人员: Frank Xu 校对人员: Yanyan Hong 对大多数人来说，放屁 是一种受欢迎的解脱、一个尴尬的插曲、或是

一个有关毒气的恶作剧机会。然而对于许多其他生物来说，放屁可不是闹着玩的事。深在动物王国的肠胃中，放屁可以作为恐吓的工具、自卫的行动，甚至是恶臭的凶杀武器。动物王国中最臭的部分 虽不是致命的，但也可能毁了你的海滩之旅。海豹和海狮因其饮食 导致放臭屁闻名。鱼类和贝类拥有极丰富的硫含量。在消化过程当中，哺乳动物的肠道细菌将硫以及含硫氨基酸分解 来制造出二硫化氢气体，那是一种闻起来像是烂鸡蛋的气体。海豹和海狮无法控制自己的肠胃气体，但有些动物则可以 将它们的屁作为战术使用。东部猪鼻蛇和索诺兰珊瑚蛇都使用一种被称作“泄殖腔弹出”的战术。这战术包括将空气吸入泄殖腔中——泄殖腔是一种用于 小便、排便和繁殖的孔——而后将空气伴随着“砰”的响声 从泄殖腔弹射出。这些砰砰炮弹 不如海狮的臭气来得危险，但是它们能有效的驱散潜在的掠食者。与此同时，珠翅幼虫的 肠胃气体既无声又致命。它们屁里有一种被称为 异原信息素的化学物质，专门进化出来用以麻痹白蚁。事实上这种异原信息素强大到仅仅一个屁便能让多个白蚁 失去行动长达三小时，或者甚至直接将它们杀死。不论如何，这些有毒的屁 给了珠翅幼虫大量的时间来吞食比它们体积大三倍的猎物。但是，对于其它一些动物来说，憋着屁可能是致命的。波森幼鱼是一种生活在 北墨西哥的小型淡水鱼。这些鱼类以藻类和其它 在沉积物中的小生物为食。但是在夏天最热的时候，藻会产生出来大量的气体。如果一条幼鱼不将 这种气体通过屁排放出来——它会浮起来而容易成为过往鸟类的猎物。而它们不仅得为这些猎食者担心。过多的气体累积实际上 也会造成它们消化系统爆裂。研究人员发现了几百条死去的幼鱼因为不放屁而丧了命。对人类来说幸运的是，动物放屁并不会直接 伤害人——除了让我们吐出午餐以外。但在适当的情况下，一些动物的肠胃气体会制造出异常危险的状况。在 2015 年秋季，一架飞机因为烟雾报警器响起不得不被迫紧急降落。经进一步的调查官员们并没有发现火灾——他们只找到了货舱里 超过两千只山羊所放的屁和打的嗝。气压的变化导致它们集体排出气体。谢天谢地的是，这个山羊放屁的事件代价相对不高。但是世上最危险的 肠胃气体可能实际来自一种似乎也看起来 人畜无害的哺乳动物：谦逊的牛。世界上有将近十亿头牛，他们中的大部分被专门养来生产肉和牛奶。像山羊一样，牛是反刍动物，这意味着它们有四个胃，让它们能够咀嚼、消化 并对食物进行多次反刍。这个过程帮助它们 从食物里获得额外的营养，但它也同时产生很多气体。这很麻烦是因为牛排出的气体之一是甲烷，一种导致温室效应的主要气体。一千克甲烷能在大气中困住超过一千克二氧化碳几倍的热量。而因为每头牛每年 放出多达 100 千克的甲烷，这些动物已经成为了导致温室效应的最大原因之一。所以在其它动物放出 更响、更臭、甚至更毒的屁时，牛的肠胃胀气可能是 有史以来最危险的气体。

P13 2021-02-02 What if every satellite suddenly disappeared - Moriba Jah

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=13>)

One day, without warning or apparent cause, all of humanity's artificial satellites suddenly disappear. The first to understand the situation are a handful of government and commercial operators. But well before they have time to process what's happened, millions sitting on their couches become aware that something is amiss. TV that's broadcast from or routed through satellites dominate the market for international programming as well as some local channels, so the disappearance causes immediate disruptions, worldwide. The next people affected are those traveling by air, sea, or land, as global positioning, navigation and timing services, have entirely ceased. Pilots, captains, and drivers have to determine their locations using analog instruments and maps. Aircraft, ships, and ground vehicles get stopped, grounded, or returned to port. In the meantime, air traffic controllers have a difficult task on their hands to prevent plane crashes. Within hours, most of the planet's traffic grinds to a halt. The effects aren't limited to entertainment and travel. All sorts of machines, from heating and cooling systems to assembly lines, rely on super-accurate satellite-based timing systems, and many have little-to-no backup options. Stoplights and other traffic control systems stop synchronizing, so police and good Samaritans step in to direct the remaining cars and prevent as many accidents as possible. The most catastrophic impact is yet to come. Because in the next few hours, the world economy shuts down. Satellite-based timestamps play a critical part in everything from credit card readers and stock exchanges to the systems that keep track of transactions. People are unable to withdraw cash or make electronic payments. Logistics and supply chains for crucial goods like food and medicine fragment, leaving people to survive on whatever is locally available. Most countries declare a state of emergency and call on the military to restore order. That may take quite a while. Most navigation and communication systems are no longer operational, so military chains of command may be in disarray. Many troops, including those actively deployed, are left to their own devices. Commanders of nuclear submarines and missile control centers wonder if the disruption is the result of a hostile attack. What sorts of decisions do they make with partial information? Even in the best-case scenario, our civilization gets set back by decades at the very least. That's because,

despite being a relatively new phenomenon, satellites have quickly replaced more traditional long range technologies. The combination of global positioning and internet has allowed for near-instant signals that can be synchronized worldwide. Many systems we use daily have been built upon this foundation. Going back to the communication systems of the mid-20th century would not be a simple matter. In many cases, they'd have to be rebuilt from the ground up. While the sudden disappearance in this thought experiment is unlikely, there are two very real scenarios that could lead to the same results. The first is a solar flare so strong it fries satellite circuitry— as well as many other devices and power grids around the world. And the second is an orbital chain reaction of collisions. With about 7,500 metric tons of defunct spacecraft, spent boosters, and discarded equipment orbiting our planet at relative speeds up to 56,000 kilometers per hour, even small objects can be highly destructive. A single collision in space could create thousands of new pieces of debris, leading to a chain reaction. Space is huge, but many of the thousands of satellites currently in orbit share the same orbital highways for their specific purposes. And since most objects sent to space are not designed with disposal in mind, these highways only become more congested over time. The good news is, we can protect ourselves by studying our solar system, creating backup options for our satellite networks, and cooperating to avoid an orbital tragedy of the commons. The space kilometers above our heads is like our forests, the ocean's biodiversity and clean air: If we don't treat it as a finite resource, we may wake up one day to find we no longer have it at all.

P13 2021-02-02 What if every satellite suddenly disappeared - Moriba Jah

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翻译人员: Tingting Zuo 校对人员: Lipeng Chen

P14 2021-02-04 Why didn't this 2,000 year old body decompose - Carolyn Marshall

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=14>)

In 1984, two field workers discovered a body in a bog outside Cheshire, England. Officials named the body the Lindow Man and determined that he'd suffered serious injuries, including blunt trauma and strangulation. But the most shocking thing about this gruesome story was that they were able to determine these details from a body over 2,000 years old. Typically, decomposition would make such injuries hard to detect on a body buried just weeks earlier. So why was this corpse so perfectly preserved? And why don't all bodies stay in this condition? The answers to these questions live six feet underground. It may not appear very lively down here, but a single teaspoon of soil contains more organisms than there are human beings on the planet. From bacteria and algae to fungi and protozoa, soils are home to one quarter of Earth's biodiversity. And perhaps the soil's most important inhabitants are microbes, organisms no larger than several hundred nanometers that decompose all the planet's dead and dying organic material. Imagine we drop an apple in the forest. As soon as it contacts the soil, worms and other invertebrates begin breaking it down into smaller parts; absorbing nutrients from what they consume and excreting the rest. This first stage of decomposition sets the scene for microbes. The specific microbes present depend on the environment. For example, in grasslands and farm fields there tend to be more bacteria, which excel at breaking down grass and leaves. But in this temperate forest there are more fungi, capable of breaking down complex woody materials. Looking to harvest more food from the apple's remains, these microbes release enzymes that trigger a chemical reaction called oxidation. This breaks down the molecules of organic matter, releasing energy, carbon, and other nutrients in a process called mineralization. Then microbes consume the carbon and some nutrients, while excess molecules of nitrogen, sulfur, calcium, and more are left behind in the soil. As insects and worms eat more of the apple, they expose more surface area for these microbial enzymes to oxidize and mineralize. Even the excretions they leave behind are mined by microbes. This continues until the apple is reduced to nothing—a process that would take one to two months in a temperate forest. Environments that are hot and wet support more microbes than places that are cold and dry, allowing them to decompose things more quickly. And less complex organic materials break down faster. But given enough time, all organic matter is reduced to microscopic mineral nutrients. The atomic bonds between these molecules are too strong to break down any further. So instead, these nutrients feed plant life, which grow more food that will eventually decompose. This constant cycle of creating and decomposing supports all life on Earth. But there are a few environments too hostile for these multi-talented microbes—including the peat bogs outside Cheshire, England. Peat bogs are mostly made of highly acidic Sphagnum mosses. These plants acidify the soil while also releasing a

compound that binds to nitrogen, depriving the area of nutrients. Alongside cold northern European temperatures, these conditions make it impossible for most microbes to function. With nothing to break them down, the dead mosses pile up, preventing oxygen from entering the bog. The result is a naturally sealed system. Whatever organic matter enters a peat bog just sits there—like the Lindow Man. The acid of the bog was strong enough to dissolve relatively simple material like bone, and it turned more complex tissue like skin and organs pitch black. But his corpse is otherwise so well-preserved, that we can determine he was healthy, mid-20s, and potentially wealthy as his body shows few signs of hard labor. We even know the Lindow Man's last meal—a still undigested piece of charred bread. Scholars are less certain about the circumstances of his death. While cold-blooded murder is a possibility, the extremity of his injuries suggest a ritual sacrifice. Even 2,000 years ago, there's evidence the bog was known for its almost supernatural qualities; a place where the soil beneath your feet wasn't quite dead or alive.

P14 2021-02-04 Why didn't this 2,000 year old body decompose - Carolyn Marshall

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=14>)

翻译人员: Boya Li 校对人员: Jiasi Hao1984 年, 两名矿工在英国柴郡外的 林道沼泽里发现了一具尸体。官方将这具尸体 命名为林道人 (Lindow Man), 并判定他曾受过重伤, 包括钝性损伤和绞勒痕迹。但这段可怕的故事里最令人震惊的是, 人们能从一具两千多年前的尸体中 发现这些细节。一般来说, 即使是尸体下葬近有数星期, 尸体腐化会使这些创伤难以察觉。那么为什么这具尸体 保存如此完好? 为什么并非所有的尸体 都能维持这一状态? 问题的答案 就在地面六英尺之下。地下乍一看很难发现生命的痕迹, 但一茶匙土所含的微生物数量, 比全球的人口都多。从细菌、藻类到真菌、原生生物, 土壤里生存着地球上 1/4 生物种类。土壤里最重要的居民 或许是微生物, 它们的大小仅有几百纳米, 却能分解地球上 所有死亡或濒死的有机物。想象我们在森林里扔了一颗苹果, 它一旦接触到土壤, 虫子等无脊椎动物便开始将其分解, 一边吸收营养, 一边排泄废物。这是分解的第一步, 为后续的微生物分解做好了准备。不同环境中 生存的微生物也有所不同。比如, 草地和田地里细菌较多, 它们擅长分解草和树叶。但这片温带森林里的真菌更多, 它们能够分解结构复杂的木材。为从苹果残骸里获得更多的食物, 这些微生物开始释放生物酶, 并导致氧化反应。这会分解有机物分子, 释放能量; 而碳和其它营养物质 则会发生矿化作用——微生物消耗碳和一些营养物质, 而剩余的氮、硫、钙分子等被留在土壤里。随着昆虫和蠕虫进食更多苹果, 它们增加了苹果 暴露于这些生物酶的表面积, 从而促进氧化和矿化反应。甚至是它们留下的排泄物 也会被微生物分解。这一过程会持续到苹果消失——在温带森林里需要 1-2 个月时间。与干冷的地方相比, 湿热的环境适合微生物生存, 同时促使微生物加速分解进程。结构较为简单的有机物 分解速度较快。但只要有足够的时间, 所有的有机物都会被分解为 微小的矿物营养物质。这些分子的原子键合力很强, 无法被继续分解。于是, 这些营养物质会滋养植物, 植物会长出更多最终能被分解的食物。这一创造和分解的链条不断循环, 养育地球上所有的生命。但有些环境却令这些 能干的微生物难以适应——包括英国柴郡外的 那片泥炭沼泽。泥炭沼泽中 基本上都是强酸性的泥炭藓苔。这些植物会酸化土壤, 并释放出一种化合物。这种物质会与氮结合, 使土壤里的营养物质流失。再加上欧洲北部的寒冷气候, 这些条件 使得大部分微生物无法正常工作。由于没有微生物能将其分解, 枯死的藓苔逐渐堆积, 因此氧气无法进入沼泽。结果形成了一个自然的密闭空间。任何进入泥炭沼泽的有机体 都会维持原样——比如林道人。沼泽所含的酸性物质足够强, 能够溶解构造较为简单的物质, 比如骨头, 并让皮肤、器官等结构复杂的组织变成黑色。但除此以外, 他的尸体保存完好——我们能推断出他死前很健康。 年龄为 20 多岁, 可能生活富足, 因为他的身体没有 太多从事强力劳动的痕迹。我们甚至知道林道人最后一餐 吃了什么——一片还未消化的干面包。学者们还不清楚他死亡的原因。或许他死于一场冷血的谋杀, 但尸体创伤的严重程度表示 他也可能作为献祭品死于祭祀。即便在两千年前, 有证据表明, 当时的人们认为 沼泽具有超自然力量——在那里, 你脚下的土壤 并没有绝对的死亡与生命。

P15 2021-02-08 Uncovering the brain's biggest secret - Melanie E. Peffer

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=15>)

In the late 1860s, scientists believed they were on the verge of uncovering the brain's biggest secret. They already knew the brain controlled the body through electrical impulses. The question was, how did these signals travel through the body without changing or degrading? It seemed that perfectly transmitting these impulses would require them to travel uninterrupted along

some kind of tissue. This idea, called reticular theory, imagined the nervous system as a massive web of tissue that physically connected every nerve cell in the body. Reticular theory captivated the field with its elegant simplicity. But soon, a young artist would cut through this conjecture, and sketch a bold new vision of how our brains work. 60 years before reticular theory was born, developments in microscope technology revealed cells to be the building blocks of organic tissue. This finding was revolutionary, but early microscopes struggled to provide additional details. The technology was especially challenging for researchers studying the brain. Soft nervous tissue was delicate and difficult to work with. And even when researchers were able to get it under the microscope, the tissue was so densely packed it was impossible to see much. To improve their view, scientists began experimenting with special staining techniques designed to provide clarity through contrast. The most effective came courtesy of Camillo Golgi in 1873. First, Golgi hardened the brain tissue with potassium bichromate to prevent cells from deforming during handling. Then he doused the tissue in silver nitrate, which visibly accumulated in nerve cells. Known as the “black reaction,” Golgi’s Method finally allowed researchers to see the entire cell body of what would later be named the neuron. The stain even highlighted the fibrous branches that shot off from the cell in different directions. Images of these branches became hazy at the ends, making it difficult to determine exactly how they fit into the larger network. But Golgi concluded that these branches connected, forming a web of tissue comprising the entire nervous system. 14 years later, a young scientist and aspiring artist named Santiago Ramón y Cajal began to build on Golgi’s work. While writing a book about microscopic imaging, he came across a picture of a cell treated with Golgi’s stain. Cajal was in awe of its exquisite detail—both as a scientist and an artist. He soon set out to improve Golgi’s stain even further and create more detailed references for his artwork. By staining the tissue twice in a specific time frame, Cajal found he could stain a greater number of neurons with better resolution. And what these new slides revealed would upend reticular theory—the branches reaching out from each nerve cell were not physically connected to any other tissue. So how were these individual cells transmitting electrical signals? By studying and sketching them countless times, Cajal developed a bold, new hypothesis. Instead of electrical signals traveling uninterrupted across a network of fibers, he proposed that signals were somehow jumping from cell to cell in a linear chain of activation. The idea that electrical signals could travel this way was completely unheard of when Cajal proposed it in 1889. However his massive collection of drawings supported his hypothesis from every angle. And in the mid-1900s, electron microscopy further supported this idea by revealing a membrane around each nerve cell keeping it separate from its neighbors. This formed the basis of the “neuron doctrine,” which proposed the brain’s tissue was made up of many discrete cells, instead of one connected tissue. The neuron doctrine laid the foundation for modern neuroscience, and allowed later researchers to discover that electrical impulses are constantly converted between chemical and electrical signals as they travel from neuron to neuron. Both Golgi and Cajal received the Nobel Prize for their separate, but shared discoveries, and researchers still apply their theories and methods today. In this way, their legacies remain connected as discrete elements in a vast network of knowledge.

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翻译人员: 校对人员: Helen Chang 1860 年代末, 科学家相信他们即将揭开大脑之谜。他们已经知道大脑通过 电脉冲控制身体。问题是, 这些信号是如何保持不变得穿过身体的? 为了能完美地传送这些脉冲它们必须不停顿地穿梭于一些组织。被称为“网状学说”的这一想法认为神经系统就像一张组织巨网连接着身体中的每一个神经细胞。网状学说及其简约的理论 征服了学说界。但很快, 一位年轻的画家 将会推翻这一推测并会重新绘制出我们的大脑 是如何工作的。早于“网状学说”60 年, 显微镜科技的发展让我们认识到生物组织基于细胞之上。这一发现是极具变革意义的, 但早期的显微镜却无法提供更多的细节。在研究大脑这一块, 显微镜科技遇到了一些麻烦。软神经组织十分脆弱, 人们很难处理。而且即使研究人员成功提取至显微镜下, 这一组织的紧密程度, 让人无法看清细节。为了看清细节科学家测试了特殊的染色方法, 通过对比来提高清晰度。最成功的来自于卡米洛·高尔基 于 1873 年得出的方法。首先, 高尔基将脑部组织浸于重铬酸钾防止组织细胞在过程中受到伤害然后他再将组织浸于硝酸银中, 用来在视觉上将神经细胞聚集起来。这个方法叫做“黑反应”, 高尔基的方法让研究者 可以看到整个细胞, 这个细胞后来被命名为神经元。被染色的地方甚至凸显出了 纤维状的分支。这些分支的图像在末端变得模糊, 很难确定它们究竟如何融入更大的网络。但是高尔基得出结论说 这些分支都是链接在一起的, 从而建立了一个网状物的组织, 组成了整个神经系统。14 年后, 一个名叫 圣地亚哥·拉蒙-卡哈尔的年轻又有抱负的科学家兼艺术家 开始在高尔基的基

础上做研究。当卡哈尔在写一本关于 微小图像的书的时候，他无意中看到了一张 高尔基染液细胞的照片。卡哈尔作为一名科学家和艺术家，是十分敬畏这样精致的细节的。他很快就进一步改善高尔基的染液，同时也可以给他的艺术作品 创造更加细节的参考。卡哈尔发现当他在一定的时间内 给细胞组织上染两次的话，就能看到更多、更清晰的神经元。这样的发现支撑起了网状学说的假设：神经细胞的分支并未和任何别的组织链 实体上接在一起。那么这些独立的细胞是 怎么传递电信号的呢？在无数次的学习和列草稿后，卡哈尔发展出一个胆大、全新的假设。他提出电信号不是通过一张 不间断的纤维网移动的，而是在各个细胞中间跳动的，像连线行的激活一样。当卡哈尔在 1889 年提出这个 关于电信号想法的时候，这样的移动方式是前所未闻的。但是他的无数张草稿从每一个角度 支撑起了他的假设。在 19 年代的中期，电子显微镜 又进一步地证实了这个想法。电子显微镜发现每个神经细胞的 周围都有一层膜，让它和隔壁的细胞分隔开来了。“神经元学说”的基础就这么形成了。神经元学说提议脑子里的组织是由很多独立的细胞构成的，而不是一张有链接的网。神经元学说给现代神经系统科学 铺垫了基础，也让后来的研究者发现当电脉冲在每个神经元中跳动的时候，它们的化学和电信号 是不停变换的。高尔基和卡哈尔都拿到了诺贝尔奖，由于他们独立却又相连的发现。科研者到今天都会一直使用 他们的理论和方法。这样来看的话，他们的传奇 是在一张巨大的知识网里紧紧相连的两个分离的元素。

P16 2021-02-09 What causes dandruff, and how do you get rid of it - Thomas L. Dawson

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=16>)

Here in this abundant forest, *Malassezia* is equipped with everything it could ever need. Feasting constantly, it's in paradise. But wait— what's this? In fact, *Malassezia* is a type of yeast that lives and dines on all of our scalps. And in about half of the human population, its activity causes dandruff. So, why do some people have more dandruff than others? And how can it be treated? We might consider ourselves individuals, but we're really colonies. Our skin hosts billions of microbes. *Malassezia* yeasts make themselves at home on our skin shortly after we're born. Follicles, the tiny cavities that grow hairs all over our body, make for especially popular living quarters. *Malassezia* are fond of these hideouts because they contain glands that secrete an oil called sebum that's thought to lubricate and strengthen our hair. *Malassezia* evolved to consume our skin's proteins and oils. And because of its many sebum-secreting follicles, our scalp is one of the oiliest places on our body—and consequently, one of the yeastiest. As these fungi feast on our scalp's oils, dandruff may form. This is because sebum is composed of both saturated and unsaturated fatty acids. Saturated fats neatly pack together. Unsaturated fats, on the other hand, contain double bonds that create an irregular kink in their structure. *Malassezia* eat sebum by secreting an enzyme that releases all of the oil's fatty acids. But they only consume the saturated fats, leaving the unsaturated ones behind. These irregularly shaped leftovers soak into the skin and pry its barrier open, allowing water to escape. The body detects these breaches and responds defensively, causing the inflammation that gives dandruff its itch. It also makes the skin cells proliferate to repair the damaged barrier. Usually, our skin's outer surface, or epidermis, completely renews itself every two to three weeks. Epidermal cells divide, move outwards, die, and form the skin's tough outer layer, which gradually sheds off in single cells far too small to see. But with dandruff, cells churn out quickly to correct the broken barrier, meaning they don't mature and differentiate properly. Instead, they form large, greasy clumps around the hair follicle that are shed as visible flakes. This is how *Malassezia*'s voracious appetite and our bodies reaction to its by-products lead to dandruff. Currently, the most effective way to get rid of dandruff is by using antifungals in things like shampoos, applied directly to the scalp, to kill *Malassezia*. For those who experience dandruff, it usually comes and goes as sebum secretions vary throughout one's lifetime due to hormonal changes. But despite the fact that *Malassezia* colonize everyone to a similar extent, not everyone gets dandruff. Some people are more susceptible. Exactly why is unclear. Do people with dandruff have a certain genetic predisposition? Is their skin barrier more permeable? Scientists are currently investigating if people with dandruff do, in fact, lose more water through their scalps, and whether this is what's leading their skin cells to proliferate. Researchers are learning that *Malassezia* communicate with our immune system using small, oily molecules called oxylipins that regulate inflammation. If they can find a way to inhibit inflammatory oxylipins and boost anti-inflammatory ones, they could develop new treatments. Scientists are also investigating if there's any benefit to our relationship with *Malassezia*. They hypothesize that dandruff, which can be uncomfortable and embarrassing for us, creates a reliable, oily food source for the yeast. But dandruff isn't contagious or a great threat to our health. And *Malassezia* seem to excel at defending their territory, our skin, from other, more harmful microbes like *Staphylococcus aureus*. So, while scientists have gotten to the bottom of many mysteries surrounding this

condition, it must be said: dandruff remains a head-scratcher.

P16 2021-02-09 What causes dandruff, and how do you get rid of it - Thomas L. Dawson

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=16>)

翻译人员: Siqi Gao 校对人员: Helen Chang 在这片茂密的丛林里, 马拉色菌拥有绝佳生存条件, 这里如天堂般供它欢宴作乐。但等等——这是什么? 事实上, 马拉色菌是一种酵母, 它在我们所有的头皮上定居和进食。它在近一半的人群中, 导致了头皮屑的产生。那么, 为何有些人的头皮屑比较多? 而我们又该怎么处理它呢? 我们也许认为我们是独立个体, 但我们其实是一个部落, 我们皮肤表面定植着众多微生物。马拉色菌自我们出生时便很快地 在我们的皮肤上定居。毛囊, 全身毛发从这些小凹陷中长出来, 并打造出一个特别友好的生存空间。马拉色菌特别喜欢这些藏身之处, 因为这里包含了腺体。而这种腺体能分泌一种油脂, 亦称皮脂。普遍认为, 这能使我们的头发 变得顺滑和强韧。马拉色菌进而以我们皮肤的 蛋白质和油脂为食。因为头皮有许多分泌油脂的毛囊, 所以它是我们全身最多油脂的地方之一, 同时也是酵母最多的地方。当这些酵母在头皮上大吃大喝时, 头皮屑也随之产生。因为皮脂是由饱和脂肪酸 和非饱和脂肪酸共同组成的。饱和脂肪酸整齐地排列在一起。相反, 非饱和以双键以双键不规则地连接在一起。马拉色菌分泌一种酶, 分解皮脂中的所有脂肪酸。但他们只以饱和脂肪酸为食, 留下了非饱和脂肪酸。而这些不规则非饱和脂肪酸 渗入皮肤, 破开了皮肤屏障, 让水分外渗。身体检测到水分流失 并做出防御性反应, 发生炎症反应, 产生令人发痒的头皮屑。它同时也使皮肤细胞增生, 以修复损伤的屏障。通常, 我们皮肤的外表面或表皮每两到三周就会完全更新一次。表皮细胞分裂、外移、凋亡, 形成皮肤坚韧的屏障, 并以肉眼无法看到的 单细胞逐渐脱落。但是对于头皮屑, 细胞会迅速产生 以修复破损的屏障, 这就意味着它们不能 正常成熟和分化。相反, 它们会在毛囊周围 形成又大又油的团块, 并脱落成我们所看到的头皮屑。头皮屑正是由于马拉色菌嗜油脂以及我们对它副产品的反应而产生。通常, 摆脱头皮屑最有效的方法是用含抗真菌成分的洗发露直接抹在头皮上去杀死马拉色菌。对于那些有头皮屑的人来说, 皮脂分泌物通常随着人一生的 激素水平的变化而变化。尽管马拉色菌在每个人身上的定植程度都差不多, 但并不是每个人都有头皮屑。有些人会更加容易产生皮屑。而原因尚未明确。有头皮屑的人有明确的遗传易感性吗? 非饱和脂肪酸是否 更容易渗入他们的皮肤? 目前, 科学家正在研究 有头皮屑的人群是否会因为头皮屑而丢失更多水分, 或是否因此促进皮肤细胞的增殖。研究人员发现马拉色菌通过 一种名为氧化脂素的油性分子与我们的免疫系统传递信息, 从而调节炎症反应。如果他们能找到一种能阻断 炎性氧化脂素产生的方法, 或者能促进抗炎物质的生成, 新的治疗方案就能研发出来了。科学家同时也在研究 马拉色菌对于我们来说是不是也有好处。他们猜测头皮屑在给我们带来不适与尴尬的同时, 也为马拉色菌提供足够的油脂来源。但头皮屑不具有传染性, 也没有对我们的健康造成很大威胁。而马拉色菌似乎很擅长 保护自身领地, 即我们的皮肤, 不会受到如金黄色葡萄球菌 这些有害微生物的伤害。因此, 虽说围绕这些问题, 科学家已经解开了谜底, 但还是必须要说: 头皮屑依旧让人挠头。

P17 2021-02-11 The satisfying math of folding origami - Evan Zodl

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=17>)

As the space telescope prepares to snap a photo, the light of the nearby star blocks its view. But the telescope has a trick up its sleeve: a massive shield to block the glare. This starshade has a diameter of about 35 meters— that folds down to just under 2.5 meters, small enough to carry on the end of a rocket. Its compact design is based on an ancient art form. Origami, which literally translates to “folding paper,” is a Japanese practice dating back to at least the 17th century. In origami, the same simple concepts yield everything from a paper crane with about 20 steps, to this dragon with over 1,000 steps, to a starshade. A single, traditionally square sheet of paper can be transformed into almost any shape, purely by folding. Unfold that sheet, and there’s a pattern of lines, each of which represents a concave valley fold or a convex mountain fold. Origami artists arrange these folds to create crease patterns, which serve as blueprints for their designs. Though most origami models are three dimensional, their crease patterns are usually designed to fold flat without introducing any new creases or cutting the paper. The mathematical rules behind flat-foldable crease patterns are much simpler than those behind 3D crease patterns— it’s easier to create an abstract 2D design and then shape it into a 3D form. There are four rules that any flat-foldable crease pattern must obey. First, the crease pattern must be two-colorable— meaning the areas between creases can be filled with two colors so that areas of the same color never touch. Add another crease here, and the crease pattern no longer displays two-

colorability. Second, the number of mountain and valley folds at any interior vertex must differ by exactly two—like the three valley folds and one mountain fold that meet here. Here's a closer look at what happens when we make the folds at this vertex. If we add a mountain fold at this vertex, there are three valleys and two mountains. If it's a valley, there are four valleys and one mountain. Either way, the model doesn't fall flat. The third rule is that if we number all the angles at an interior vertex moving clockwise or counterclockwise, the even-numbered angles must add up to 180 degrees, as must the odd-numbered angles. Looking closer at the folds, we can see why. If we add a crease and number the new angles at this vertex, the even and odd angles no longer add up to 180 degrees, and the model doesn't fold flat. Finally, a layer cannot penetrate a fold. A 2D, flat-foldable base is often an abstract representation of a final 3D shape. Understanding the relationship between crease patterns, 2D bases, and the final 3D form allows origami artists to design incredibly complex shapes. Take this crease pattern by origami artist Robert J. Lang. The crease pattern allocates areas for a creature's legs, tail, and other appendages. When we fold the crease pattern into this flat base, each of these allocated areas becomes a separate flap. By narrowing, bending, and sculpting these flaps, the 2D base becomes a 3D scorpion. Now, what if we wanted to fold 7 of these flowers from the same sheet of paper? If we can duplicate the flower's crease pattern and connect each of them in such a way that all four laws are satisfied, we can create a tessellation, or a repeating pattern of shapes that covers a plane without any gaps or overlaps. The ability to fold a large surface into a compact shape has applications from the vastness of space to the microscopic world of our cells. Using principles of origami, medical engineers have re-imagined the traditional stent graft, a tube used to open and support damaged blood vessels. Through tessellation, the rigid tubular structure folds into a compact sheet about half its expanded size. Origami principles have been used in airbags, solar arrays, self-folding robots, and even DNA nanostructures— who knows what possibilities will unfold next.

P17 2021-02-11 The satisfying math of folding origami - Evan Zodi

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=17>)

翻译人员: 校对人员: Carol Wang 当太空望远镜准备拍照时, 附近恒星的光线挡住了视线。但望远镜自有妙招: 用一个巨大遮星板来遮挡眩光。这个遮星板直径大约 35 米——折叠起来则不到 2.5 米, 小到可以放在火箭的末端。其紧凑设计基于一种古老艺术形式: 折纸, 字面意思是折叠纸张, 是至少可以追溯到 十七世纪日本的一种做法。在折纸中, 同样简单的概念 可以折成任何东西: 从只需 20 个步骤的纸鹤 到需要 1,000 个步骤的纸龙, 甚至可以做成遮星板。一张传统的方形纸, 仅仅通过折叠, 就可以 变成任何的形状。展开那张纸, 可以看到线条图案, 每条线代表一个凹谷褶皱 或者一个凸山褶皱。折纸艺术家通过折叠去创造折痕, 来作为他们设计的蓝图。虽然大多数折纸模型都是三维的, 折痕图案通常设计为平折, 不会引入任何新折痕或切割纸张。平折折痕背后的数学规则比 3D 折痕图案 背后的规则要简单的多——先创造抽象的 2D 设计, 再塑造成 3D 会更加简单。任何平折的折痕图案 都必须遵守四个规则: 首先, 折痕的图案必须可涂双色——即折痕间的区域可用两种颜色填充, 使相同颜色的区域永远不会接触。在此处添加另一个折痕, 折痕图不再显示两种可着色性。第二条, 山和沟褶皱的数量在任何内部顶点必须差恰好两个——就像这里交汇的 三谷褶皱和一山褶皱一样。下面仔细看看在这个顶点 进行折叠时会发生什么: 如果在这个顶点添加一个山褶, 就有三个山谷和两个山; 如果是谷, 则有四谷一山。无论哪种方式, 模型都不会平坦。第三条规则是, 如果我们对 内部顶点处所有角进行编号, 顺时针或逆时针标注均可, 偶数角加起来必须是 180 度, 奇数角也必须如此。仔细观察褶皱, 可以看出原因。如果在这个顶点添加 一个折痕并给新的角编号, 偶数和奇数角度加起来 不再是 180 度, 并且模型不会折叠平。最后, 一层纸不能穿过褶皱。一个可折叠 2D 平面底座, 通常是最终 3D 形状的抽象表示。了解折痕图案、2D 基座和最终 3D 形式的关系, 令折纸艺术家设计出 极其复杂的形状。以折纸艺术家 Robert J. Lang 的 折痕图案为例, 通过折痕图案分配区域, 分出动物的腿、尾巴和其他部位。当我们将折痕图案 折叠到这个平坦底座上时, 这些分好的区域中的每一个 都成为一个单独的襟翼。通过缩小、弯曲和塑性这些襟翼, 2D 基底变成了 3D 蝎子。现在, 如果我们想在同一张纸上 折叠 7 朵花怎么办? 如果我们可以复制 花朵的折痕图案并以满足所有四个定律的方式 连接它们中的每一个, 就可以创建一个镶嵌或形状重复, 覆盖一个平面, 没有任何间隙或重叠。将大表面折叠成紧凑形状的能力, 在广阔的空间和我们细胞的微观世界中都有应用。运用折纸原理, 医学工程师重新构想了 传统的覆膜支架, 即一个用于打开 和支撑受损血管的管子——通过镶嵌, 刚性管状结构 折叠成紧凑的薄片, 体积约是展开后的一半。折纸原理已用于 安全气囊、太阳能电池板、自折叠机器人, 甚至 DNA 纳米结构——谁知道接下来会出现什么可能性。

P18 2021-02-16 The “myth” of the boiling frog

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=18>)

Two frogs are minding their own business in the swamp when WHAM— they’re kidnapped. They come to in a kitchen, captives of a menacing chef. He boils up a pot of water and lobs one of the frogs in. But it’s having none of this. The second its toes hit the scalding water it jumps right out the window. The chef refills the pot, but this time he doesn’t turn on the heat. He plops the second frog in, and this frog’s okay with that. The chef turns the heat on, very low, and the temperature of water slowly rises. So slowly that the frog doesn’t notice. In fact, it basks in the balmy water. Only when the surface begins to bubble does the frog realize: it’s toast. What’s funny about this parable is that it’s not scientifically true... for frogs. In reality, a frog will detect slowly heating water and leap to safety. Humans, on the other hand, are a different story. We’re perfectly happy to sit in the pot and slowly turn up the heat, all the while insisting it isn’t our hand on the dial, arguing about whether we can trust thermometers, and questioning— even if they’re right, does it matter? It does. Since 1850, global average temperatures have risen by 1 degree Celsius. That may not sound like a lot, but it is. Why? 1 degree is an average. Many places have already gotten much warmer than that. Some places in the Arctic have already warmed 4 degrees. If global average temperatures increase 1 more degree, the coldest nights in the Arctic might get 10 degrees warmer. The warmest days in Mumbai might get 5 degrees hotter. So how did we get here? Almost everything that makes modern life possible relies on fossil fuels: coal, oil, and gas full of carbon from ancient organic matter. When we burn fossil fuels, we release carbon dioxide that builds up in our atmosphere, where it remains for hundreds or even thousands of years, letting heat in, but not out. The heat comes from sunlight, which passes through the atmosphere to Earth, where it gets absorbed and warms everything up. Warm objects emit infrared radiation, which should pass back out into space, because most atmospheric gases don’t absorb it. But greenhouse gases— carbon dioxide and methane— do absorb infrared wavelengths. So when we add more of those gases to the atmosphere, less heat makes it back out to space, and our planet warms up. If we keep emitting greenhouse gases at our current pace, scientists predict temperatures will rise 4 degrees from their pre-industrial levels by 2100. They’ve identified 1.5 degrees of warming— global averages half a degree warmer than today’s— as a threshold beyond which the negative impacts of climate change will become increasingly severe. To keep from crossing that threshold, we need to get our greenhouse gas emissions down to zero as fast as possible. Or rather, we have to get emissions down to what’s called net zero, meaning we may still be putting some greenhouse gases into the atmosphere, but we take out as much as we put in. This doesn’t mean we can just keep emitting and sequester all that carbon— we couldn’t keep up with our emissions through natural methods, and technological solutions would be prohibitively expensive and require huge amounts of permanent storage. Instead, while we switch from coal, oil, and natural gas to clean energy and fuels, which will take time, we can mitigate the damage by removing carbon from the atmosphere. Jumping out of the proverbial pot isn’t an option, but we can do something the frogs can’t: reach over, and turn down the heat.

P18 2021-02-16 The “myth” of the boiling frog

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=18>)

翻译人员: Gia Hwang 校对人员: Carol Wang 两只青蛙在沼泽地里正各忙各的，这时“砰”地一声——它俩被绑架了，它们被恶厨师捕获后来到了厨房。他煮了一锅水，把一只青蛙丢进锅里。但它从没经历过这些，它脚趾碰到滚烫水的那一刻，它直接跳出了窗外。厨师又把锅装满水，但这次他没有开火。他把第二只青蛙丢进锅里，这只青蛙没啥反应。厨师打开小火，水温慢慢升高，慢到青蛙都没注意到。其实，它沐浴在温暖的水中。只有当水面开始冒泡时，青蛙才意识到：它已熟了。这个寓言的有趣之处在于，科学角度看关于青蛙的说法不正确。其实青蛙能察觉慢慢加热的水，然后跳到安全的地方。但另一方面，人类的情况就不同了。我们很享受坐在锅里，慢慢地把火调大，始终坚持说不是我们的手在控温、争论温度计是否可信并质疑——就算温度计正确，有关系吗？确实有关系。自1850年以来，全球平均气温上升了1℃。听起来上升不多，但其实很多，为什么？因为1℃是平均值，许多地方的气温已经比这高得多。北极一些地方已经升温4℃。如果全球平均气温再升1℃，北极最冷寒夜可能温度会上升10℃，孟买最热的时候可能还要热5℃。那么我们是怎么走到这一步的呢？几乎所有使现代生活成为可能的东西都依赖于化石燃料：煤、石油和天然气都充满来自远古有机物的碳。当我们燃烧化石燃料时，释放出二氧化碳，它在大气层中累积，并停留数百年、甚至数千年。让热量进入，而不会排出热量。来自阳光的热量穿过大气

层到达地球，热量被吸收，使一切变暖。温度较高的物体会发出红外辐射，这种辐射本该返回太空，因为多数大气气体不会吸收它。但温室气体——二氧化碳和甲烷——确实会吸收红外线波长。所以，当我们向大气中释放更多这种气体时，返回太空的热量减少，地球就会变暖。如果继续以目前速度排放温室气体，科学家预测，到 2100 年，与工业化前的水平相比，全球气温将上升 4°C。他们已确定，气温上升 1.5°C 就到临界值，即全球平均气温比现在高 0.5°C，一旦超过这个临界值，气候变化的负面影响将变得更严重。为了避免超过这个门限值，我们需要尽快将温室气体排放降至零。或者确切地说，我们必须将排放量降至所说的净零，即我们仍可在向大气中排放一些温室气体，但我们吸收和排放一样多。这并不意味着可以继续排放和封存所有的碳——我们无法通过自然封存方法跟上我们的碳排放，而且技术解决方案会非常昂贵，还需要大量的永久储存。相反，当我们从煤炭、石油和天然气转向清洁能源和燃料时——这需要时间——可以通过大气去碳来减轻损害。跳出热锅不是我们的选择，但我们可以做一些青蛙做不到的事：伸出手来，把火关小。

P19 2021-02-18 Why do we, like, hesitate when we, um, speak - Lorenzo García-Amaya

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=19>)

For as long as we've had language, some people have tried to control it. And some of the most frequent targets of this communication regulation are the ums, ers, and likes that pepper our conversations. Ancient Greek and Latin texts warned against speaking with hesitation, modern schools have tried to ban the offending terms, and renowned linguist Noam Chomsky dismissed these expressions as "errors" irrelevant to language. Historically, these speech components had been lumped into the broader bucket of "disfluencies"—linguistic fillers which distract from useful speech. However, none of this controversy has made these so-called disfluencies less common. They continue to occur roughly 2 to 3 times per minute in natural speech. And different versions of them can be found in almost every language, including sign language. So are ums and uhs just a habit we can't break? Or is there more to them than meets the ear? To answer this question, it helps to compare these speech components to other words we use in everyday life. While a written word might have multiple definitions, we can usually determine its intended meaning through context. In speech however, a word can take on additional layers of meaning. Tone of voice, the relationship between speakers, and expectations of where a conversation will go can imbue even words that seem like filler with vital information. This is where "um" and "uh" come in. Or "eh" and "ehm," "tutoa" and "öö," "eto" and "ano." Linguists call these filled pauses, which are a kind of hesitation phenomenon. And these seemingly insignificant interruptions are actually quite meaningful in spoken communication. For example, while a silent pause might be interpreted as a sign for others to start speaking, a filled pause can signal that you're not finished yet. Hesitation phenomena can buy time for your speech to catch up with your thoughts, or to fish out the right word for a situation. And they don't just benefit the speaker—a filled pause lets your listeners know an important word is on the way. Linguists have even found that people are more likely to remember a word if it comes after a hesitation. Hesitation phenomena aren't the only parts of speech that take on new meaning during dialogue. Words and phrases such as "like," "well" or "you know" function as discourse markers, ignoring their literal meaning to convey something about the sentence in which they appear. Discourse markers direct the flow of conversation, and some studies suggest that conscientious speakers use more of these phrases to ensure everyone is being heard and understood. For example, starting a sentence with "Look..." can indicate your attitude and help you gauge the listener's agreement. "I mean" can signal that you're about to elaborate on something. And the dreaded "like" can perform many functions, such as establishing a loose connection between thoughts, or introducing someone else's words or actions. These markers give people a real-time view into your thought process and help listeners follow, interpret, and predict what you're trying to say. Discourse markers and hesitation phenomena aren't just useful for understanding language—they help us learn it too. In 2011, a study showed toddlers common and uncommon objects alongside a recording referring to one of the items. When a later recording asked them to identify the uncommon object, toddlers performed better if that instruction contained a filled pause. This may mean that filled pauses cue toddlers to expect novel words, and help them connect new words to new objects. For adolescents and adults learning a second language, filled pauses smooth out awkward early conversations. And once they're more confident, the second-language learner can signal their newfound fluency by using the appropriate hesitation phenomenon. Because, contrary to popular belief, the use of filled pauses doesn't decrease with mastery of a language. Just because hesitation phenomena and discourse markers are a natural part of communication doesn't mean they're always appropriate. Outside of writing dialogue, they serve no purpose in most formal writing. And in some contexts,

the stigma these social cues carry can work against the speaker. But in most conversations, these seemingly senseless sounds can convey a world of meaning.

P19 2021-02-18 Why do we, like, hesitate when we, um, speak - Lorenzo García-Amaya

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=19>)

翻译人员: nayan liu 校对人员: Helen Chang 人类自从有了语言, 就试图去掌控它。在这种沟通规则中最常见的目标是充斥在交谈中的: 嗯, 呃, 然后.....古希腊和拉丁明文规定说话不要迟疑, 在现代学校中禁止使用冒犯性的词语, 著名语言学家诺姆·乔姆斯基 (Noam Chomsky) 认为将这些表达视为与语言无关的“错误”。历史上, 这些语音成分被归纳为被归入更广泛的“不流利”的范畴---这些语言补料将分散人们 对于有用话语的注意力。然而, 这些争议都没有减少 所谓的“不流利”的出现。在一个自然的演讲中, 它们每分钟会出现 2 至 3 次。而且几乎在每种语言中, 都可以看待它们的身影, 甚至是手语。那么, “嗯”和“啊”只是 我们无法改变的一种习惯吗? 背后是否还有更多我们的耳朵 听不到的故事? 要回答这个问题, 就需要比较一下这些语音成分和我们日常生活中 用到的其他词语。一个书面用词可能会有多重含义, 我们通常可以通过上下文 来判断它的本意。然而在口语中, 一个词可以带上额外的意义。说话的语气、谈话者之间的关系, 以及谈话的走向能够使那些听来用作填声的词语 充满重要信息。填声词就像“嗯”、“呃”或“诶”、“唔”、“啊”、“那个”。语言学家们称之为“填声停顿”, 是一种迟疑的现象。而这些看似微不足道的中断, 实际上在口头交流中非常有意义。比如, 无声的停顿可能被理解为让其他人开始讲话的标志, 填声停顿则标志着你的话还没有说完。迟疑现象为你争取到了时间, 让你的嘴追上你的思想, 或为特定情形找出最准确的用词。而且不只说话的人获益, 填声停顿让你的听众们知道, 马上就要说到重点了。语言学家们甚至发现, 人们更有可能 记住一个在迟疑之后出现的词。迟疑现象在对话中并非是唯一带上新意义的部分。类似于“这个”、“嗯”、“那个”这样的词语充当话语标记, 在它们出现的句子里, 忽略它们的字面意思, 传达了有关句子的信息。话语标记引导谈话的进程。有研究表明, 尽责的演讲人更多地使用这些词 从而让每个人都被倾听和理解。比如, 用“你看...”起头, 可以表明你的态度, 帮你拿捏听众的同意程度。“我的意思是”表明 接下去你会展开细讲。可怕的“这个”能够发挥许多作用, 比如, 在思想之间建立松散的联系, 或者介绍别人的言语或行为。这些“标记”让人们 实时了解你的思维过程, 帮助听众听懂、理解、 预判你要说的内容。话语标记和迟疑现象不仅对理解语言有帮助——它们也有助于我们学习语言。在 2011 年, 一项研究向幼儿展示 常见和不常见的物体, 还配上一段提到其中一个物品的录音。之后一段录音让他们指认不常见的物体, 当录音指导含有填声停顿时, 幼儿们表现得更好。这可能意味着 填声停顿提示幼儿留意新词, 也帮他们将新词与新的物体联系起来。对于正在学习第二语言的 青少年和成人而言, 填声停顿消除了早期谈话的尴尬。当他们更自信的时候, 习得第二语言的人能够通过适当的迟疑现象展现他们的流利。因为, 与流行的看法相反, 填声停顿的使用不会随着 对一门语言的掌握度的提升而减少。迟疑现象和话语标记是交流的自然组成部分, 并不意味着它们总是合适的。除了书面对话之外, 在大多数正式写作中没有任何用处。在某些情境中, 这些社会暗示带来的耻辱可能会对说话者带来不利影响。但在大多数谈话中, 这些看似毫无意义的声音能够传达出一个有意义的世界。

P20 2021-02-22 The world's biggest battery looks nothing like a battery

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=20>)

As of 2020, the world's biggest lithium-ion battery is hooked up to the Southern California power grid and can provide 250 million watts of power, or enough to power about 250,000 homes. But it's actually not the biggest battery in the world: these lakes are. Wait— how can a pair of lakes be a battery? To answer that question, it helps to define a battery: it's simply something that stores energy and releases it on demand. The lithium-ion batteries that power our phones, laptops, and cars are just one type. They store energy in lithium ions. To release the energy, the ions are separated from their electrons, then rejoined at the other end of the battery as a new molecule with lower energy. How do the two lakes store and release energy? First, one is 300 meters higher than the other. Electricity powers pumps that move billions of liters of water from the lower lake to the higher one. This stores the energy by giving the water extra gravitational potential energy. Then, when there's high demand for electricity, valves open, releasing the stored energy by letting water flow downhill to power 6 giant turbines that can generate 3 billion watts of power for 10 hours. We're going to need more and more giant batteries. That's because right now, generating enough electricity to power the world produces an unsustainable amount of greenhouse gas: 14 billion tons per

year. We'll need to get that number down to net-zero. But many clean energy sources can't produce electricity 24/7. So to make the switch, we need a way to store the electricity until it's needed. That means we need grid-scale batteries: batteries big enough to power multiple cities. Unfortunately, neither of the giant batteries we've talked about so far can solve this problem. The two lakes setup requires specific geography, takes up a lot of land, and has high upfront costs to build. The giant lithium-ion battery in California, meanwhile, can power about 250,000 homes, yes, but only for an hour. Lithium-ion batteries are great for things that don't use a lot of power. But to store a lot of energy, they have to be huge and heavy. That's why electric planes aren't a thing: the best electric plane can only carry two people for about 1,000 kilometers on one charge, or its batteries would be too heavy to fly. A typical commercial jet can carry 300 people over 14,000 km before refueling. Lithium-ion batteries also require certain heavy metals to make. These resources are limited, and mining them often causes environmental damage. Inventors all over the world are rising to the challenge of making batteries that can meet our needs— many of them even weirder than the two lakes. One company is building a skyscraper battery. When the sun is shining, a crane powered by solar energy piles blocks on top of each other in a tower. At night, the cranes let gravity pull the blocks down and use the resulting power to spin generators. Though there have been some early setbacks, another promising approach involves heating up salts until they melt. The molten salt can be stored until there's a high demand for electricity, then used to boil water. The steam can power turbines that generate electricity. Another idea: bio-batteries made from paper, powered by bacteria, and activated by spit. Bacteria release energy in the form of electrons when they metabolize glucose, and at least one species of bacteria can transfer those electrons outside its cells, completing a circuit. While these batteries won't power a city, or even a house, they don't have the waste and cost concerns of traditional batteries. From vast mountain lakes to microscopic bacteria, from seawater batteries that bypass the need for heavy metals to nuclear batteries that power deep space missions, we're constantly rethinking what a battery can be. The next unlikely battery could be hiding in plain sight— just waiting to be discovered and help us achieve a sustainable future.

P20 2021-02-22 The world's biggest battery looks nothing like a battery

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=20>)

翻译人员: Helen Chang 校对人员: Jiasi Hao 截至 2020 年, 全球最大的锂离子电池与南加州电网接通, 能够提供 2.5 亿瓦特的电力, 足够为大约 25 万家庭供电。但实际上 它并不是世界上最大的电池: 这些湖泊才是。等——两座湖泊怎会是个电池呢? 了解电池的定义 则有助于回答这个问题: 电池只是个储存能量 并应需求而释放能量的东西。为我们的手机、笔记本电脑和汽车 提供动力的锂离子电池, 只是电池的一种类型。它们用锂离子储存能量。为释放能量, 锂离子与它们的电子分离, 然后在电池的另一头再次结合, 成为能量较低的新分子。两座湖泊如何储存和释放能量呢? 首先, 一座湖比另一座高出 300 米。电力驱动水泵把数十亿升水从低湖转移到高湖。通过为水提供额外的重力势能 来储存能量。然后, 在电力需求量高的时候打开阀门, 让水往山下流 从而释放储存的能量。这些能量 可为 6 个巨型的涡轮机提供动力, 进而持续 10 小时, 产生 30 亿瓦的电力。我们将会需要越来越多巨型电池。那是因为目前供给世界 足够电力的发电方式产生的温室气体量不可持续: 每年 140 亿吨。我们将需要把那个数字降到净零。然而很多清洁能源无法全天候发电。所以为实现这一转变, 我们需要一种能储电直到需要用电的方法。这意味着我们需要电网规模的电池: 大到足够为多个城市供电的电池。不幸的是, 我们已经 讨论过的两种巨型电池都无法解决这个问题。湖泊电池对地理位置有特定要求, 占用大片土地, 而且前期的建设成本很高。与此同时, 加州的巨大锂离子电池可以为大约 25 万家庭供电, 没错, 但只能供电一小时。锂离子电池 对于耗电少的东西非常有用。但为了储存大量能量 锂电池就必须又大又重。这就是电动飞机仍不成气候的原因: 目前最好的电动飞机只能载两个人, 充电一次, 大约能跑 10,000 公里, 要不然电池就重到飞不起来。典型的商用飞机能载 300 人, 飞行超过 14,000 公里才需再加油。制造锂离子电池还需要若干重金属。这些资源有限, 而且开采过程往往会破坏环境。全世界的发明家奋起面对这一挑战: 发明能满足我们的需求的电池。其中, 许多电池设计 甚至比湖泊电池更奇怪。一家公司正在建造摩天大楼电池。当日光照耀时, 太阳能驱动的起重机把一块块的积木相互堆叠于塔中。到了晚上, 起重机让重力 将积木拉下来, 借此产生的能量驱动发电机。尽管早期遭遇了一些挫折, 另一种具有前景的方法是 加热盐直到熔化。熔化的盐 可保存至电力需求大的时候, 然后用来烧水。蒸汽可以驱动涡轮机发电。另一个想法是制造生物电池纸, 由细菌提供动力, 由唾液激活。细菌代谢葡萄糖时 以电子的形态释放能量, 而且至少有一种细菌 能够把这些电子转移到细胞外, 形成完整的电路。尽管这些电池无法 为一座城市, 甚至一栋房子供电, 但它们没有传统电池的 废弃和成本顾虑。从巨大的山湖到微小的细菌, 从无重金属需求的海水电池到为深空

任务供能的核电池，我们不断反复思考 电池可以是什么样的。或许下一个无法想象的电池 正隐藏在光天化日之下——就等着被发现， 帮助我们实现可持续发展的未来。

P21 2021-02-23 Can you solve the demon dance party riddle - Edwin Meyer

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=21>)

Once each year, thousands of logicians descend into the desert for Learning Man, a week-long event they attend to share their ideas, think through tough problems... and mostly to party. And at the center of that gathering is the world's most exclusive club, where under the full moon, the annual logician's rave takes place. The entry is guarded by the Demon of Reason, and the only way to get in is to solve one of his dastardly challenges. You're attending with 23 of your closest logician friends, but you got lost on the way to the rave and arrived late. They're already inside, so you must face down the demon alone. He poses you the following question: When your friends arrived, the demon put masks on their faces and forbade them from communicating in any way. No one at any point could see their own masks, but they stood in a circle where they could see everyone else's. The demon told the logicians that he distributed the masks in such a way that each person would eventually be able to figure out their mask's color using logic alone. Then, once every two minutes, he rang a bell. At that point, anyone who could come to him and tell him the color of their mask would be admitted. Here's what happened: Four logicians got in at the first bell. Some number of logicians, all in red masks, got in at the second bell. Nobody got in when the third bell rang. Logicians wearing at least two different colors got in at the fourth bell. All 23 of your friends played the game perfectly logically and eventually got inside. Your challenge, the demon explains, is to tell him how many people gained entry when the fifth bell rang. Can you get into the rave? Pause here to figure it out yourself. Answer in 3 Answer in 2 Answer in 1 It's initially difficult to imagine how anyone could, using just logic and the colors they see on the other masks, deduce their own mask color. But even before the first bell, everyone will realize something critical. Let's imagine a single logician with a silver mask. When she looks around, she'd see multiple colors, but no silver. So she couldn't ever know that silver is an option, making it impossible for her to logically deduce that she must be silver. That contradicts rule five, so there must be at least two masks of each color. Now, let's think about what happens when there are exactly two people wearing the same color mask. Each of them sees only one mask of that color. But because they already know that it can't be the only one, they immediately know that their own mask is the other. This must be what happened before the first bell: two pairs of logicians each realized their own mask colors when they saw a unique color in the room. What happens if there are three people wearing the same color? Each of them—A, B and C—sees two people with that color. From A's perspective, B and C would be expected to behave the same way that the orange and purple pairs did, leaving at the first bell. When that doesn't happen, each of the three realizes that they are the third person with that color, and all three leave at the next bell. That was what the people with red masks did—so there must have been three of them. We've now established a basis for inductive reasoning. Induction is where we can solve the simplest case, then find a pattern that will allow the same reasoning to apply to successively larger sets. The pattern here is that everyone will know what group they're in as soon as the previously sized group has the opportunity to leave. After the second bell, there were 16 people. No one left on the third bell, so everyone then knew there weren't any groups of four. Multiple groups, which must have been of five, left on the fourth bell. Three groups would leave a solitary mask wearer, which isn't possible, so it must've been two groups. And that leaves six logicians outside when the fifth bell rings: the answer to the demon's riddle. Nothing left to do but join your friends and dance.

P21 2021-02-23 Can you solve the demon dance party riddle - Edwin Meyer

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=21>)

翻译人员: Teresa Chen 校对人员: Helen Chang 每年一度，成千上万的逻辑学家 在沙漠中参加“学习者”活动，一个为期一周的活动，参加以分享他们的想法，思考棘手的问题... 以及主要为了聚会。而这个聚会的中心 是最独特的俱乐部。满月的时候，一年一度的 逻辑学家狂欢在这里举行。入口由“理性之魔”把守，进入的唯一方法是解决他的一个卑鄙的挑战。你和你最亲密的 23 位 逻辑学家朋友一起参加，但你在去的路上迷路而迟到了。他们已经在里面了， 所以你必须独自面对这个恶魔。他向你提出了如下问题：当你的朋友到达时， 恶魔给他们的脸上都戴了面具并禁止他们以任何方式进行交流。没有人在任何时候 可以看到自己的面具，但他们站成一个圈子，可

以看到所有其他人的面具。恶魔告诉逻辑学家们 以他分配面具的方式每个人最终都能找出自己面具的颜色且只使用逻辑。然后，每隔两分钟，他按一下铃。到时候，任何能来找他并告诉恶魔自己面具颜色的人 都会被接纳。这是发生的情况：四位逻辑学家 在第一次铃响时就进了场。一些都戴着红色面具的逻辑学家，在第二次铃响时进入了。第三次铃响时，无人进入。至少两种不同颜色面具的逻辑学家们 在第四次铃响时进入了。你所有的 23 位朋友 都完全符合逻辑地进行了游戏并最终进入了里面。你的挑战，恶魔解释道，是要告诉他 第五次铃响时有多少人进入。你能进入狂欢吗？在此暂停，自己想办法。答案三秒后揭晓答案两秒后揭晓答案一秒后揭晓起初很难想象任何人能够仅凭逻辑和他们在 别人面具上看到的颜色，推断出自己的面具颜色。但在第一次铃响前， 每个人就会意识到一些关键的问题。让我们想象一下， 一个独自戴着银色面具的逻辑学家。当她环顾四周时， 她会看到多种颜色，但没有银色。所以她永远不可能知道 银色是一个选项，使她不可能在逻辑上 推断出她一定是银色的。这与第五条规则冲突， 所以每种颜色至少有两个面具。现在，让我们思考一下当两个人戴着同一颜色的面具时 会发生什么。他们每人只能看到 该颜色的一个面具。但因为他们已经知道 该颜色的面具不可能是唯一。他们会立即知道， 自己的面具就是另一个。这一定发生在第一次铃响前：两对逻辑学家各自意识到了 他们自己的面具颜色当他们在场上看到一种独特的颜色时。那如果是三个人 戴着相同颜色的面具呢？他们中的每个人—A、B 和 C— 都看到了该颜色面具的两个人。从 A 的角度来看，B 和 C 会预计做出同样的行为如橙色和紫色的两对一样， 在第一次铃响时离开。当该情况没有发生时，三人都会各自意识到 他们是第三个有该颜色的人。然后三人都会在下次铃响时离开。这就是那些 戴着红色面具的人做的——所以他们肯定有三个人。我们现在已经建立了一个 归纳推理的基础。归纳法是 我们可以解决最简单的情况，然后找到一个模式 进行同样的推理以适用于接下来的更大集合。这里的模式是 每个人都会知道自己在哪个组中，一旦前一个规模的组别 有机会离开。第二次铃响过后， 剩 16 人。第三次铃响时无人离开，所以大家都会知道 没有任何四人的组别。几个组别，一定是五人的，在第四次铃响时离开。若是三组五个人， 将留下单独戴面具的一人，这是不可能的， 所以一定是两组。那么在第五次铃响时， 会剩下六位逻辑学家：便是恶魔谜题的答案。没有其他要做的了 加入你的朋友跳舞吧。

P22 2021-02-25 Debunking the myth of the Lost Cause - A lie embedded in American his

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=22>)

Between 1860 and 1861, 11 southern states withdrew from the United States and formed the Confederate States of America. They left, or seceded, in response to the growing movement for the nationwide abolition of slavery. Mississippi said, “our position is thoroughly identified with the institution of slavery.” South Carolina cited “hostility on the part of the non-slaveholding states to the institution of slavery.” In March 1861, the Vice President of the Confederacy, Alexander Stevens, proclaimed that the cornerstone of the new Confederate government was white supremacy, or as he put it, “slavery” and “subordination” to white people was the “natural and normal condition” of Black people in America and the “immediate cause of the late rupture and present revolution.” Three weeks after the now-infamous Cornerstone Speech, the American Civil War began. The conflict lasted four years, had a death toll of about 750,000, and ended with the Confederacy’s defeat. By 1866, barely a year after the war ended, southern sources began claiming the conflict wasn’t actually about slavery. Meanwhile, Frederick Douglass, a prominent abolitionist and formerly enslaved person, cautioned, “the spirit of secession is stronger today than ever.” From the words of Confederate leaders, the reason for the war could not have been clearer— it was slavery. So how did this revisionist history come about? The answer lies in the Lost Cause— a cultural myth about the Confederacy. The term was coined by Edward Pollard, a pro-Confederate journalist. In 1866, he published “The Lost Cause: A New Southern History of the War of the Confederates.” Pollard pointed out that the U.S. Constitution gave states the right to govern themselves independently in all areas except those explicitly designated to the national government. According to him, the Confederacy wasn’t defending slavery, it was defending each state’s right to choose whether or not to allow slavery. This explanation effectively turned white southerners’ documented defense of slavery and white supremacy into a patriotic defense of the Constitution. The Civil War had devastated the country, leaving those who had supported the Confederacy grasping to justify their actions. Many pro-Confederate writers, political leaders, and others were quick to adopt and spread the narrative of the Lost Cause. One organization, the United Daughters of the Confederacy, played a key role in transmitting the ideas of the Lost Cause to future generations. Founded in Nashville, Tennessee, in 1894, the UDC united thousands of middle and upper class white southern women. The UDC raised thousands of dollars to build monuments to Confederate soldiers. These were often unveiled with large public ceremonies, and given prominent placements, especially on courthouse lawns. The

Daughters also placed Confederate portraits in public schools. They monitored textbooks to minimize the horrors of slavery, and its significance in the Civil War, passing revisionist history and racist ideology down through generations. By 1918, the UDC claimed over 100,000 members. As their numbers grew, they increased their influence outside the South. Presidents William Howard Taft and Woodrow Wilson both met with UDC members and enabled them to memorialize the Confederacy in Arlington National Cemetery. The UDC still exists and defends Confederate symbols as part of a noble heritage of sacrifice by their ancestors. Despite the wealth of primary sources showing that slavery was the root cause of the Civil War, the myth about states' rights persists today. In the aftermath of the war, Frederick Douglass and his abolitionist contemporaries feared this erasure of slavery from the history of the Civil War could contribute to the government's failure to protect the rights of Black Americans—a fear that has repeatedly been proven valid. In an 1871 address at Arlington Cemetery, Douglass said: “We are sometimes asked in the name of patriotism to forget the merits of this fearful struggle, and to remember with equal admiration those who struck at the nation's life, and those who struck to save it—those who fought for slavery and those who fought for liberty and justice. [...] if this war is to be forgotten, I ask in the name of all things sacred, what shall men remember?”

P22 2021-02-25 Debunking the myth of the Lost Cause - A lie embedded in American his

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=22>)

翻译人员: Yinfeng Ma 校对人员: Helen Chang 1860 年至 1861 年 11 个南部州脱离美国成立了美利坚联盟国（南方邦联）。他们的离开，或说是退出，是在回应日益兴起的全国废奴运动。密西西比州称，“我们的立场与奴隶制完全一致。”南卡罗莱纳州的理由是“非蓄奴州对奴隶制的敌视”。1861 年三月，邦联副总统 亚历山大·史蒂芬斯宣称，新邦联政府的基石是白人至上，或如他所说，“奴隶制”和对白人的“从属”是美国黑人的“自然正常状态”和“现在革命和后期破裂的直接原因”。臭名昭著的基石演讲过后三周，美国内战爆发。战争持续了 4 年，共死亡约 75 万人，以邦联的失败告终。1866 年，战争结束仅一年，南部开始声称内战无关乎奴隶制。期间，弗雷德里克·道格拉斯，著名的废奴主义者、前奴隶警告道，“现在的分裂精神是前所未有的强烈。”照邦联的领导者们所言，内战的原因再清楚不过——就是奴隶制。那么，这段修正主义的历史是如何产生的呢？答案在于“命定败局”——一个邦联的文化神话。这个词是亲邦联的记者 爱德华·波拉德所造。1866 年，他发布了文章“命定败局——邦联战争的新南方历史。”波拉德指出，除了明确指定为国家政府管辖的地区，美国宪法赋予各州在所有地区 独立自主的权利。依他所言，邦联不是在捍卫奴隶制，而是在捍卫每个州选择 是否允许奴隶制的权利。这一解释有效地把南方白人 捍卫奴隶制和白人至上的记录变成了捍卫宪法的爱国运动。内战蹂躏这个国家，使得那些支持邦联的人 急于为自己的行为辩护。许多支持邦联的作家、政治领袖和其他人很快采纳并传播了“命定败局”这一叙述。其中一个组织，邦联之女联合组织(UDC)，在向后代传递命定败局理念方面 发挥了关键作用。UDC 于 1894 年在田纳西州的 纳什维尔成立，联合了成千的南方中上层白人妇女。UDC 筹集了数千美元 为邦联士兵建造纪念碑。这些纪念碑通常会在 大型公众仪式上揭面，放置在显眼的位置，尤其是在法院的草坪上。她们还在公立学校放置邦联的肖像。她们监控教科书，竭力减少 奴隶制的恐怖及其在内战中的意义，将修正主义历史和种族主义意识形态代代相传。到了 1918 年，UDC 已有超过 10 万成员。随着人数的增长，她们 在南方以外的影响力也在增加。威廉·霍华德·塔夫脱总统 和伍德罗·威尔逊总统，都会见了 UDC 的成员。并让她们在阿灵顿国家公墓纪念邦联。UDC 仍然存在，捍卫着邦联的记号，作为她们祖先牺牲的部分高贵遗产。尽管有大量的原始资料表明 奴隶制是南北战争的根源，但有关各州权利的虚构说法 一直延续到今天。战后，弗雷德里克·道格拉斯 和同时代的废奴主义者担心将奴隶制从内战历史中抹去可能使得政府不能保护 美国黑人的权利——这种担忧已多次被证为可信。1871 年，道格拉斯 在阿灵顿公墓发表演讲时说：“我们有时被要求以爱国主义的名义忘记这场可怕斗争的本质，以同样的钦佩之情记住那些 为国家的生命而战的人，以及为拯救国家而战的人——为奴隶制而战的人， 为自由和正义而战的人。如果这场战争将被遗忘，我以一切神圣之名提问，人们应记住什么？”

P23 2021-03-01 The material that could change the world... for a third time

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=23>)

Thousands of years ago, the Romans invented a material that allowed them to build much of their sprawling civilization. Pliny the Elder praised an imposing sea wall made from the stuff as “impregnable to the waves and every day stronger.” He was right: much of this construction still stands, having survived millennia of battering by environmental forces that would topple

modern buildings. Today, our roads, sidewalks, bridges, and skyscrapers are made of a similar, though less durable, material called concrete. There's three tons of it for every person on Earth. And over the next 40 years, we'll use enough of it to build the equivalent of New York City every single month. Concrete has shaped our skylines, but that's not the only way it's changed our world. It's also played a surprisingly large role in rising global temperatures over the last century, a trend that has already changed the world, and threatens to even more drastically in the coming decades. To be fair to concrete, basically everything humanity does contributes to the greenhouse gas emissions that cause global warming. Most of those emissions come from industrial processes we often aren't aware of, but touch every aspect of our lives. Look around your home. Refrigeration—along with other heating and cooling—makes up about 6% of total emissions. Agriculture, which produces our food, accounts for 18%. Electricity is responsible for 27%. Walk outside, and the cars zipping past, planes overhead, trains ferrying commuters to work—transportation, including shipping, contributes 16% of greenhouse gas emissions. Even before we use any of these things, making them produces emissions—a lot of emissions. Making materials—concrete, steel, plastic, glass, aluminum and everything else—accounts for 31% of greenhouse gas emissions. Concrete alone is responsible for 8% of all carbon emissions worldwide. And it's much more difficult to reduce the emissions from concrete than from other building materials. The problem is cement, one of the four ingredients in concrete. It holds the other three ingredients—gravel, sand, and water—together. Unfortunately, it's impossible to make cement without generating carbon dioxide. The essential ingredient in cement is calcium oxide, CaO . We get that calcium oxide from limestone, which is mostly made of calcium carbonate: CaCO_3 . We extract CaO from CaCO_3 by heating limestone. What's left is CO_2 —carbon dioxide. So for every ton of cement we produce, we release one ton of carbon dioxide. As tricky as this problem is, it means concrete could help us change the world a third time: by eliminating greenhouse gas emissions and stabilizing our climate. Right now, there's no 100% clean concrete, but there are some great ideas to help us get there. Cement manufacturing also produces greenhouse gas emissions by burning fossil fuels to heat the limestone. Heating the limestone with clean electricity or alternative fuels instead would eliminate those emissions. For the carbon dioxide from the limestone itself, our best bet is carbon capture: specifically, capturing the carbon right where it's produced, before it enters the atmosphere. Devices that do this already exist, but they aren't widely used because there's no economic incentive. Transporting and then storing the captured carbon can be expensive. To solve these problems, one company has found a way to store captured CO_2 permanently in the concrete itself. Other innovators are tinkering with the fundamental chemistry of concrete. Some are investigating ways to reduce emissions by decreasing the cement in concrete. Still others have been working to uncover and replicate the secrets of Roman concrete. They found that Pliny's remark is literally true. The Romans used volcanic ash in their cement. When the ash interacted with seawater, the seawater strengthened it—making their concrete stronger and more long-lasting than any we use today. By adding these findings to an arsenal of modern innovations, hopefully we can replicate their success—both by making long lasting structures, and ensuring our descendants can admire them thousands of years from now.

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翻译人员: Meiqi Jia 校对人员: Helen Chang 几千年前, 罗马人发明了一种 得以让他们建设庞大文明的材料。老普林尼夸赞一个由这种材料搭建的海堤称之为“坚不可摧, 并且日益坚固”。他说的对, 这建筑大半至今犹存, 从会摧毁现代建筑的数千年的 恶劣环境影响中存活下来了。今天的道路、人行道、桥和摩天大楼由类似、没有那么耐用的材料所制, 叫做混凝土。世上每个人有 3 吨混凝土。今后的四十年每个月的消耗量 都足够建造一座纽约市。混凝土塑造了我们地平线, 但不局限于此。混凝土还惊人地大大影响 过去一个世纪的全球升温。这个趋势已经改变了世界, 并且温度上升将会在未来加剧。对混凝土公平一点, 其实人类所有的行为都会促成温室气体排放, 造成全球变暖。绝大多数的排放源来自我们没察觉到却处处影响我们生活的工业活动。看看你的家。冰箱连同其他加热和制冷占了大约 6% 的总排放。生产食物的农业占 18%。电力占 27%。出去走走, 驶过的车, 头顶上的飞机, 载着通勤的人们的火车—交通工具, 包括船舶, 占温室气体排放的 16%。甚至在我们使用这些东西之前, 制造它们都会造成排放, 很多排放。制造材料—混凝土、钢铁、塑料、玻璃、铝和其他—占温室气体排放的 31%。单单混凝土便造成了 全世界 8% 的碳排放量。而且, 想减少混凝土造成的排放 要比其他的材料更难。问题出在水泥身上, 混凝土 四种主要组成原料中的其中一种。水泥将其他三种原料—碎石, 沙子和水粘在一起。不幸的是, 生产水泥的过程中 是不可能不产生二氧化碳的。 CaO 氧化碳是生产水泥的核心成分。我们从由 CaCO_3 碳酸钙组成的 石灰岩中

提取氧化碳。通过加热石灰岩从 CaCO_3 中提取 CaO 。剩下的便是 CO_2 ——二氧化碳。每生产一吨水泥便要排放一吨二氧化碳。即便这个问题很棘手，这代表混凝土可以第三次改变世界，做法是：减少温室气体的排放，并且使我们的天气更稳定。今天，没有 100% 洁净的混凝土，但有些帮助我们达到目的的好想法。制造石灰的过程中，燃烧化石燃料去加热石灰岩，还造成温室气体的排放。用清洁能源或者其他燃料加热石灰岩会去除这些排放。至于石灰岩自带的二氧化碳，最好的赌注便是碳捕获：确切来说，在产生二氧化碳之处，于其进入大气层之前，将其捕获。现在有可以达到这种目的的装置，但是由于没有经济激励，它们的应用并不广泛。运输并且储存被捕获的碳非常昂贵。去解决这些问题，一个公司找到了可以永久在混凝土里储存被捕获的二氧化碳的方式，其他创新者们在利用混凝土的基础化学原理。有些人研究减少混凝土里面的水泥成分去减少排放。其他人仍旧在尝试揭露和复制罗马混凝土的秘密。他们发现普林尼的赞美是正确的。罗马人在混凝土里加入了火山灰。当火山灰与海水发生反应，海水使火山灰变得更坚固——比任何今天所使用的混凝土都更坚固和持久。把这些新的发现加入到现代的创新者们的宝库里，希望我们可以复制他们的成功，不仅建造更加持久的建筑，还确保我们的后代在几千年后仍能够敬仰它们。

P24 2021-03-02 Can loud music damage your hearing - Heather Malyuk

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=24>)

After a three-hour concert by her favorite Norwegian metal band, Anja finds it difficult to hear her friend rave about the show. It sounds like he's speaking from across the room, and it's tough to make out his muted voice over the ringing in her ears. By the next morning, the effect has mostly worn off, but Anja still has questions. What caused the symptoms? Is her hearing going to fully recover? And can she still go to concerts without damaging her ears? To answer these questions, we first need to understand what sound is and how we hear it. Like a pebble creating ripples in water, sound is created when displaced molecules vibrate through space. While sound vibrations can travel through solids and liquids, our ears have evolved to process vibrations in the air. These waves of air pressure enter our ear canals and bounce off the eardrum. A trio of bones called the ossicular chain then carries those vibrations into the cochlea, transforming waves of air pressure into waves of cochlear fluid. Here, our perception of sound begins to take form. The waves of fluid move the basilar membrane, a tissue lined with tens of thousands of hair cells. The specific vibration of these hair cells and the stereocilia on top of each one determine the auditory signal our brain perceives. Unfortunately, these essential cells are also quite vulnerable. There are two properties of sound that can damage these cells. The first is volume. The louder a sound is, the greater the pressure of its vibrations. While the ear's upper limits vary from person to person, close range exposure to sound exceeding 120 decibels can instantly bend or blow out hair cells, resulting in permanent hearing damage. The pressure of more powerful sounds can even dislocate the ossicular chain or burst an eardrum. The other side of this equation is the sound's duration. While dangerously loud sounds can injure ears almost instantly, hair cells can also be damaged by exposure to lower sound pressure for long periods. For example, hearing a hand dryer is safe for the 20 seconds you're using it. But if you listened for 8 consecutive hours, this relatively low-pressure sound would overwork the stereocilia and swell the hair cell's supporting tissue. Swollen hair cells are unable to vibrate with the appropriate speed and accuracy, making hearing muffled. This kind of hearing loss is known as a temporary threshold shift, and many people will experience it at least once in their lifetime. In Anja's case, the loud sounds of the concert only took three hours to cause this condition. Fortunately, it's a temporary ailment that usually resolves as swelling decreases over time. In most cases, simply avoiding hazardous sounds gives hair cells all they need to recover. One temporary threshold shift isn't likely to cause permanent hearing loss. But frequent exposure to dangerous sound levels can lead to a wide range of hearing disorders, such as the constant buzz of tinnitus or difficulty understanding speech in loud environments. Overworked hair cells can also generate dangerous molecules called reactive oxygen species. These molecules have unpaired electrons, driving them to steal electrons from nearby cells and cause permanent damage to the inner ear. There are numerous strategies you can adopt for preventing hearing loss. Current research around earbud headphone use suggests keeping your volume at 80% or less if you'll be listening for more than 90 minutes throughout the day. Noise-isolating headphones can also help you listen at lower volumes. Getting a baseline understanding of your hearing is essential to protecting your auditory system. Just like our eyes and teeth, our ears also need annual check-ups. Not all communities have access to audiologists, but organizations around the world are developing portable hearing tests and easy-to-use apps to bring these vital resources to remote regions. Finally, wear earplugs when you're knowingly exposing yourself to loud sounds

for extended periods. An earplug's effectiveness depends on how well you've inserted it, so be careful to read the instructions. But when worn correctly, they can ensure you'll be able to hear your favorite band for many nights to come.

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翻译人员: Jiasi Hao 校对人员: Wanting Zhong 在听了她最爱的挪威金属乐队的三小时演唱会后, 安雅发现自己听不清朋友对演出的痴迷爆吹。朋友仿佛是在房间的另一头和她说话, 她嗡嗡作响的耳朵很难分辨出朋友啞哑的声音。第二天早上, 这种情况基本消失了, 但是安雅依旧心存疑惑。是什么导致了昨天的症状? 她的听力会完全恢复吗? 她可以在不损伤耳朵的情况下继续去现场演唱会吗? 要回答这些问题, 首先我们需要了解什么是声音, 以及我们是如何听到声音的。如同鹅卵石在水中激起涟漪, 声音是由位移的分子在空间中振动而产生的。振动可以通过固体和液体传播, 而我们的耳朵已进化到能处理空气中传播的振动。这些气压波进入我们的耳道, 并在鼓膜上反弹。三块相互连接的听小骨 (名为听小骨链) 随之将这些振动传递至耳蜗, 将气压波转化为耳蜗液体的振动, 于是我们对听觉的感知开始形成。液体机械波会使耳蜗基底膜移动, 这是一个排列了数万毛细胞的组织。这些毛细胞的特定振动和每个毛细胞顶部静纤毛的摆动决定了我们大脑感知的听觉信号。不幸的是, 这些细胞十分重要, 但也相当脆弱。两种声音属性能够损害这些细胞。首先是音量。音量越大, 振动的压力越大。尽管耳朵能承受的上限因人而异, 但近距离接触超过 120 分贝的声音会立即弯曲或振破毛细胞, 从而导致永久性听力损伤。更响声音的压力甚至可以使听骨链脱位, 或耳膜破裂。另一个属性是声音的持续时间。危险的大音量几乎能对耳朵造成瞬时伤害, 不过长时间暴露于较低的声压下也会损伤毛细胞。例如, 在使用烘手机的 20 秒内, 它的噪音是安全的, 但如果连续听 8 小时, 这个相对较低的声压会过度使用静纤毛并使毛细胞的支持组织肿胀。肿胀的毛细胞无法以正确的速度和精度振动, 令听力变得模糊不清。这种听力损失被称为暂时性阈值偏移 (即听觉疲劳), 很多人一生中至少会经历一次。在安雅的例子中, 演唱会的喧闹只需 3 小时就能导致这种情况。幸运的是, 这是一种暂时的疾病, 通常会随着时间推移、肿胀消退而消失。大部分情况下, 只需避免危害性的声音就足以让毛细胞恢复。一次暂时性听阈偏移不太可能会造成永久听力损失, 但是频繁暴露在危险的声音水平会导致各种听力障碍, 例如持续嗡嗡作响的耳鸣, 或在嘈杂的环境中难以分辨他人说话。过度工作的毛细胞也会产生名为活性氧的危险分子。这些分子携带未配对电子, 驱使它们从附近细胞中偷取电子并造成内耳的永久性损伤。你可以采用很多方式预防听力损失。有关耳塞式耳机的最新研究建议, 如果一天使用耳机 90 分钟以上, 最好将音量控制于 80% 以下。降噪耳机也能帮助你降低音量收听。对你的听力有一个基本的认识对保护听力系统极为重要。和眼睛与牙齿一样, 我们的耳朵也需要年检。尽管不是所有地方都有听力学家, 但是全球相关组织正在研发便携式听力测试以及方便使用的 app, 将这些重要资源带到偏远地区。最后, 在你知道自己要长时间暴露于大音量声响时, 戴上耳塞。耳塞的有效性取决于你戴得多好, 所以请仔细阅读使用说明。不过只要正确地使用, 耳塞能确保你在未来的无数夜晚可以继续欣赏你最爱的乐队。

P25 2021-03-04 How would you finish the sentence, "Imagine if..." - Sir Ken Robinson

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=25>)

You know, there are very few things that set us apart from the rest of life on Earth. At the heart of them, I believe, is our inexhaustible power of imagination. Imagination is the ability to bring into mind, things that aren't present. With imagination, we can anticipate the future. We can revisit the past. You can step outside the present moment and try and see things as other people see them. It's through creativity that we develop our architecture, our scientific proofs, and our works of art. We don't just live in the world as we find it, we create civilizations, theories, technologies, and we reach beyond the planet. In honor of the life and work of Sir Ken Robinson, TED-Ed invites you to reimagine the aspects of life we take for granted by finishing the sentence: imagine if ... Visit ed.ted.com/ImagineIf to learn more.

P25 2021-03-04 How would you finish the sentence, "Imagine if..." - Sir Ken Robinson

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翻译人员: Yanyan Hong 校对人员: Wanting Zhong “你为自己所做的事将随你而逝…… 你为他人所做的事将永垂不

朽。”——肯·罗宾逊爵士 (Sir Ken Robinson) 与地球上的其他生命相比很少有东西让我们显得与众不同。我相信，其中最重要的，莫过于我们无尽的想象力。想象力是一种可以让不存在的事物浮现脑海的能力，有了想象力，我们可以预测未来、回首过往。可以跳出当下，尝试用他人的眼光来看待事物。正是创造力让我们得以推进建筑业发展、验证科学，以及创造艺术作品。我们不仅是生活在我们所发现的世界里，我们还创造了文明、理论、技术，我们甚至能探索太空。为纪念肯·罗宾逊爵士的生平与事业，TED-Ed 邀请你补充完整这句话：“想象一下，如果……”，让我们重新想象那些我们认为理所当然的生活的方方面面。访问 ed.ted.com/ImagineIf 了解详情。

P26 2021-03-08 Who were Las Mariposas, and why were they murdered - Lisa Krause

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=26>)

From 1930 to 1961, thousands of people were imprisoned, tortured, and murdered under Rafael Trujillo's dictatorship in the Dominican Republic. Three sisters would go on to lead an underground revolution. But while their courage inspired many, it threatened the man in power, and their lives would come to a tragic early end. Trujillo rose through the military ranks during the United States' occupation of the Dominican Republic. He assumed power in 1930 through a coup and rigged election and created a system that enriched himself and his allies. Trujillo's family alone controlled three-fifths of the country's gross domestic product, including monopolies over salt, beef, and newspapers. He renamed the country's capital after himself and expected his portrait to be displayed in every household. And he committed atrocities, including the massacre of thousands of Haitians. All the while, a secret police force maintained his power by targeting opponents at home and abroad. The Mirabal sisters grew up in a middle class family in the countryside. Their parents sent the four sisters— Patria, Dedé, Minerva, and María Teresa— to one of the country's best boarding schools. There, Minerva met a classmate whose relative was killed on Trujillo's orders. She began seeking out strong voices of opposition and discussing issues of oppression and justice with her sisters. While Dedé stayed out of politics, Minerva, Patria, and María Teresa became invested in changing their country. However, the Mirabal family's safe standing soon collapsed. In 1949, they were invited to one of Trujillo's parties, which served as his personal hunting grounds for young women. Declining the invitation was not an option. Despite Minerva's attempts to avoid him at the reception, she eventually danced with Trujillo but rejected his advances. The Mirabal family left the party early, which was seldom done and considered disrespectful to the dictator. Their father, Enrique, was imprisoned and family property was confiscated. Minerva graduated with highest honors as one of the first women in the country to receive a law degree. But she was denied state authorization to practice—a process Trujillo oversaw. While studying, Minerva met Manolo Tavárez Justo. He shared her political convictions and the two married in 1955. They watched as armed revolutions launched throughout Latin America. After Trujillo crushed an attempt to overthrow him in 1959, they began to prepare a revolution of their own. The Mirabal sisters and their husbands formed the June 14th movement along with many others from the middle class. Codenamed Las Mariposas, or the Butterflies, the three sisters organized and attended clandestine meetings and distributed pamphlets detailing Trujillo's violations. In January of 1960, they called representatives together from all over the country to establish the movement's structure and prepare an uprising. But it was not to be. Trujillo had spies everywhere. Soon, many revolutionaries, including Minerva and María Teresa, were arrested. During this time, Patria found creative ways of transmitting information to and from imprisoned rebels. Fearful of losing the support of the U.S. and the Church, which had recently begun to criticize him, Trujillo released the sisters while leaving their husbands imprisoned. But they continued to threaten his regime's stability—and his ego. On November 25th, as the three sisters were returning from visiting two of their imprisoned husbands, Trujillo's men stopped their car. The sisters, along with their driver, Rufino de la Cruz, were asphyxiated and beaten to death. The men rolled the Jeep off a hill to frame the murder as a car accident. Patria was 36, Minerva was 33, and María Teresa was 25. But Trujillo's plan to silence the Mirabal sisters and stabilize his regime backfired. Much of the public wasn't fooled by the flimsy coverup. The international community condemned the assassination. And the U.S. closed its Dominican embassy and secretly invested in the anti-Trujillo movement. Months later, former members of the Dominican military killed the dictator, bringing his violent, 31-year reign to an end. Thanks to their family, especially their surviving sister, Dedé, the legacy of the Mirabal sisters would surpass the clutches of Trujillo's tyranny even long after their deaths. Today, the Mirabal sisters are national heroes with monuments and honors commemorating their struggle. In 1999, the United Nations declared November 25th, the anniversary of their deaths, the International Day for the Elimination of Violence Against Women. Their courageous fight for justice has inspired generations.

P26 2021-03-08 Who were Las Mariposas, and why were they murdered - Lisa Krause

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=26>)

翻译人员: Frank Xu 校对人员: Helen Chang 从 1930 年到 1961 年, 有数千人被监禁、折磨还有杀害, 这些都发生在特鲁希略独裁统治下的 多米尼加共和国。三位姐妹将在这段时期中 领导一场地下革命。可是她们的勇气在启发了无数人的同时, 也威胁到了这位掌权者, 而她们的人生也将早早地以悲剧收尾。特鲁希略在美国占领多米尼加共和国时, 在军队中不断晋升。他在 1930 年时通过一次政变 以及操纵选举取得了权力, 并且创立了一套为他自己 及他盟友夺取财富的体系。单是特鲁希略一家就控制了个国家五分之三的生产总值, 其中包括对盐、牛肉 以及报纸行业的垄断。他将国家的首都以自己的名字重新命名, 还要求在每一个家庭中摆设自己的肖像。并且他还犯下了包括 屠杀数千名海地人在内的多起暴行。在这期间, 有一支秘密警察 通过针对身处本土以及国外的反对派开展行动来维持他的权力。米拉瓦尔姐妹们在乡下的 一个中产阶级家庭长大。她们的父母将四姐妹 ——帕特丽娅、狄狄、米涅尔芭 和玛丽亚特丽莎送到了全国最好的寄宿学校之一。在那里, 米涅尔芭结识了 一位亲人被特鲁希略下令杀害的同学。她开始寻找人群中强烈的反对声音并且和她的姐妹们讨论 关于压迫和正义的问题。在狄狄避开政治的同时, 米涅尔芭、帕特丽娅和玛丽亚特丽莎 对改变她们国家变得投入。然而, 米拉尔瓦家族安全的地位 很快瓦解了。在 1949 年, 他们受邀参加 特鲁希略的一场宴会, 这些实际上是他 物色年轻女子的狩猎场。拒绝邀请不是个选择。尽管米涅尔芭在迎宾时试着躲开他, 她终究还是和特鲁希略跳了支舞, 但她拒绝了他的示爱。米拉尔瓦一家提早离开了宴会, 这在当时不常发生, 且被视为 对这位独裁者的不敬。她们的父亲, 恩里克, 遭到了监禁而家族财产也被没收。米涅尔芭以最高荣誉毕业, 并成为了该国第一批 获得法律学位的女性之一。可她的从法授权被国家拒绝 ——这过程由特鲁希略亲自监督。在学习时, 米涅尔芭遇到了 玛诺鲁·塔巴雷斯·胡斯托。他和她有着相同的政治信仰, 并且两人在 1955 年结了婚。他们眼看着武装革命 在整个拉丁美洲爆发。在特鲁希略于 1959 年 镇压了一次推翻他的企图后, 两人开始准备一场他们自己的革命。米拉瓦尔三姐妹和她们的丈夫们 创立了 6 月 14 日运动, 一同参与的还有其他 许多中产阶级成员。以西语“Las Mariposas”, 或中文叫“烈焰飞蝶”作为代号三姐妹组织并参与了秘密集会, 并分发细说特鲁希略践踏国家行为的传单。在 1960 年一月, 她们召集了来自全国的代表, 以此确立运动的组织并准备一场起义。但事实并非所愿。特鲁希略到处都有间谍。很快, 很多革命家, 包括 米涅尔芭和玛丽亚特丽莎都被逮捕。在这段时间里, 帕特丽娅 找到了独特的方法, 以向狱中的反叛者发送和接受信息。害怕失去美国和教会的支持, 两者在不久前开始批判他, 特鲁希略在持续关押他们丈夫的同时 释放了两姐妹。但是两姐妹继续破坏他的统治稳定 以及他的自尊心。11 月 25 日, 在三姐妹们看望被监禁的丈夫们后 回家的路上, 特鲁希略的手下拦下了她们的车。三姐妹, 连同他们的司机 鲁非诺·德拉克鲁斯被殴打和窒息致死。手下们将吉普车推下山崖 来为这起谋杀制造意外假象。帕特丽娅时年 36 岁, 米涅尔芭 33 岁, 而玛丽亚特丽莎当时 25 岁。然而特鲁希略压制米拉尔瓦姐妹并稳固他统治的计划适得其反。大部分公众并没有被这 不足为信的假象所蒙蔽。国际社会对这次刺杀发出了谴责。而美国关闭了 在多米尼加共和国的大使馆, 并秘密为反对特鲁希略的运动 提供了支持。几个月后, 多米尼加军队的前成员杀死了这位独裁者, 结束了他 31 年的残暴统治。托她们的家人, 尤其是幸存的二姐狄狄, 米拉瓦尔姐妹的遗赠 才能胜过特鲁希略暴政的魔爪, 甚至在她们死后远远流传。今天, 米拉瓦尔姐妹们是国家英雄, 人们用纪念碑和赞誉纪念她们的奋斗。在 1999 年, 联合国宣布将 11 月 25 日, 她们的逝世纪念日, 作为世界消除对妇女暴力日。她们为正义的勇敢斗争启发了几代人。

P27 2021-03-09 How much electricity does it take to power the world

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=27>)

You flip a switch. Coal burns in a furnace, which turns water into steam. That steam spins a turbine, which activates a generator, which pushes electrons through the wire. This current propagates through hundreds of miles of electric cables and arrives at your home. All around the world, countless people are doing this every second— flipping a switch, plugging in, pressing an “on” button. So how much electricity does humanity need? The amount we collectively use is changing fast, so to answer this question, we need to know not just how much the world uses today, but how much we’ll use in the future. The first step is understanding how we measure electricity. It’s a little bit tricky. A joule is a unit of energy, but we usually don’t measure electricity in just joules. Instead, we measure it in watts. Watts tell us how much energy, per second, it takes to power something. One joule per second equals one watt. It takes about .1 watts to power a smart phone, a thousand to power your

house, a million for a small town, and a billion for a mid-size city. As of 2020, it takes 3 trillion watts to power the entire world. But almost a billion people don't have access to reliable electricity. As countries become more industrialized and more people join the grid, electricity demand is expected to increase about 80% by 2050. That number isn't the complete picture. We'll also have to use electricity in completely new ways. Right now, we power a lot of things by burning fossil fuels, emitting an unsustainable amount of greenhouse gases that contribute to global warming. We'll have to eliminate these emissions entirely to ensure a sustainable future for humanity. The first step to doing so, for many industries, is to switch from fossil fuels to electric power. We'll need to electrify cars, switch buildings heated by natural gas furnaces to electric heat pumps, and electrify the huge amount of heat used in industrial processes. So all told, global electricity needs could triple by 2050. We'll also need all that electricity to come from clean energy sources if it's going to solve the problems caused by fossil fuels. Today, only one third of the electricity we generate comes from clean sources. Fossil fuels are cheap and convenient, easy to ship, and easy to turn into electricity on demand. So how can we close the gap? Wind and solar power work great for places with lots of wind and sunshine, but we can't store and ship sunlight or wind the way we can transport oil. To make full use of energy from these sources at other times or in other places, we'd have to store it in batteries and improve our power grid infrastructure to transport it long distances. Meanwhile, nuclear power plants use nuclear fission to generate carbon-free electricity. Though still more expensive than plants that burn fossil fuels, they can be built anywhere and don't depend on intermittent energy sources like the sun or wind. Researchers are currently working to improve nuclear waste disposal and the safety of nuclear plants. There's another possibility we've been trying to crack since the 1940s: nuclear fusion. It involves smashing light atoms together, so they fuse, and harnessing the energy this releases. Accidents aren't a concern with nuclear fusion, and it doesn't produce the long-lived radioactive waste fission does. It also doesn't have the transport concerns associated with wind, solar, and other renewable energy sources. A major breakthrough here could revolutionize clean energy. The same is true of nuclear fission, solar, and wind. Breakthroughs in any of these technologies, and especially in all of them together, can change the world: not only helping us triple our electricity supply, but enabling us to sustain it.

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翻译人员: Gia Hwang 校对人员: Carol Wang 你拨动开关, 炉中燃烧的煤将水变成蒸汽, 蒸汽推动涡轮并带动发动机, 推动电子通过导线形成电流。电流通过数百英里电缆的传送, 并到达你家。全球每一秒都有无数人在做这件事——拨动开关, 插电并按下“开”按钮, 那么人类需要多少电力呢? 我们共同使用的电量正快速变化, 所以要回答这个问题, 我们不仅需要知道 目前全球用电多少, 还要知道将来会使用多少。第一步是了解我们如何测量电力, 这有点棘手。焦耳是能量单位, 但通常不只用焦耳来衡量电, 而是用瓦特来衡量它。瓦特是某物每秒所需电量, $1 \text{ 焦耳} / \text{秒} = 1 \text{ 瓦特}$ 。智能手机供电大约需要 0.1 瓦, 你的房子供电需 1 千瓦, 小镇供电需要 100 万瓦, 一个中等城市需要 10 亿瓦。到 2020 年, 全球 需要 3 万亿瓦供电, 但近 10 亿人无法 获得可靠的电力。随着国家越来越工业化, 越来越多的人加入电网, 预计到 2050 年 电力需求将增加约 80%。这个数据并不完整, 我们还必须以全新方式使用电力。现在, 我们通过燃烧化石燃料 为很多东西提供动力, 排放不可持续的温室气体, 导致全球变暖。我们必须完全消除这些排放, 以确保人类的可持续未来。对于许多行业来说, 实现目标的第一步 是由化石燃料转向电力。我们需要汽车电气化、将天然气炉供热的建筑 转换为使用电热泵, 并用电来满足工业过程中 使用的大量热量。总而言之, 到 2050 年, 全球电力需求可能增加 2 倍。若要解决化石燃料引起的问题, 所有电力都必须来自清洁能源。今天, 我们的电力中 只有 1/3 来自清洁能源。化石燃料便宜又方便, 易于运输, 并且很容易按需转化为电能。那么如何弥补差距呢? 风能和太阳能非常适合 风和阳光充足的地方, 但无法像运输石油那样 储存和运输阳光或风力。为了在其他时间或其他地方 充分利用这些来源的能源, 我们必须把它储存在电池里, 并改善我们的电网基础设施, 以实现长距离传输。同时, 核电站利用核裂变产生无碳电力。虽然仍比燃烧化石燃料的电厂昂贵, 但它们可以建在任何地方, 并且不需依赖像太阳 或风这样的间歇性能源。研究人员正努力改善核废料处理以及核电站的安全。自 20 世纪 40 年代起, 我们一直试图破解另一种可能性: 核聚变。原理是让轻原子相撞后融合在一起, 然后利用融合释放的能量。核聚变无事故之忧, 也不会像核裂变那样 产生长寿命放射性废物; 它也没有运输难题, 不像风能、太阳能 及其他可再生能源那样。这方面的重大突破 可能会彻底改变清洁能源, 核裂变、太阳能和风能也是如此。任何这些技术的突破, 尤其是所有这些方面的突破, 就能改变世界: 不仅帮我们实现 3 倍电力供应, 而且使我们能维持下去。

P28 2021-03-11 How does artificial intelligence learn - Briana Brownell

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=28>)

Today, artificial intelligence helps doctors diagnose patients, pilots fly commercial aircraft, and city planners predict traffic. But no matter what these AIs are doing, the computer scientists who designed them likely don't know exactly how they're doing it. This is because artificial intelligence is often self-taught, working off a simple set of instructions to create a unique array of rules and strategies. So how exactly does a machine learn? There are many different ways to build self-teaching programs. But they all rely on the three basic types of machine learning: unsupervised learning, supervised learning, and reinforcement learning. To see these in action, let's imagine researchers are trying to pull information from a set of medical data containing thousands of patient profiles. First up, unsupervised learning. This approach would be ideal for analyzing all the profiles to find general similarities and useful patterns. Maybe certain patients have similar disease presentations, or perhaps a treatment produces specific sets of side effects. This broad pattern-seeking approach can be used to identify similarities between patient profiles and find emerging patterns, all without human guidance. But let's imagine doctors are looking for something more specific. These physicians want to create an algorithm for diagnosing a particular condition. They begin by collecting two sets of data— medical images and test results from both healthy patients and those diagnosed with the condition. Then, they input this data into a program designed to identify features shared by the sick patients but not the healthy patients. Based on how frequently it sees certain features, the program will assign values to those features' diagnostic significance, generating an algorithm for diagnosing future patients. However, unlike unsupervised learning, doctors and computer scientists have an active role in what happens next. Doctors will make the final diagnosis and check the accuracy of the algorithm's prediction. Then computer scientists can use the updated datasets to adjust the program's parameters and improve its accuracy. This hands-on approach is called supervised learning. Now, let's say these doctors want to design another algorithm to recommend treatment plans. Since these plans will be implemented in stages, and they may change depending on each individual's response to treatments, the doctors decide to use reinforcement learning. This program uses an iterative approach to gather feedback about which medications, dosages and treatments are most effective. Then, it compares that data against each patient's profile to create their unique, optimal treatment plan. As the treatments progress and the program receives more feedback, it can constantly update the plan for each patient. None of these three techniques are inherently smarter than any other. While some require more or less human intervention, they all have their own strengths and weaknesses which makes them best suited for certain tasks. However, by using them together, researchers can build complex AI systems, where individual programs can supervise and teach each other. For example, when our unsupervised learning program finds groups of patients that are similar, it could send that data to a connected supervised learning program. That program could then incorporate this information into its predictions. Or perhaps dozens of reinforcement learning programs might simulate potential patient outcomes to collect feedback about different treatment plans. There are numerous ways to create these machine-learning systems, and perhaps the most promising models are those that mimic the relationship between neurons in the brain. These artificial neural networks can use millions of connections to tackle difficult tasks like image recognition, speech recognition, and even language translation. However, the more self-directed these models become, the harder it is for computer scientists to determine how these self-taught algorithms arrive at their solution. Researchers are already looking at ways to make machine learning more transparent. But as AI becomes more involved in our everyday lives, these enigmatic decisions have increasingly large impacts on our work, health, and safety. So as machines continue learning to investigate, negotiate and communicate, we must also consider how to teach them to operate ethically.

P28 2021-03-11 How does artificial intelligence learn - Briana Brownell

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=28>)

翻译人员: Yuwei Wu 校对人员: Helen Chang 如今的人工智能 可以帮助医生诊断病人, 飞行员驾驶商业飞机, 城市规划员预测交通。但不论人工智能如何运作设计它们计算机科学家 却可能不知道其具体运作方法。这是因为人工智能常有自学能力, 它们会根据设定好的程序指令创造一套独特的规则和策略。那么机器到底是如何自主学习的? 创建自学程序的方法有很多种。但它们都依赖三种基础机器学习方法: 无监督学习、监督学习, 和强化学习。来看

看它们的真实运作情况，先想象一下，研究员正尝试从一组包含了几千名患者的医疗资料中提取信息。首先，是无监督学习。此方法适用于通过分析所有资料来获取大体的相似性和有用的模式。也许某些患者有类似的疾病表现，抑或治疗会产生特定的副作用。这种广泛的模式寻找方法可以用来识别患者档案之间的相似之处，并发现新出现的模式，所有这些都无需人类的指导。但让我们想象一下医生在寻找更具体的东西。这些医生想要创建一种算法来诊断特定的疾病。他们首先收集两组数据：健康患者和确诊患者的医学图像和测试结果。然后，他们将这些数据输入一个程序，该程序旨在识别患病患者而非健康患者共有的特征。根据看到某些特征的频率，该程序将对这些特征的诊断意义赋值，生成一种用于诊断未来患者的算法。然而，与无监督学习不同的是，医生和计算机科学家在接下来发生的事情中扮演着重要的角色。医生将做出最终诊断，并检查算法预测的准确性。然后，计算机科学家可以使用更新的数据集来调整程序的参数，并提高其准确性。这种亲身实践的方法被称为监督学习。现在，假设这些医生想设计另一种算法来推荐治疗方案。由于这些计划将分阶段实施，并可能根据每个人对治疗的反应而改变，医生决定使用强化学习。这个程序使用一种迭代的方法来收集关于哪种药物、关于哪种药物、剂量和治疗最有效的反馈。然后，它将这些数据与每个患者的档案进行比较，以创建他们独特的、最佳的治疗方案。随着治疗的进展和程序收到更多的反馈，它可以不断更新每个患者的计划。这三种技术中没有哪一种天生就比其他的更聪明。虽然有些需要或多或少的人工干预，但它们都有自己的优缺点，这使它们最适合某些任务。然而，通过将它们一起使用，研究人员可以构建复杂的人工智能系统，其中单个程序可以相互监督和指导。例如，当我们的非监督学习程序发现相似的患者群体时，它可以将这些数据发送到连接的监督学习程序。然后该程序将这些信息纳入其预测。或者，数十个强化学习项目可能会模拟潜在的患者结果，以收集关于不同治疗计划的反馈。有许多方法可以创建这些机器学习系统，而最有希望的模型可能是那些模拟大脑神经元之间关系的模型。这些人工神经网络可以使用数百万个连接来处理图像识别、语音识别甚至语言翻译等困难任务。然而，这些模型越自我指导，计算机科学家就越难确定这些自学的算法是如何得到它们的解决方案的。研究人员已经在寻找让机器学习更透明的方法。但随着人工智能越来越多地参与到我们的日常生活中，这些神秘的决定对我们的工作、健康和安全产生越来越大的影响。因此，在机器继续学习调查、谈判和沟通的同时，我们也必须考虑如何教它们彼此如何合乎道德地操作。

P29 2021-03-15 The incredible, bendable, twistable, expandable elephant trunk - Chas

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=29>)

As a breeze blows through the savannah, a snake-shaped tube stretches into the air and scans the horizon like a periscope. But it's not seeing— it's sniffing for odors like the scent of a watering hole or the musk of a dangerous predator. The trunk's owner is a young African elephant. At only 8 years old, she still has a lot to learn about her home. Fortunately, she's not alone. Elephants are extremely social creatures, with females living in tight-knit herds led by a single matriarch. And every member of the group has one of the most versatile tools in the savannah to help them get by. Today her herd is looking for water. Or, more accurately, smelling for water. Elephants have more genes devoted to smell than any other creature, making them the best sniffers in the animal kingdom. Even at our elephant's young age, her trunk is already 1.5 meters long and contains five times as many olfactory receptors as a human nose, allowing her to smell standing water several kilometers away. And now, the matriarch uses her own keen sense of smell to plot the herd's course. Their journey is long, so our elephant keeps her energy up by snacking on the occasional patch of thick grass. But this light lunch isn't just about staying fed— she's also looking for clues. Like many other mammals, vents in the roof of an elephant's mouth lead directly to the vomeronasal organ. This structure can detect chemical signals left by other elephants. So as the herd forages, they're also gathering information about what other herds have come this way. All the while, the group's adults are on the lookout for signs of other animals, including potential threats. Fortunately, while lions might attack a young or sickly elephant, few are foolish enough to take on a healthy adult. Weighing 3 tons and bearing powerful tusks nearly a meter long, our elephant's mother is a force to be reckoned with. Her dexterous trunk doubles as a powerful, flexible arm. Containing no bones and an estimated 40,000 muscles, these agile appendages can bend, twist, contract, and expand. At 8 years old, our elephant's trunk is already strong enough to move small fallen trees, while finger-like extensions allow for delicate maneuvers like wiping her eye. She can even grab a nearby branch, break it to just the right length, and wave off pesky insects. Suddenly, the matriarch stops their march and sniffs the air. Using smell alone, elephants can recognize each member of their herd, and their exceptional memories can retain the smells of elephants outside their herd as well. It's one of these old but familiar odors that's caught the matriarch's attention. She bellows into the air, sending out a sound wave that rings across the savannah. But it travels even further through

the earth as infrasonic rumbles. Elephants up to 10 kilometers away can receive these rumbles with their feet. If the matriarch's nose is right, her herd should expect a response. Smelling the secretions from her daughter's temporal glands, our elephant's mother can sense her daughter's unease about this unfamiliar encounter. As the herd of unknown elephants approaches, trunks from both herds rise into the air, sounding trumpets of alarm. But upon recognition, apprehension quickly gives way to happy rumbles. Members from each herd recognize each other despite time apart, and many investigate each other's mouths with their trunks to smell what their counterparts have been eating. With the reunion now in full swing, both herds head toward their final destination: the long-awaited watering hole. Here, older elephants suck up to 8 liters of water into their trunks before spraying the contents on themselves to cool off. Meanwhile, our young elephant plays in the mud with her peers, digging into the muck and even using her trunk as a snorkel to breathe while submerged. The pair of matriarchs look contentedly on their herds, before turning their trunks to the horizon once more.

P29 2021-03-15 The incredible, bendable, twistable, expandable elephant trunk - Chas

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=29>)

翻译人员: Zizhuo Liang 校对人员: Jiasi Hao 当微风吹过稀树大草原, 一根蛇形的管子伸向空中, 如潜望镜般扫描着地平线。但它并不是在看——而是在嗅诸如水坑或是 危险捕食者携带的麝香的气味。这象鼻的主人 是一头年轻的非洲象。年仅八岁的她, 关于她的家, 还有很多要学。幸运的是, 学习路上并不只有她一头象。大象是社会性极强的动物, 雌象生活在由一个女首领领导的 关系紧密的象群中。这个象群的每个成员都有一个在大草原生存的通用的工具来帮助她们度过难关。今天雌象首领的象群正在寻找水源。或者, 更准确地说, 用嗅觉寻找水源。大象拥有比其它任何生物 都要多嗅觉基因, 这让它们成为 动物王国中最好的嗅探者。即使是年幼的大象, 她的鼻子就已有 1.5 米长, 并且其嗅觉感受器的数量 是人类鼻子的五倍, 这让她能够嗅到几公里外的水源。现在, 雌象首领用她自己敏锐的嗅觉 来绘制象群的路线。她们要走的路途很长, 所以大象们在偶尔途径茂密草地时会吃草来保持充沛的精力。不过, 这顿清淡的午餐 不仅仅是为了吃饱——她还以此寻找线索。与许多其它的哺乳动物一样, 大象口腔上颚的开口会直接 通向犁鼻器。这一结构使其能探测到 其它大象留下的化学信号。所以在象群觅食的同时, 她们也在收集其它路过此处象群的信息。与此同时, 象群的成年象会观察 其它动物的迹象, 包括潜在的威胁。幸运的是, 虽然狮子可能会攻击 一头年幼或病弱的大象, 但很少有狮子会愚蠢到 攻击一头健康的成年大象。重达 3 吨, 长着将近 1 米长且有力的象牙, 大象妈妈 是一股不容小觑的力量。她灵巧敏捷的象鼻 可兼作强壮而灵活的手臂。象鼻虽不含骨骼 却有大约 4 万块肌肉, 这些敏捷的附器 可以弯曲、扭转、收缩和扩张。在 8 岁时, 大象的象鼻就已强壮到可以搬运倒下的小树。而象鼻末端的指状突 可做精细动作, 如擦拭她的眼睛。她甚至可以抓住身边的一根树枝, 把它折断至合适的长度, 然后用它挥赶讨厌的昆虫。突然, 雌象首领停下脚步, 嗅了嗅空气。仅凭嗅觉, 大象就可以辨认出 自己象群中的每一个成员, 而且它们非凡的记忆力 可以让它们记住不属于这个象群的其它大象的气味。正是这种似曾相识的气味 引起了雌象首领的注意。她向空中咆哮, 发出响彻整个大草原的声浪。但她发出的次声波隆隆声 可以在陆地上传得更远。10 公里外的大象 可以用脚接收到隆隆声。如果首领鼻子的判断正确, 她的象群应该期待获得回应。大象母亲 闻着她女儿腺体的分泌物, 能感觉到她女儿对这一陌生遭遇的不安。当一群陌生的大象接近时, 两群大象的象鼻都升到了空中, 发出警报的号角。但经过辨认, 先前的忐忑 很快被快乐的隆隆声所取代。两个象群的成员虽然长久未见, 但还是能认出对方, 许多象用鼻子 互相探查对方的嘴巴, 嗅嗅对方吃了什么。团圆如火如荼进行的同时, 两个象群朝着最终目的地前进: 那期待已久的水坑。水坑边, 年长的大象将多达 8 升水吸入象鼻, 随后把水喷洒在自己身上 用来降温。与此同时, 小象和同伴们 一起在泥泞中玩耍, 挖泥巴, 甚至用鼻子作为通气管以便在潜入泥巴时呼吸。两个雌象首领 心满意足地看着她们的象群, 然后再一次, 将她们的象鼻转向地平线。

P30 2021-03-16 How much land does it take to power the world

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=30>)

No matter how we make electricity, it takes up space. Electricity from coal requires mines, and plants to burn it and convert the heat into electricity. Nuclear power takes uranium mines, facilities to refine the uranium, a reactor, and a place to store the spent fuel safely. Renewable energy needs wind turbines or solar panels. How much space depends on the power source. Say you wanted to power a 10-watt light bulb with fossil fuels like coal. Fossil fuels can produce up to 2,000 watts per square

meter, so it would only take a credit card-sized chunk of land to power the light bulb. With nuclear power, you might only need an area about the size of the palms of your hands. With solar power, you'd need at least 0.3 square meters of land—twice the size of a cafeteria tray. Wind power would take roughly 7 square meters—about half the size of a parking space—to power the bulb. When you consider the space needed to power cities, countries, and the whole world, it adds up fast. Today, the world uses 3 trillion watts of electricity. To power the entire world with only fossil fuels, you'd need at least about 1,200 square kilometers of space—roughly the area of Grand Bahama island. With nuclear energy, you'd need almost four times as much space at a minimum—roughly 4,000 square kilometers, a little less than the area of Delaware. With solar, you'd need at least 95,000 square kilometers, approximately the area of South Korea. With wind power, you'd need two million—about the area of Mexico. For each power source, there's variability in how much power it can generate per square meter, but these numbers give us a general sense of the space needed. Of course, building energy infrastructure in a desert, a rainforest, a town, or even in the ocean are completely different prospects. And energy sources monopolize the space they occupy to very different extents. Take wind power. Wind turbines need to be spread out—sometimes half a kilometer apart—so that the turbulence from one turbine doesn't reduce the efficiency of the others. So, much of the land needed to generate wind power is still available for other uses. But the baseline amount of space still matters, because cities and other densely populated areas have high electricity demands, and space near them is often limited. Our current power infrastructure works best when electricity is generated where and when it's needed, rather than being stored or sent across long distances. Still, space demands are only part of the equation. As of 2020, 2/3 of our electricity comes from fossil fuels. Every year, electricity generation is responsible for about 27% of the more than 50 billion tons of greenhouse gases we add to the atmosphere, accelerating climate change and all its harms. So although fossil fuels require the least space of our existing technologies, we can't continue to rely on them. Cost is another consideration. Nuclear plants don't emit greenhouse gases and don't require much space, but they're way more expensive to build than solar panels or wind turbines, and have waste to deal with. Renewables have almost no marginal costs—unlike with plants powered by fossil fuels, you don't need to keep purchasing fuel to generate electricity. But you do need lots of wind and sunlight, which are more available in some places than others. No single approach will be the best option to power the entire world while eliminating harmful greenhouse gas emissions. For some places, nuclear power might be the best option for replacing fossil fuels. Others, like the U.S., have the natural resources to get most or all of their electricity from renewables. And across the board, we should be working to make our power sources better: safer in the case of nuclear, and easier to store and transport in the case of renewables.

P30 2021-03-16 How much land does it take to power the world

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=30>)

翻译人员: Gia Hwang 校对人员: Carol Wang 无论我们如何发电, 它都会占用空间。煤炭发电需要矿山和燃煤工厂, 并将热量转化为电能; 核电需要铀矿、提炼铀的设施、反应堆和安全储存乏核燃料的地方; 可再生能源需要风力涡轮机 或太阳能电池板; 所需空间大小取决于能源。假设你想用煤等化石燃料 为一个 10 瓦灯泡供电, 化石燃料每平方米可产生 高达 2,000 瓦的电力, 所以, 信用卡大小的土地 就可以为灯泡供电; 要是用核电的话, 可能只需手掌的大小区域即可。若使用太阳能, 则至少需要 0.3 平方米的土地——大小是自助餐厅托盘的两倍; 风力发电大约需要 7 平方米才能为灯泡供电——大约半个停车位的大小。当考虑为城市、国家 和全球供电所需空间时, 数量增加很快。当今世界使用的电力为 3 万亿瓦, 用化石燃料为全球供电的话, 至少需要大约 1,200 平方公里的地方——大约是大巴哈马岛的面积; 若用核能供电, 至少需要几乎四倍的空间——即大约 4,000 平方公里, 比特拉华州的面积略小; 使用太阳能, 则至少 需要 95,000 平方公里, 大约与韩国面积相当; 风力发电则需两百万平方公里——大约是墨西哥的面积。针对不同的能源, 其每平方米产生的电力不同, 但这些数字让我们对所需空间 有一个大致的了解。当然, 在沙漠、热带雨林、城镇、 甚至在海洋建设能源基础设施, 其前景也完全不同, 发电方式在不同程度上 决定了其占据空间的大小。以风力发电为例, 风力涡轮机需要分散开——有时相距半公里——以免一台涡轮机的湍流降低其它涡轮机的效率。这样风力发电 所需的大部分土地仍可用于其他用途。但所需空间的基线量仍然很重要, 因为城市和其他人口 稠密地区电力需求很高, 而且其附近空间通常很有限。在电力需求地按需发电, 而非长距离存储或发送时, 目前的电力基础设施效果最好。尽管如此, 空间需求 只是等式的一部分。截至 2020 年, 我们 2/3 的电力来自化石燃料, 每年, 我们向大气排放 500 多亿吨温室气体, 其中约 27%是发电产生的, 加剧了气候变化及其危害。因此, 尽管化石燃料 对现有技术的需求最小, 但我们不能继续依赖它们。成本是另一个考虑因

素。核电站不排放温室气体，也不需要太多空间，但其建造成本远高于太阳能电池板或风力涡轮机，并且还要处理核废料。可再生能源几乎没有边际成本——和化石燃料发电厂不同，无需持续购买燃料来发电，但确实需要大量的风和阳光，某些地方比其他地方更易获得这些资源。在消除有害温室气体排放的同时，没有哪个单一发电方式是为全球提供能源的最佳选择。在某些地方，核电可能是替代化石燃料的最佳选择；其他国家，如美国，拥有从可再生能源中获取大部分或全部电力的自然资源。全面而言，我们应该努力使我们的能源更好：让核电更安全、让可再生能源更容易储存和运输。

P31 2021-03-18 How do antidepressants work - Neil R. Jeyasingam

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=31>)

In the 1950s, the discovery of two new drugs sparked what would become a multibillion dollar market for antidepressants. Neither drug was intended to treat depression at all—in fact, at the time, many doctors and scientists believed psychotherapy was the only approach to treating depression. The decades-long journey of discovery that followed revolutionized our understanding of depression—and raised questions we hadn't considered before. One of those first two antidepressant drugs was ipronazid, which was intended to treat tuberculosis. In a 1952 trial, it not only treated tuberculosis, it also improved the moods of patients who had previously been diagnosed with depression. In 1956, a Swiss clinician observed a similar effect when running a trial for imipramine, a drug for allergic reactions. Both drugs affected a class of neurotransmitters called monoamines. The discovery of these antidepressant drugs gave rise to the chemical imbalance theory, the idea that depression is caused by having insufficient monoamines in the brain's synapses. Ipronaizid, imipramine, and other drugs like them were thought to restore that balance by increasing the availability of monoamines in the brain. These drugs targeted several different monoamines, each of which acted on a wide range of receptors in the brain. This often meant a lot of side effects, including headaches, grogginess, and cognitive impairments including difficulty with memory, thinking, and judgment. Hoping to make the drugs more targeted and reduce side effects, scientists began studying existing antidepressants to figure out which specific monoamines were most associated with improvements in depression. In the 1970s, several different researchers converged on an answer: the most effective antidepressants all seemed to act on one monoamine called serotonin. This discovery led to the production of fluoxetine, or Prozac, in 1988. It was the first of a new class of drugs called Selective Serotonin Reuptake Inhibitors, or SSRIs, which block the reabsorption of serotonin, leaving more available in the brain. Prozac worked well and had fewer side effects than older, less targeted antidepressants. The makers of Prozac also worked to market the drug by raising awareness of the dangers of depression to both the public and the medical community. More people came to see depression as a disease caused by mechanisms beyond an individual's control, which reduced the culture of blame and stigmatization surrounding depression, and more people sought help. In the 1990s, the number of people being treated for depression skyrocketed. Psychotherapy and other treatments fell by the wayside, and most people were treated solely with antidepressant drugs. Since then, we've developed a more nuanced view of how to treat depression—and of what causes it. Not everyone with depression responds to SSRIs like Prozac—some respond better to drugs that act on other neurotransmitters, or don't respond to medication at all. For many, a combination of psychotherapy and antidepressant drugs is more effective than either alone. We're also not sure why antidepressants work the way they do: they change monoamine levels within a few hours of taking the medication, but patients usually don't feel the benefit until weeks later. And after they stop taking antidepressants, some patients never experience depression again, while others relapse. We now recognize that we don't know what causes depression, or why anti-depressants work. The chemical imbalance theory is at best an incomplete explanation. It can't be a coincidence that almost all the antidepressants happen to act on serotonin, but that doesn't mean serotonin deficiency is the cause of depression. If that sounds odd, consider a more straightforward example: steroid creams can treat rashes caused by poison ivy—the fact that they work doesn't mean steroid deficiency was the cause of the rash. We still have a ways to go in terms of understanding this disease. Fortunately, in the meantime, we have effective tools to treat it.

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[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=31>)

翻译人员: Wanting Zhong 校对人员: Yanyan Hong 在 20 世纪 50 年代，两种新药的发现激发了日后价值数十亿美

元的抗抑郁药市场。原来这两种药根本没有打算用来治疗抑郁症——事实上，当时许多医生和科学家都相信心理治疗是医治抑郁症的唯一方法。随后长达数十年的探索之旅彻底改变了我们对抑郁症的理解——并提出了我们未曾思考过的问题。异烟酰异丙肼（Iproniazid）是最早的两种抗抑郁药之一，最初打算用来治疗结核病。在 1952 年的一次试验中，它不仅治好了结核病，还改善了抑郁症患者的情绪。1956 年，一名瑞士临床医生在对一种过敏药 丙咪嗪（imipramine）进行试验时发现了类似的效果。这两种药物都能影响一种叫做单胺类的神经递质。这些抗抑郁药物的发现催生了“化学物不平衡理论”，认为抑郁症是由于大脑的突触里缺乏足够的单胺类递质而造成的。异烟酰异丙肼、丙咪嗪和其它类似药物能通过增加大脑内单胺类递质的供应而恢复这个平衡。这些药物能针对几种不同的单胺类递质，每种递质都能广泛作用于大脑里的各种受体。这通常意味着很多副作用，包括头痛、头晕，以及记忆、思考和判断困难等认知障碍。为了让药物更具针对性、减少副作用，科学家们开始研究现有的抗抑郁药，想要找出哪些特定的单胺类递质和抑郁症的改善最为密切相关。在 20 世纪 70 年代，几位研究者得出了一致的答案：最有效的抗抑郁药物似乎都作用于一种叫做血清素的单胺类递质。这一发现使得氟西汀，即百忧解，于 1988 年问世。它是一类新药中的第一个——这类药物叫做选择性血清素再摄取抑制剂（SSRI），能阻止对血清素的再摄取，从而增加大脑中的血清素储备。百忧解效果很好，副作用也少于更早的、针对性更弱的抗抑郁药。为了推销这种药，百忧解的生产商也致力于提升公众和医疗群体对抑郁症危害的意识。更多人开始将抑郁症视为一种疾病，其发病机制不受个人控制，从而减少了围绕抑郁症的责备与污名化，也让越来越多人去寻求帮助。20 世纪 90 年代，接受抑郁症治疗的人数迅速飞升。心理治疗和其它疗法纷纷旁落，大多数人只使用抗抑郁药物进行治疗。从那之后，我们对抑郁症疗法和抑郁症成因的看法变得更加慎重细致。百忧解等 SSRI 药物并不是对每一位抑郁症患者都有效果——作用于其他神经递质的药物对有些人效果更好，有些人甚至任何药物都对他们无效。对于很多人来说，心理治疗和抗抑郁药相结合比单独使用一种疗法更为有效。我们也不清楚抗抑郁药为何如此作用：它们在服药后几小时内就能改变单胺类浓度，但患者通常要等到几个星期后才能感受到效益。而在他们停止服用抗抑郁药后，有的患者再也不会经历抑郁症，而有人却会复发。我们现在认识到，我们不知道抑郁症的成因，也不知道抗抑郁药的原理。化学物不平衡理论最多是一个不完整的解释。几乎所有抗抑郁药都恰好作用于血清素，这不可能是巧合，但也不意味着缺乏血清素就是抑郁症的成因。如果这听起来很奇怪，那就想象一个更直接的例子：类固醇软膏可用于治疗毒漆藤引起的皮疹——但类固醇有效的事实并不代表类固醇缺乏是皮疹的原因。在理解抑郁症这一方面，我们还有很长的路要走。所幸的是，在此期间，我们有治疗它的有效工具。

P32 2021-03-22 What's the best fuel for your car

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=32>)

Historically, most cars have run on gasoline, but that doesn't have to be the case in the future: other liquid fuels and electricity can also power cars. So what are the differences between these options? And which one's best? Gasoline is refined from crude oil, a fossil fuel extracted from deep underground. The energy in gasoline comes from a class of molecules called hydrocarbons. There are hundreds of different hydrocarbons in crude oil, and different ones are used to make gasoline and diesel— which is why you can't use them interchangeably. Fuels derived from crude oil are extremely energy dense, bringing a lot of bang for your buck. Unfortunately, they have many drawbacks. Oil spills cause environmental damage and cost billions of dollars to clean up. Air pollution from burning fossil fuels like these kills 4.5 million people each year. And transportation accounts for 16% of global greenhouse gas emissions, almost half of which comes from passenger cars burning fossil fuels. These emissions warm the planet and make weather more extreme. In the U.S. alone, storms caused by climate change caused \$500 billion of damage in the last five years. So while gas is efficient, something so destructive can't be the best fuel. The most common alternative is electricity. Electric cars use a battery pack and electric motor instead of the internal combustion engine found in gas-powered cars, and must be charged at charging stations. With the right power infrastructure, they can be as efficient as gas-powered cars. If powered by electricity generated without fossil fuels, they can avoid greenhouse gas emissions entirely. They're more expensive than gas-powered cars, but the cost difference has been shrinking rapidly since 2010. The other alternatives to gasoline are other liquid fuels. Many of these can be shipped and stored using the same infrastructure as gasoline, and used in the same cars. They can also be carbon-neutral if they're made using carbon dioxide from the atmosphere— meaning when we burn them, we release that same carbon dioxide back into the air, and don't add to overall emissions. One approach to carbon-neutral fuel is to capture carbon dioxide from the atmosphere and combine its carbon with the hydrogen in water. This creates hydrocarbons, the source of energy in fossil fuels— but without any emissions

if the fuels are made using clean electricity. These fuels take up more space than an energetically equivalent amount of gasoline—an obstacle to using them in cars. Another approach is to make carbon-neutral fuels from plants, which sequester carbon from the air through photosynthesis. But growing the plants also has to be carbon neutral—which rules out many crops that require fertilizer, a big contributor to greenhouse gas emissions. So the next generation of these fuels must be made from either plant waste or plants that don't require fertilizer to grow. Biofuels can be about as efficient as gasoline, though not all are. For a fuel to be the best option, people have to be able to afford it. Unfortunately, the high upfront costs of implementing new technologies and heavy subsidies for the producers of fossil fuels, mean that almost every green technology is more expensive than its fossil-fuel-based cousin. This cost difference is known as a green premium. Governments have already started subsidizing electric vehicles to help make up the difference. In some places, depending on the costs of electricity and gas, electric cars can already be cheaper overall, despite the higher cost of the car. The other alternatives are trickier, for now—zero-carbon liquid fuels can be double the price of gasoline or more. Innovators are doing everything they can to bring green premiums down, because in the end, the best fuel will be both affordable for consumers and sustainable for our planet.

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翻译人员: Gia Hwang 校对人员: Carol Wang 纵观历史, 多数汽车都使用汽油, 但将来不一定如此: 其他液体燃料和电力 也能为汽车提供动力。那么, 这些选项有何区别呢? 哪个最好? 汽油是从原油中提炼出来的, 原油是从地下深处抽取的化石燃料。汽油的能量来自一类 叫做碳氢化合物的分子。原油中有数百种不同的碳氢化合物, 汽油和柴油是由不同 碳氢化合物生产的——这正是它们不能互换使用的原因。原油提炼的燃料能量密度极高, 为你带来超值的好处。不幸的是, 它们也有很多缺点。石油泄漏造成环境破坏, 清理费用达数十亿美元; 燃烧这种化石燃料造成的空气污染每年杀死 450 万人。交通运输占全球 温室气体排放量的 16%, 其中几乎一半来自 燃烧化石燃料的乘用车。这些排放物令地球变暖、使天气更加极端。过去五年因气候变化 导致的恶劣天气里, 仅在美国就造成了 5,000 亿美元的损失。因此, 虽然天然气是高效的, 但具有如此破坏性的燃料 不可能是最好的, 最常见的替代方案是电力。电动汽车使用电池组和电机, 而非汽油动力汽车的内燃机, 并且必须在充电站充电。有了合适的电力基础设施, 它们能像汽油动力汽车一样高效。若用非化石燃料电力提供动力, 它们可以完全避免温室气体排放。它们比汽油动力汽车更贵, 但自 2010 年以来, 成本差异一直在迅速缩小。汽油的其它替代品是其它液体燃料, 其中许多可以用与汽油相同的 基础设施运输和储存, 并用于相同的汽车。若用大气中的二氧化碳发电, 也可以是碳中和的——即当我们燃烧它们时, 同样的二氧化碳又释放回空气中, 并不增加总排放量。生产碳中和燃料的一种方法 是从大气中捕获二氧化碳, 再将其中的碳与水中的氢结合, 从而产生碳氢化合物, 即化石燃料的能源——但不产生排放, 前提是 使用清洁电力生产燃料。与能量相当的汽油相比, 这些燃料占用更多空间——这成为在汽车中使用的障碍。另一种是用植物制造碳中和燃料, 通过光合作用从空气中吸收碳。但是植物种植也必须是碳中和——这排除了许多需要施肥的作物, 肥料是温室气体排放的一大贡献者。所以, 下一代燃料必须用植物废料 或不用肥料即可生长的植物。生物燃料的效率与汽油差不多, 但并非全部如此。要使燃料成为最佳选择, 人们必须负担得起才行。很遗憾, 实施新技术的前期成本高, 加上给化石燃料厂商的巨额补贴, 这意味着几乎所有绿色技术都比基于化石燃料的电力更贵, 这种成本差异称为绿色溢价。政府已开始补贴电动汽车以帮助弥补差价。在一些地方, 尽管 电动汽车的成本更高, 但电动汽车总体上已经便宜了, 这取决于电力和汽油的成本。目前, 其他选择更棘手——零碳液体燃料的价格可能是汽油的两倍或更高。创新者正尽力降低绿色溢价, 因为最终来说, 最好的燃料不但消费者负担得起, 而且对地球可持续。

P33 2021-03-23 Ugly History - The Spanish Inquisition - Kayla Wolf

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=33>)

It's 1481. In the city of Seville, devout Catholics are turning themselves in to the authorities. They're confessing to heresy—failure to follow the beliefs of the Catholic Church. But why? The Spanish Inquisition has arrived in Seville. The Inquisition began in 1478, when Pope Sixtus IV issued a decree authorizing the Catholic monarchs, Ferdinand and Isabella, to root out heresy in the Spanish kingdoms—a confederacy of semi-independent kingdoms in the area that would become the modern country of Spain. Though the order came from the church, the monarchs had requested it. When the Inquisition began, the

Spanish kingdoms were diverse both ethnically and religiously, with Jews, Muslims, and Christians living in the same regions. The Inquisition quickly turned its attention to ridding the region of people who were not part of the Catholic Church. It would last more than 350 years. On the ground, groups called tribunals ran the Inquisition in each region. Roles on a tribunal could include an arresting constable, a prosecuting attorney, inquisitors to question the accused, and a scribe. A “Grand Inquisitor,” a member of the clergy selected by the king and queen, almost always led a tribunal. The Inquisition marked its arrival in each new place with an “Edict of Grace.” Typically lasting 40 days, the Edict of Grace promised mercy to those who confess to heresy. After that, the inquisitors persecuted suspected heretics on the basis of anonymous accusations. So the confessors in Seville probably didn’t see themselves as actual heretics— instead, they were hedging their bets by reporting themselves when the consequences were low, rather than risking imprisonment or torture if someone else accused them later on. They were right to worry: once the authorities arrested someone, accusations were often vague, so the accused didn’t know the reasons for their arrest or the identity of their accuser. Victims were imprisoned for months or even years. Once arrested, their property was confiscated, often leaving their families on the street. Under these conditions, victims confessed to the most mundane forms of heresy— like hanging linen to dry on a Saturday. The Inquisition targeted different subsets of the population over time. In 1492, at the brutal Grand Inquisitor Tomás de Torquemada’s urging, the monarchs issued a decree giving Spanish Jews four months to either convert to Christianity or leave the kingdom. Thousands were expelled and those who stayed risked persecution. Converts to Christianity, known as conversos, weren’t even safe, because authorities suspected them of practicing Judaism in secret. The hatred directed at conversos was both religious and economic, as conversos made up a large portion of the upper middle class. The Inquisition eventually shifted its focus to the moriscos, converts to Christianity from Islam. In 1609, an edict passed forcing all moriscos to leave. An estimated 300,000 left. Those who remained became the Inquisition’s next targets. The inquisitors announced the punishments of those found guilty of heresy in public gatherings called autos de fé, or acts of faith. Hundreds of people gathered to watch the procession of sinners, mass, sermon, and finally the announcement of punishments. Most of the accused received punishments like imprisonment, exile, or having to wear a sanbenito, a garment that marked them as a sinner. The worst punishment was “relaxado en persona”— a euphemism for burning at the stake. This punishment was relatively uncommon— reserved for unrepentant and relapsed heretics. Over 350 years after Queen Isabella started the Inquisition, her namesake, Queen Isabella II, formally ended it on July 15th, 1834. The Spanish kingdoms’ dependence on the Catholic Church had isolated them while the rest of Europe experienced the Enlightenment and embraced the separation of church and state. Historians still debate the number of people killed during the Inquisition. Some suggest over 30,000 but most estimate between 1,000 and 2,000. The consequences of the Inquisition, however, reach far beyond fatalities. In some places, an estimated 1/3 of prisoners were tortured. Hundreds of thousands of members of religious minorities were forced to leave their homes, and those who remained faced discrimination and economic hardship. Smaller inquisitions in Spanish colonial territories in the Americas, especially Mexico, carried their own tolls. Friends turned in friends, neighbors accused neighbors, and even family members reported each other of heresy. Under the Inquisition, people were condemned to live in fear and paranoia for centuries.

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翻译人员: Meiqi Jia 校对人员: Helen Chang 1481 年，在西班牙的塞维利亚城，虔诚的天主教徒正在向当局自首。他们承认异端，违背了天主教的教义。但是为什么？西班牙宗教审讯所来到了塞维利亚。宗教审讯开始于 1478，教宗西斯科特四世颁布法令，授权天主教君主费迪南德和伊莎贝拉根除西班牙王国的异端邪说。当时该地区的半独立王国联盟是现代西班牙的前身。虽然命令来自于教会，但那也是君主要求的。一开始审讯时，西班牙王国有着形形色色的种族和宗教，犹太人、穆斯林、天主教徒居住在同一区域。审讯所很快便开始专注于驱除那些非天主教人士，持续超过 350 年。在当地，名为审裁小组的团体掌控了每个区域的审讯所。审裁小组包括一位负责逮捕的警察、一位检察官、审问被告的审讯官，和一位抄写员。一位“大审判官”，是一位被国王和王后挑选的神职人员，通常带领审裁。审讯所每到一个地方都会发布“恩典赦令”，通常期限是 40 天。“恩典赦令”许诺会仁慈对待那些承认异端的人。在那之后，审讯官便根据匿名指控迫害那些被怀疑的异端们。所以，塞维利亚的忏悔者未必认为自己真的是异端，而是赌——在后果尚不严重时便自我上报，免得往后一旦别人指认他们会被监禁或刑求。他们的担忧没有错：一旦当局逮捕了某些人，控告通常是模糊的，所以被控告的人不知道他们为何被逮捕，也不知道控

告者的身份。受害者受到长达几个月 或者几年的监禁。一旦被逮捕，财产就被没收，以至于他们的家人无家可归。在这样的情况下 受害者承认最平凡的异端形式——例如在星期六晾晒床单。审讯所逐渐针对人口中的不同团体。1492 年，在残忍的大审判官 托马斯·德·托尔克马达的催促下，君主发布一条法令，命令西班牙犹太人 要么在四个月内改信天主教，要么离开西班牙。上千人被驱逐，那些留下来的则有被迫害的风险。改信天主教的人被称为改宗者， 也不安全，因为当局怀疑他们 秘密地信奉犹太教。改宗者们受到了宗教 与经济性的敌意，因为他们很大一部分是中上阶级。审讯所关注的中心 最终转移到了莫里斯科人，从伊斯兰教转信基督教的人。1609 年，一则法令强迫 所有的莫里斯科人离开西班牙。估计三十万人离开了。那些留下来的人成为了 审讯所下一个针对对象。审判官在公共集会上 宣布惩罚那些犯有异端罪的人，称为 *autos de fé* 或信仰的行为。上百人围观充斥着 罪人、弥撒、布道的游行，和最终处罚的宣告。大部分被告被罚监禁、流放，或穿悔罪服——标记罪人的服装。最糟的处罚是“*relaxado en persona*”——火刑的委婉说法。这种处罚不是很常见——留给不悔悟和复发的异端。在伊莎贝拉女王开始 审讯所的 350 多年后，与她同名的伊莎贝拉二世女王在 1834 年的 7 月 15 日 正式终止审讯所。西班牙王国对天主教 教会的依赖使得其孤立，那期间其他的欧洲国家 经历启蒙运动，接受政教分离。历史家们仍然在争论 因为审讯所而死亡的人数。有些人认为死亡人数超过三万人，但是大部分人估计 大约在一到两千之间。然而审讯所带来的后果 远远超过死亡人数。有些地方估计 1/3 的囚犯被刑求。成千上万的宗教少数派 被强迫离开家园，留下来的面临歧视和经济困境。在美洲的较小型的审讯所，尤其是墨西哥，也受到了影响。朋友反目，邻居互相控告，甚至家庭成员控告彼此是异端。审讯之下，几个世纪的人被罚而活在恐惧中。

P34 2021-03-25 Can you solve the fantasy election riddle - Dennis E. Shasha

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=34>)

After much debate, the fantasy realm you call home has decided dragon jousting may not be the best way to choose its leaders, and has begun transitioning to democracy. The candidates are a giant orange troll and an experienced tree statesman. An all-powerful eyebrow has hired your company— The Dormor Polling Agency— to survey the citizens of the land and predict who will win. There's a lot riding on this: if you get it wrong, heads— well, your head— will quite literally roll. Your job is to go from door to door, asking voters whether they prefer the troll or the tree fellow and to use the results to project how the election will go. Your fellow citizens want you to succeed and would tell you the truth... but there's a problem. Few are willing to admit they support the troll on account of his controversial life choices. If you were to ask a troll supporter who she'll vote for, there's a good chance that she'll claim to support the tree man, skewing your results. You're about to begin your rounds when a stranger offers you some cryptic advice: "Here's the question that will save your neck: what have you got in your pocket?" You reach into your pocket and pull out... a silver coin, which has the current king's head on one side and his tail on the other. How can you use it to conduct an accurate poll? Pause here to figure it out yourself. Answer in 3 Answer in 2 Answer in 1 The trick here is to use the coin to add random chance to your interaction that will give troll supporters deniability. In other words, you're looking for a system where when someone says "troll," it could either be because the coin somehow told them to, or because they actually support the troll— and you'd have no way to tell the difference. You'll also need to know how frequently the coin skewed the results, so you can account for it in your calculations. One solution is to have every pollee go into their house and flip the coin. If it lands heads, they should tell you "troll," whether or not they actually support him. If it lands tails, they should tell you their actual preference. Here's what happens: you poll 200 voters, and 130 say they'll vote for the troll. For about 50%, or 100 of them, the coin will have landed heads. So you can subtract 100 troll votes off his total, and know the troll's real support is 30 to 70, and he's very likely to lose. The election comes around, but before the results can be certified a third party candidate swoops in and burns the tree fellow to a crisp. The freshly signed and deeply flawed constitution mandates that this challenger gets to take his victim's place in a new election. The Dormor Polling Agency sends you back out on the streets with your trusty coin. Only this time no one is comfortable admitting their preference: supporting the troll is still shameful, and nobody wants to express support of a dragon who murdered his way into the race. But your job is your job. How do you conduct an accurate poll now? Pause here to figure it out for yourself. Answer in 3 Answer in 2 Answer in 1 This time, instead of masking just one candidate preference, you need some way to disguise both. At the same time, you also need to leave space for some portion of the people polled to express their true preference. But a coin toss only has two possible outcomes... right? Suppose you have everyone flip the coin twice— now there are four possible results. You can tell the people who flip heads twice in a row to report support for the troll; those who get tails twice in a row

to report dragon; and those with any other combination to declare their true preference. The chances of getting either two heads or two tails in a row are 50% times 50%— or 25%. Subtracting that proportion of the total respondents from each candidate's score should give you something close to the real distribution. This time, 105 respondents announced themselves in favor of the troll and 95 for the dragon. Out of the total, the coin will make 25% or 50 respond troll and another 50 respond dragon. Subtracting 50 from each result reveals that voters seem to prefer the troll by a margin of about 55 to 45. It's close, but as predicted, the troll wins the election, and you live to poll another day.

P34 2021-03-25 Can you solve the fantasy election riddle - Dennis E. Shasha

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=34>)

翻译人员: yifei wang 校对人员: Helen Chang 多轮辩后, 你的国家幻想之国觉得 赛龙也许不是选择领袖的最好方式 于是从赛龙这种方式逐渐过渡到了民主候选人们是一个橙色巨人 和一棵经验丰富的树政治家一个全能的眉毛雇用你的公司“老虎窗投票公司”来调查地区居民, 推断赢家干这个的压力很大呀如果有什么差错, 有人的脑袋, 嗯...你的脑袋就要掉在地上滚了你的工作是挨家挨户地询问投票者是支持巨人还是树然后运用投票的结果来决定选举的结果你的子民们会想要你成功 他们会向你吐露心声但是还有个问题由于巨人饱受争端的生活方式只有那么区区几个会承认他们支持巨人如果你去问巨人的支持者 她们应该选择谁有很大的几率她会告诉你 说她支持的是树这就让你采集的结果非常不可靠正当你打算开始用这个不可靠的方式 采集投票结果时: 一个神秘人向你提供了一个神秘的建议“这是一个能让你保住脑袋的问题: 你口袋里装的是什么? “你伸手去你的口袋里掏... 原来是一枚硬币 硬币正面有着现任国王的头像, 反面是国王的尾巴你怎么用这枚硬币 得到一个准确的大选结果呢? 按暂停然后自己想想 321 方法就是用硬币来增加 支持巨人的票数的随机性因为有些人不是不敢投巨人吗换种说法就是, 你要找一种体制, 当人们在这个体制中投票给巨人可以是因为这个硬币让他们这样做也可以是因为他们的确想投给巨人但是你无法判断你还需要知道这枚硬币打乱结果的频率最后你就可以通过以上的信息 来计算大选结果那么办法就是, 每个投票的人 回房间里去抛硬币如果正面朝上, 他们就必须支持巨人不管他们是不是真正的支持巨人如果是反面朝上, 他们就必须说出真实的想法那么以下的局面就会发生: 你采集了 200 个人的投票选择 130 个人说要投给巨人那么大约 50% 或者 200 人里的 100 个人抛出来的硬币正面朝上所以你就可以用 巨人得到的总票数减去 100 得到真正支持巨人的是 3 比 7 显然巨人要落选啊大选正在进行 但当结果确定下来之前有个第三方突然出现 然后把参加大选的树烧成了渣渣刚刚完工, 漏洞百出的宪法规定 这个第三方挑战者能代替他的受害人去参加新的大选你的老虎窗投票公司 又派你和你可靠的硬币去调查大选只是这次没有人愿意说出 他们真正的想法了因为: 支持巨人还是一件很羞耻的事而且没有人想在明面上 支持一个靠着谋杀成为候选人的龙但是你的工作还是得做啊 在该怎么得到最公平准确的结果呢? 按暂停然后自己想想 321 这次与上次不一样, 你不只是要模糊 群众对一个候选人的喜好你要同时模糊两个 同时增加票数随机性与此同时, 你还要留点空间 让某一部分的人去表达他们真正的意愿但是一枚硬币只有着正反两面 两种可能性... 对吧? 假设你让所有人都抛两次硬币那么现在就有 4 种结果你可以让抛硬币结果是 “两次都是正面”的人说他们支持巨人两次都是反面的人说她们支持龙让那些一正一反的吐露他们的心声抛到相同面, 两正或两反的几率是 50%乘 50%--->25%减去总人数的 25%每个候选人的投票结果就应该和真实的结果比较相近了这次, 有 105 个人投了巨人 95 人投了龙硬币的结果会让总人数的 25%也就是 50 人, 投给巨人再有另外 50 人投给龙用巨人和龙获得的票数各减去 50 我们发现选民似乎更喜欢巨人大概是 55 比 45 这样的结果虽然是险胜, 但是巨人还是 照预测的那样赢得了选举而你又能活着去调查下一个选举了

P35 2021-03-29 Why every world map is wrong - Kayla Wolf

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=35>)

Fourteen Greenlands could fit in Africa, but you wouldn't guess it from most maps of the world. The fact is, every world map humans have ever made is wrong. Actually, it's impossible to make a map of the world 100% right. No, not you, globe—we know you're accurate. Not you, Google Earth, you're just a digital globe. We're talking about flat maps, which, let's face it, are way more convenient for a lot of things. Anyway, as we were saying, it's impossible to make a 100% accurate flat map of a spherical planet. For a long time, people didn't even try. They just plonked places down in arbitrary locations without any consistent scale. Then in 150 AD, the Greek mathematician and astronomer Ptolemy systematically mapped the Earth on a grid and placed locations on the grid according to coordinates, so maps could be checked against others and replicated.

Ptolemy built his grid out of lines we still use today: 180 lines of latitude and 360 lines of longitude. In spite of these advances, people kept getting lost. Part of the problem was a— shall we say— incomplete understanding of the world's geography. But it was also just really difficult to navigate using a map. Because the Earth is round, the shortest route from one place to another is a path along a circle. If we draw this route on a flat map, it passes through every line of longitude at a different angle. To follow the route, you'd have to constantly shift the direction you're traveling. Any slight error would land you in the wrong place. In 1569, Gerardus Mercator fixed this problem. He created a world map proportioned so these curved navigational routes would be straight, passing through every line of longitude at the same angle and therefore allowing navigators to set a constant bearing—in other words, travel in one direction—for a whole journey. There was just one tiny hitch: to do this, he had to distort land masses and bodies of water so those furthest from the equator got larger and those closest to the equator shrank. In spite of its inaccuracies, Mercator's map was very useful. In fact, it's still widely used today, including in online maps. But it's still wrong! In 1925, the Goode Homolosine Projection was created as— get this— an interrupted pseudo-cylindrical equal area projection. What does that mean? Not important. The point was to minimize distortion for the entire world. The map can be land-oriented... or ocean-oriented. Either way, the so-called orange peel map isn't very easy to read. The Dymaxion Projection by American architect Buckminster Fuller in the 1940s is even better. Sorry, did we say better? It's not better if you want to understand where things are in the world. It is better in the sense that there are no visibly evident distortions of the land masses. Though if you wanted to know, say, how far Brazil is from Nigeria, you won't get any sense of that from this map. The most accurate projection to date is the AuthaGraph World Map designed by Japanese architect Hajime Narukawa in 1999. The continents and oceans are almost completely in proportion, and the map is rectangular, just how we like it. Could this be the perfect map? Well... no. Since the Mercator works for navigation and reads clearly, why bother with all these whacky maps? Arno Peters argued that by enlarging European and North American countries, the Mercator projection gives white nations a sense of supremacy over non-white nations closer to the equator. He adapted the Gall-Peters Projection, which counteracts that particular problem, but the continents are still... stretched. Today, we rely on maps less and less for navigation, but they still play a vital role in education. Peters was definitely on to something: no matter what map we're looking at, it's a story told from the perspective of the map's creator that in turn shapes—perhaps unduly—our perception of our world. Simple changes in map design, even changes that have nothing to do with how we transfer a round Earth to a flat surface, can completely shift our point of view.

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翻译人员: Leonard Au 校对人员: Yanyan Hong 非洲可以装下 14 个格陵兰岛, 但是你看从多数世界地图上 绝对看不出这一点, 实际上, 我们所设计的 每一张世界地图都是错的。其实, 世界地图是 不可能画得 100% 准确的。地球仪, 我们不是在说你—— 我们知道你是准确的。谷歌地球, 我们也不是在说你, 你也只不过是数字地球仪。我们说的是平面地图。不得不说, 在很多事情上, 平面地图方便多了。言归正传, 我们刚刚说的是, 为球形的行星制作一张 100% 准确的平面地图是天方夜谭。过去很长一段时间里, 人们甚至都没去尝试, 他们不过是在地图上草草定下各地位置, 甚至没采用标准比例尺。后来, 在公元 150 年, 希腊数学家和天文学家托勒密系统性地网格上 绘制了地球的地图, 然后把各个地方的坐标 标记在网格上, 好让地图有据可循, 复制共享。托勒密画网格时 所用的线条一直沿用至今: 180 条纬线和 360 条经线。尽管有了这些进展, 人们还是不断迷路。问题的一部分在于—— 怎么说呢——人们对世界地理了解得不全面。但用地图来导航, 本来就是一件很困难的事情。由于地球是圆的, 两个地点之间的最短路线 会形成圆圈上的轨道。要是把这条路线画在平面地图上, 它与每一条经线交叉的角度就会不同。要想沿着这条路线走, 你就要时时刻刻调整你前进的方向。只要稍有误差, 你就会走错地方。1569 年, 杰拉杜斯·墨卡托 (Gerardus Mercator) 解决了这个问题。他制作的世界地图的比例让这些弯曲的导航路线都变直了, 而且还会以同样的角度 与每一条经线交叉, 好让导航设下稳定的线路——换句话说, 全程能往一个方向走。但有个小问题: 为了这么做, 他必须调整陆地与海域, 这样距离赤道最远的 陆地与海洋面积会比实际大, 最靠近赤道的陆地 和海域面积会小于实际。尽管存在这些误差, 墨卡托的地图还是很管用。事实上, 它目前还在广泛使用中, 包括线上地图。但是它还是存在错误的! 1925 年, 古蒂等面积投影 问世了——注意——它是一种断续的伪圆柱形等面积投影。什么意思呢? 其实不重要。其旨在减少世界地图表面误差。这张地图可以只看陆地, 也可以只显示海洋。不管怎样, 这张所谓的橙皮地图 也不太容易辨识。美国建筑师巴克敏斯特·福乐 (Buckminster Fuller)

上世纪 40 年代的 戴美克森投影都比它好。抱歉，我们是说“更好”吗？如果你想知道某地在地球的位置，这张地图并没多好，它好的地方是指各陆地在地图上看起来不太变形。但假如你想知道 巴西和尼日利亚之间的距离，你从这张地图上是不看出来的。到目前为止，最准确的投影是日本建筑师鸣川肇在 1999 年设计的 AuthaGraph 世界地图。所有陆地和海洋的比例几乎完全一致，而且地图也是矩形的，就像我们习惯的一样。这究竟是不是完美的地图呢？嗯……并不是。既然墨卡托投影可以用于导航，而且清晰易用，为什么还要用这些古怪的地图呢？阿诺·彼得斯（Arno Peters）认为，墨卡托投影让欧洲和北美洲国家看起来更大，使白种人所在的国家有了优越感，可凌驾于靠近赤道的非白种人国家之上。他对高尔-彼得斯投影进行了调整，解决了这个问题，但是各大陆还是……被拉长了。而今，我们找路时，越来越少用地图了，但是它们在教育中仍起着至关重要的作用。彼得斯确实说得对：不管我们看的是什么地图，地图让我们看到是创作者眼中的世界，这——或许会大大——改变我们对世界的看法。当我们把地球转化为平面的地图，哪怕只是设计上无关紧要的改变，也可以彻底地改变我们的想法。

P36 2021-03-30 A brief history of the devil - Brian A. Pavlac

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=36>)

Satan, the beast crunching sinners' bones in his subterranean lair. Lucifer, the fallen angel raging against the established order. Mephistopheles, the trickster striking deals with unsuspecting humans. These three divergent devils are all based on Satan of the Old Testament, an angelic member of God's court who torments Job in the Book of Job. But unlike any of these literary devils, the Satan of the Bible was a relatively minor character, with scant information about his deeds or appearance. So how did he become the ultimate antagonist, with so many different forms? In the New Testament, Satan saw a little more action: tempting Jesus, using demons to possess people, and finally appearing as a giant dragon who is cast into hell. This last image particularly inspired medieval artists and writers, who depicted a scaled, shaggy-furred creature with overgrown toenails. In Michael Pacher's painting of St. Augustine and the Devil, the devil appears as an upright lizard—with a second miniature face glinting on his rear end. The epitome of these monster Satans appeared in Italian poet Dante Alighieri's "Inferno." Encased in the ninth circle of hell, Dante's Satan is a three-headed, bat-winged behemoth who feasts on sinners. But he's also an object of pity: powerless as the panicked beating of his wings only encases him further in ice. The poem's protagonist escapes from hell by clambering over Satan's body, and feels both disgust and sympathy for the trapped beast—prompting the reader to consider the pain of doing evil. By the Renaissance, the devil started to assume a more human form. Artists painted him as a man with cloven hooves and curling horns inspired by Pan, the Greek god of the wild. In his 1667 masterpiece "Paradise Lost," English poet John Milton depicted the devil as Lucifer, an angel who started a rebellion on the grounds that God is too powerful. Kicked out of heaven, this charismatic rebel becomes Satan, and declares that he'd rather rule in hell than serve in heaven. Milton's take inspired numerous depictions of Lucifer as an ambiguous figure, rather than a purely evil one. Milton's Lucifer later became an iconic character for the Romantics of the 1800s, who saw him as a hero who defied higher power in pursuit of essential truths, with tragic consequences. Meanwhile, in the German legend of Doctor Faust, which dates to the 16th century, we get a look at what happens when the devil comes to Earth. Faust, a dissatisfied scholar, pledges his soul to the devil in exchange for bottomless pleasure. With the help of the devil's messenger Mephistopheles, Faust quickly seizes women, power, and money—only to fall into the eternal fires of hell. Later versions of the story show Mephistopheles in different lights. In Christopher Marlowe's account, a cynical Doctor Faustus is happy to strike a deal with Mephistopheles. In Johann Wolfgang von Goethe's version, Mephistopheles tricks Faust into a grisly deal. Today, a Faustian bargain refers to a trade that sacrifices integrity for short-term gains. In stagings of Goethe's play, Mephistopheles appeared in red tights and cape. This version of the devil was often played as a charming trickster—one that eventually paraded through comic books, advertising, and film in his red suit. These three takes on the devil are just the tip of the iceberg: the devil continues to stalk the public imagination to this day, tempting artists of all kinds to render him according to new and fantastical visions.

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翻译人员: Yu Xie 校对人员: Helen Chang 撒旦，一个在地下巢穴 啃食罪人骨头的怪物。路西法，一个与现存制度

激烈反抗的堕落天使。梅菲斯特，一个与单纯人类 打交道的骗子。这三个性格迥异的恶魔都来源于 《圣经旧约》，一个上帝宫廷的善良角色， 在《约伯记》中折磨约伯。但是与上述文学作品中的恶魔不同，《圣经》中的撒旦 只是一个不怎么重要的角色，书中基本上没有关于撒旦的事迹 和外貌的叙述。那么拥有这么多形态的撒旦是如何 成为最大的反派的呢？在《新约》里， 撒旦变得活跃起来：怂恿耶稣， 用恶魔去控制人类，最后以被抛入地狱的 巨龙形态现身。书中最后的图像对中世纪的 艺术家和作家影响深远，这幅图描绘了一个有鳞片、 全身毛茸茸、脚趾甲很长的生物。在迈克尔·帕切尔一幅关于 圣奥斯丁和恶魔的画作里，恶魔被画成一只直立的蜥蜴——并且在臀部那里有它的 第二张缩小版的脸。撒旦形象的典型代表出现在意大利诗人 但丁·阿利吉耶里的诗集《地狱》里。在诗集 中的第九狱里，但丁所描述的撒旦是一个有三个头、 蝙蝠翅膀、以罪人为食的巨兽。但这个恶魔也是一个令人同情的对象：正如它惊慌拍打的翅膀一般， 它的力量很弱，被困在冰里。诗里的主人公踏过撒旦的身体 逃出了地狱，他对这只被困住的怪兽 感到既厌恶又同情——激起读者思考这只恶魔 所承受的痛苦。到文化复兴时期，恶魔的形象 逐渐向人类靠近。艺术家们将它画成有蹄子 和弯曲的犄角的人，艺术家们是受到了希腊牧神， 潘的启发。1667 年，在史诗 《失乐园》里英国诗人约翰·弥尔顿将恶魔 描述成了路西法，一个因上帝权势过高 而发起反抗的天使。它被驱逐出了天堂， 于是这个魅力超凡的反派变成了撒旦，这个角色宁愿当地狱的主宰 也不会再服务于天堂。弥尔顿的作品启发了 之后一系列的文学作品其中路西法不再是一个纯粹的角色，不单单是一个纯恶的恶魔。弥尔顿 创作的路西法成为了 19 世纪 浪漫主义时期的标志人物形象，被视为不畏强权追求真理的英雄，虽然结局令人扼腕。同时，在德国民间传说 《浮士德》里，这个传说可追溯到 16 世纪，我们可以得知当恶魔降生时 所发生的事情。感到迷茫和不满的学者浮士德将自己的灵魂 向恶魔换取无尽的快乐。在恶魔信使 梅菲斯特的帮助下，浮士德立即拥有了 女人、权力以及金钱——最后将自己陷入到了永恒的 地狱之火中。后世的版本用不同的视角 对梅菲斯特进行了展示。在克里斯托弗·马洛的描述中，愤世嫉俗的学者浮士德 非常乐意与梅菲斯特做交易。在约翰·沃尔夫冈·范·歌德的版本中，梅菲斯特引诱着浮士德去达成 一个可怕的交易。现在，浮士德式交易则代表着 那些为了短期利益而牺牲掉正直精神的交易。在歌德戏剧的舞台上，梅菲斯特以一席 红色紧身服和斗篷登场。在这个版本下， 恶魔总是以一个 富有魅力的骗子形象登场——而后也以同样的形象出现在动画书，广告以及影视作品里。这三个版本的恶魔形象 只是冰山一角：如今恶魔依旧激发着 公众的想象力，引诱着各种风格的艺术家用 让它活跃在公众视野以全新更具有想象力的形象。

P37 2021-04-01 How to see with sound - Jacques S. Abramowicz

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=37>)

In a pitch-black cave, bats can't see much. But even with their eyes shut, they can navigate rocky topography at incredible speeds. This is because a bat's flight isn't just guided by its eyes, but rather, by its ears. It may seem impossible to see with sound, but bats, naval officers, and doctors do it all the time, using the unique properties of ultrasound. All sound is created when molecules in the air, water, or any other medium vibrate in a pulsing wave. The distance between each peak determines the wave's frequency, measured as cycles per second, or hertz. This means that over the same amount of time, a high frequency wave will complete more cycles than a low frequency one. This is especially true of ultrasound, which includes any sound wave exceeding 20,000 cycles per second. Humans can't hear or produce sounds with such high frequencies, but our flying friend can. When it's too dark to see, he emits an ultrasound wave with tall peaks. Since the wave cycles are happening so quickly, wave after wave rapidly bounces off nearby surfaces. Each wave's tall peak hits every nook and cranny, producing an echo that carries a lot of information. By sensing the nuances in this chain of echoes, our bat can create an internal map of its environment. This is how bats use sound to see, and the process inspired humans to try and do the same. In World War One, French scientists sent ultrasound beams into the ocean to detect nearby enemy submarines. This early form of SONAR was a huge success, in large part because sound waves travel even faster through mediums with more tightly packed molecules, like water. In the 1950s, medical professionals began to experiment with this technique as a non-invasive way to see inside a patient's body. Today, ultrasound imaging is used to evaluate organ damage, measure tissue thickness, and detect gallbladder stones, tumors, and blood clots. But to explore how this tool works in practice, let's consider its most well-known use—the fetal ultrasound. First, the skin is covered with conductive gel. Since sound waves lose speed and clarity when traveling through air, this gooey substance ensures an airtight seal between the body and the wand emitting ultrasound waves. Then the machine operator begins sending ultrasound beams into the body. The waves pass through liquids like urine, blood, and amniotic fluid without creating any echoes. But when a wave encounters a solid structure, it bounces back. This echo is

rendered as a dot on the imaging screen. Objects like bones reflect the most waves, appearing as tightly packed dots forming bright white shapes. Less dense objects appear in fainter shades of gray, slowly creating an image of the fetus's internal organs. To get a complete picture, waves need to reach different depths in the patient's body, bypassing some tissues while echoing off others. Since longer, low frequency waves actually penetrate deeper than short, high frequency ones, multiple frequencies are often used together and composited into a life-like image. The operator can then zoom in and focus on different areas. And since ultrasound machines send and receive cascades of waves in real time, the machine can even visualize movement. The waves used for medical ultrasound range from 2 million to 10 million hertz—over a hundred times higher than human ears can hear. These incredibly high frequencies create detailed images that allow doctors to diagnose the smallest developmental deviations in the brain, heart, spine, and more. Even outside of pre-natal care, medical ultrasound has huge advantages over similar technologies. Unlike radiation-based imaging or invasive surgical procedures, ultrasound has no known negative side effects when used properly. At very high levels, the heat caused by ultrasound waves can damage sensitive tissues, but technicians typically use the lowest levels possible. And since modern ultrasound machines can be small and portable, doctors can use them in the field—allowing them to see clearly in any medical emergency.

P37 2021-04-01 How to see with sound - Jacques S. Abramowicz

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=37>)

翻译人员: Kai Liu 校对人员: Helen Chang 在一片漆黑的洞穴里 蝙蝠难以看得清楚但即便闭上眼蝙蝠依然能以惊人的速度穿越岩石地形这是因为蝙蝠不单用眼睛去看路而是用耳朵似乎不可能用声音去看东西但蝙蝠、海军军官和医生经常这样做他们借助了超声波(Ultrasound)的特性分子在空气、水或者是其他介质中以脉冲波的形式振动进而产生声音波峰间的距离决定了波的频率用每秒完成周期的次数 赫兹(hertz)来衡量也就是说,在相同的时间里高频率的波比低频率波完成更多的周期尤其是超声波它包含了所有每秒完成 2 万次以上周期的声波人类听不到也无法发出如此高频的声音但我们的蝙蝠朋友就可以做到当环境太暗看不清时 它会发出高峰值的超声波因为这种波的周期特别短波又从附近的表面很快地反射回来波的高峰遍布洞穴里的每一个角落产生携带大量信息的回声通过感受一系列回声的细微差别蝙蝠就可以画出洞穴内部环境的地图这就是蝙蝠用声音看东西的原理这个过程启发了人类尝试做同样的事在第一次世界大战中 法国科学家向海洋发射超声波来探测敌方附近的潜水艇这个声呐雏形取得了巨大的成功很大程度上因为一些介质 有更多紧密联系的分子,比如说水声波在这样的介质里传播地更快在 20 世纪 50 年代 医学专业人员开始用这项技术做实验以非侵入的方式检查病人身体的内部今天超声成像被用来 评估器官损伤的情况测量组织厚度,探测 胆囊结石、肿瘤和血栓但要想弄明白如何 在实践中应用这项技术让我们来看一种最出名的用途胎儿超声首先,皮肤由导电凝胶所覆盖因为在穿过空气时 声波会损失一些速度和清晰度这种黏性物质确保身体和仪器棒之间 发射超声波的位置气密封然后仪器操作员把超声束发射到体内波穿过像尿液、血液、羊水这样的液体不产生任何回声但当碰到固体结构时,波反弹回去回声在成像屏幕上以点的形式呈现像骨头这样的物质反射大部分的波并以紧密点构成亮白形状密度较小的物质 以较模糊灰色的形状出现慢慢地 显示出胎儿内部器官的图像要想得到完整的图像波需要在病人身体里 到达不同深度的地方绕开某些组织 并在其他部位反射因为长波、低频率波实际上 比于短波、高频率波渗透地更深操作员经常混用多种频率的波合成逼真的图像这样操作员就可以放大 关注不同部位因为超声仪器实时 发射并收到一系列的波机器甚至可以把动作可视化医用超声波的频率在 2 百万到 1 千万赫兹之间在人耳能听到频率的 100 倍以上这些非常高频的波合成了详细的图像医生可以借此诊断脑部、心脏、脊柱还有其他部位 最细微的发育性偏斜即便在非产前检查的领域医用超声波仍比同类技术更具优势不像辐射成像或侵入性手术只要使用得当 超声没有明显的副作用具有很高能量的超声波产生的热量 可以毁坏敏感组织但是技师通常尽可能使用 最低能量的超声波因为现代超声仪器体积小且易于携带医生可以在工作场景下使用它们这让医生们在任何紧急情况下 都可以看得一清二楚

P38 2021-04-05 Can you outsmart the apples and oranges fallacy - Elizabeth Cox

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=38>)

Baking apple pie? Discount orange warehouse has you covered! A fruit's a fruit, right? It's 1988, and scientist James Hansen has just testified to the United States Congress that global warming trends are caused by human activity, and will pose an increasing threat to humanity in the future. Well, well. That's unusually prescient for a human. Looking for a wedding dress?

Try a new take on a timeless classic. It's sleek, flattering and modest—just like the traditional dress. Commercials. Could anything be more insufferable? It's 1997, and the United States Senate has called a hearing about global warming. Some expert witnesses point out that past periods in Earth's history were warmer than the 20th century. Because such variations existed long before humans, the witnesses claim the current warming trend is also the result of natural variation. Ah, there is something more insufferable than a commercial. Luckily for the humans, there's one more expert witness. What are you looking at? We're all dressed. At least we are by the logic you just used. It's as if you were to say apples and oranges are both fruits, therefore they taste the same. Or that underwear, wedding dresses, and suits are all clothes, therefore, they're all equally appropriate attire for a Senate hearing. The European wars of the 19th century and World War I were all wars, right? So World War I couldn't be any more devastating than those other wars, could it? Let's say two people have a fever. They must have the same disease that's causing that fever, right? Of course not. One fever could be caused by chicken pox, the other by influenza, or any number of other infections. Like your claim about rising global temperatures, these claims make a false analogy. You're assuming that because two phenomena share a characteristic, in this case warming, they are analogous in other ways, like the cause of that warming. But there's no evidence that that's the case. Yes, there have been other warm periods in Earth's history—no one's disputing that the climate fluctuates. But let's take a closer look at some of those older examples of global warming, shall we? The Cretaceous Hot Greenhouse, 92 million years ago, was so warm, forests covered Antarctica. Volcanic activity was likely responsible for boosting atmospheric carbon dioxide and creating a greenhouse effect. The Paleocene-Eocene Thermal Maximum, 55 million years ago, was so warm, crocodiles swam the waters of the Arctic Circle. This warming may have been caused by the drying of inland seas and release of methane, a potent greenhouse gas, from ocean sediments. Even among these other warm periods, you're making a false analogy. Yes, they had natural causes. But each had a different cause, and involved a different amount and duration of warming. They're as dissimilar as they are similar. Taking them together, all we can reasonably conclude is that the Earth's climate seems to change in response to conditions on the planet. Today, human activity is a dominant force shaping conditions on your planet, so the possibility that it's driving global warming can't be dismissed out of hand. I'll grant that the more complicated something is, the easier it is to make a mistaken analogy. That's especially true because there are many different types of false analogy: that similar symptoms must share a cause, that similar actions must lead to similar consequences, and countless others. Most false analogies you'll come across are far less obvious than those comparing apples to oranges, and climate is notoriously complex. It requires careful, rigorous study and evidence collection—and making a false analogy like this only impedes that process. It's 2013, and the United Nations Intergovernmental Panel on Climate Change has found, aggregating decades of research, that there is more than a 95% chance the global warming trend since the mid-20th century has been driven by human activity, namely the burning of fossil fuels. You're both pets, and he likes living in water, so you should, too.

P38 2021-04-05 Can you outsmart the apples and oranges fallacy - Elizabeth Cox

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=38>)

翻译人员: Ziteng Yang 校对人员: Helen Chang 做草莓派? 价格更低的橘子也能做成! 都是水果, 对吗? 1988 年, 科学家 詹姆斯·汉森曾在美国国会上言之凿凿, 是由人类活动引起的, 并且未来将对人类产生 愈发严重的威胁。哇哦, 哇哦, 真是非常有先见之明。选婚纱? 试试永恒经典款。丝滑、奢华, 又低调, 就像传统服饰一般。商业广告。有什么比这更难以忍受吗? 1997 年, 美国参议院 关于全球气候变暖召开听证会。一些专家的证词指出, 纵观地球历史, 以前的气候, 要比 20 世纪更高一些。因为在人类出现之前, 许多自然变化已存在了很久, 证词表明当前的气候变暖趋势, 也是自然变化的结果。哦, 这确实比商业广告更难以忍受。对人类来说, 幸运的是, 还有另外一个专家证词。你看什么? 我也穿衣服了。至少用你刚才的逻辑, 我是穿了衣服的。你似乎在说, 苹果和橘子都是水果, 那它们味道就一样了。同理, 内裤、婚纱和西装都是衣服, 因此去参加听证会, 穿哪个都合适。19 世纪的欧洲战争和第一次世界大战 都是战争, 对吗? 所以一战同其他战争的破坏性一样, 这合理吗? 想像一下两个人发烧, 一定是由同种疾病引发的, 是吗? 当然不是。一个可能是鸡痘炎引发的, 而另一个或许是因为流感, 或者还有很多其他感染病。像你提到的全球 气温变暖, 这样的类比就是错的。你假设, 因为两个事件显示出了 同种特征, 在这里是气候变暖, 就认定它们其他地方存在类比性, 比如导致气候变暖的原因。但没有一项证据证明 这是对的。当然, 在地球的历史上还有其他 气温较高的时期, 但没有人对气候波动 产生过怀疑。让我们来仔细看一下气候变暖的一些古典实例, 可以吗? 白垩纪时期的温室气候, 9200 万年前, 温度非常高, 那时南极洲尚被森

林覆盖。火山活动可能使大气 二氧化碳含量上升，最终造成温室效应。始新世极暖时期， 5500 万年前，温度也非常高，那时鳄鱼可以在 北极圈游荡。气温升高可能是由 内陆海水干涸，以及甲烷释放所致， 甲烷是温室气体的重要成分，从海洋沉积物中产生。即使再举几个气候变暖的例子， 你的类比也是错的。当然，他们都受自然变化影响。但每个原因都不尽相同，并且造成气温升高的程度 和持续时间也不同。它们既相似，亦不同。综上所述， 我们能推理出地球的气候似乎是随着地球的环境而变化的。如今，人类活动 是影响地球环境的主要因素，所以人类活动正加速全球 气候变暖的说法是不可磨灭的。我相信， 事情越复杂，人们越容易使用 错误的类比。这是真的，因为错误推理的种类 实在是五花八门：比如相似的症状 一定是由同种原因引起的，比如采取相似措施 一定会产生相似结果，诸如此类。大部分错误类比，不如苹果和橘子的类比 那样显而易见，并且气候问题相当复杂。这就需要 细心、谨慎的研究，并收集证据，而错误类比只会阻碍研究进程。2013 年，联合国政府间 气候变化专门委员会成立，收集了过去几十年的研究，发现全球变暖的因素中 有超过 95%，自 20 世纪中期以来， 是由人类活动造成的，具体来讲就是化石燃料的燃烧。你们都是宠物，牠喜欢待在水里， 所以，你也应该那样。

P39 2021-04-06 Why good ideas get trapped in the valley of death— and how to rescue

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=39>)

They've passed every test, cleared every hurdle, jumped through every hoop. Now, all that remains is to unleash them on the world. But wait— what's this? Ah, yes, there's one more challenge. They must now across the valley of death. All new products must pass through here before they reach the market. Many never make it out, and sometimes that's OK— if they don't work, don't fill a need, or for any number of other reasons. But inventions that could help address massive global issues also face this risk. That's because a technology's potential isn't the only factor that determines whether it will succeed. The valley of death is especially risky for innovations involving complex physical objects as opposed to software, and for those in highly regulated industries, like medicine, building materials, and transportation. Regulations and other obstacles aren't inherently bad— they're often designed to keep people safe— but they do tend to scare off investors, and that's what traps good ideas in the valley of death: their funding dries up before they can become profitable. One of the fields where this problem is most pressing today is zero-carbon technologies. They're essential to our future because they will help us eliminate greenhouse gas emissions and stabilize our climate. But they also have features that make them particularly vulnerable in the valley of death. Let's look at why that is, and how we can change it. All new technologies must go through a development phase before they can become profitable. For zero-carbon technologies, the costs of this phase are high, the timelines are long, and, in spite of the good they can do, demand is often low because they can require big changes in both infrastructure and consumer behavior. For example, electric heat pumps don't burn fossil fuels and, when you factor in savings on energy use, are cost-competitive with gas furnaces, but homeowners only change their heating and cooling systems every few decades. Direct air capture technologies, meanwhile, remove CO2 directly from the atmosphere. We need these technologies to reach our emissions goals, and several of them have already been proven to work, but they're at risk of getting trapped in the valley of death because they're expensive. This creates a vicious cycle because the best way to lower costs is by, well, practicing: making more of a product and refining it. But high initial costs scare off investors, and without their money, companies can't continue to develop their technologies— and can't ultimately decrease costs. Fortunately, there's a way to break this cycle: governments can help close the gap, when private investors won't fund technologies with such a high potential for social benefit. This isn't just theoretical: in the 1990s, functioning solar panels existed, but weren't widely adopted because of their cost. To change this, Germany offered government loans to companies creating solar panels, and legally obligated utility companies to buy electricity produced using renewable energy. The U.S. and China followed suit by financing major solar panel projects. The cost of solar has dropped almost 90% since 2009, making it much easier to adopt. A similar thing happened for wind energy: during the oil crisis of the 1970s, Denmark invested in wind power and started taxing fossil fuel-based competitors. Other countries took similar steps, and as more wind power was generated worldwide, the costs of this technology dropped dramatically. These success stories tell us that government initiatives work— initiatives like boosting spending on research and development, offering tax and loan incentives to startups that want to develop zero-carbon technologies and consumers who want to buy them, and putting a price on carbon emissions. We need governments to do what they did for solar and wind for many more innovations. At the end of the day, ideas and inventions alone can't solve our most daunting problems— policies and markets have to be shaped so the most promising technologies can succeed.

P39 2021-04-06 Why good ideas get trapped in the valley of death— and how to rescue

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=39>)

翻译人员: Yu Xie 校对人员: Jiasi Hao 它们通过了每场测试、突破了所有障碍,跨越了每道坎。接下来所要做的一切就是 将它们公诸于世。但是,等一下!这是什么?噢,对,还有一个挑战。它们现在必须要通过死亡谷。所有新产品在推向市场前的 必经之地。许多产品在此跌倒后再没成功, 有时候,这是可以理解的——比如有的产品不可用、没有满足需求, 或者是其它一些原因。但那些能帮助解决世界难题的研发产品 也同样会面临类似的窘境。因为技术潜力并不是决定产品能否成功的唯一因素。死亡谷尤为危险,尤其是不同于软件, 包含复杂物理元件的发明,以及一些受到严格监管的行业,比如医疗、建材以及交通运输。监管以及其它障碍的本意 并不是阻挠新发明,而是为保障人类安全所设计的。但确实它们会吓跑一些投资人,而这也是造成好点子 最后夭折于死亡谷的原因:在研发产品开始盈利前 筹集的资金已消耗殆尽。现在受此现象影响较大的领域之一是零碳技术。它们对我们未来的发展非常重要,因为它们能够减少温室气体的排放,稳定地球气候。但是零碳技术本身 在面对死亡谷的时候,也有致命弱点。让我们探究一下为何会出现如此现象, 以及我们如何去改善这些薄弱点。所有的新兴技术在开始盈利前都会经过一个开发阶段。对于零碳技术来讲,在开发阶段里 投入成本很高、耗时长,而且除了技术对环境的正面影响,市场需求其实很小, 因为它们对于基础设施以及消费习惯的要求, 市场需要做出极大改变。比如,电热泵不燃烧化石燃料,而且从能源使用节省的角度考虑时,电热泵与燃烧煤气的成本相似,但是对居民而言, 加热和制冷系统往往几十年才更换一次。而此时,直接空气捕获技术能够直接把二氧化碳从大气中移除。我们需要这些技术 去达成我们的排放目标,有些技术也已经被证实有效,但因为费用高昂,但它们仍有可能被腰斩在死亡谷里。这就形成了一个恶性循环, 因为降低成本的最佳方式是实践:充分挖掘一个产品 并且不断对其进行改进。但是高昂的启动资金会吓跑投资者,没有了他们的投资,于是这些公司就无法继续 研发它们的技术——因此最终的产品使用成本 也不会降低。但是幸运的是,有一个方法 可以打破这个循环:政府可以介入来填平这个坑,尤其是当私人投资人不会对具有高社会回报率的技术 进行投资的时候。这并不仅存在于理论层面:在上世纪 90 年代, 功能太阳能电池板问世,但是由于它们的使用成本高, 市场渗透率很低。为改善这一情况,德国政府 向制造这些太阳能电池板的公司提供贷款,并且在法律上强制公用事业企业去购买这些利用可再生能源 产生的电力。美国与中国政府也随之 资助大型太阳能电池板项目。从 2009 年开始, 太阳能的成本下降了近乎 90%, 从而促进太阳能的推广。这同样也适用于风能:在上世纪 70 年代的石油危机中, 丹麦投资了风能并且向风能的竞争者 化石燃料征税。其它的国家也采取了类似举措,于是世界上越来越多的地方 开始生产风能,这项技术的成本也大幅下降。这些成功案例告诉我们 政府的积极倡议是有用的。比如增加对于研发的开支;面向开发零碳技术的创业公司 以及有购买需求的消费者提供税收和贷款优惠政策;为碳排放明码标价, 以向排放组织收取费用。我们需要政府为更多的创新发明做出它们推广太阳能和风能时的举措。到头来,单凭创意和发明本身不能解决现今最艰巨的问题。要使最具潜力的技术获得成功, 塑造适宜的政策和市场环境 为当务之急。

P40 2021-04-08 The surprising secrets of hummingbird flight - Kristiina J. Hurme and

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=40>)

And the clock starts... now. Did you miss it? It wasn't some bug buzzing by or a weird trick of the light. You just saw a hummingbird perform astonishing aerial acrobatics, eat lunch in midair, pollinate a flower, and then escape a threat upside down— all in a matter of seconds. So let's slow down the action, and unpack each step in this blazing-fast feast. First up, their incredibly rapid flight. Hummingbirds typically beat their wings 30 to 40 times per second, creating the high-frequency hum they're named for. To flap their wings at this speed, hummingbirds have evolved giant pectoral muscles that comprise over a third of some species' bodyweight. But the real secret to their fine-tuned flight is all in the wrist. Most birds only generate lift on the downstroke of each flap, while using the upward recovery stroke to set up their next wing beat. Hummingbirds however, turn their wrists during the upstroke, changing their wing's angle to flap in a figure 8 pattern that continually generates lift throughout their wingbeats. Alongside their massive muscles, this special lift-producing technique allows hummingbirds to achieve sustained hovering flight— an aerial feat no other bird can perform. Hovering lets hummingbirds slow to a stop almost instantly and assess scenarios in midair. Then, they can take off in any direction, reaching speeds faster than a fighter jet, relative to the bird's size. And since they can beat each of their wings at different speeds and

angles, the birds can perform incredible spins and turns all while flying backwards or even upside down. Of course, flying this way can be exhausting. Hovering is one of the most energy intensive forms of movement in the animal kingdom. And relative to their body size, hummingbirds have the highest metabolic rates of all vertebrates. This leads them to eat very frequently— often consuming an average of four meals an hour while flying. Fortunately, their hovering lets them eat at remarkable angles without perching, consuming food that would otherwise be impossible to reach. Using their long slender bills, they reach deep inside flowers and pump out nectar with their thin grooved tongues. This sugary liquid is a hummingbird's most important energy source, and a single bird consumes six times its weight in nectar every day over hundreds of small meals. Each of these sugary snacks also pollinates the flower being visited with pollen left on the bird from previous meals. That's just a rough idea of what hummingbirds can do in several seconds. But if we hang around a little longer, we might see their aerial acrobatics put to a more dangerous test. Hummingbirds keep track of which flowers they've recently drained, as well as those they plan to drain next. And each bird will fight ruthlessly to defend this floral territory from their only real competition: other hummingbirds. Using their spear-like bills and blindingly fast flight, dueling hummingbirds chase each other through the air, aggressively stabbing and plucking feathers. The bills of some species are specialized for fighting, with spiny tips, hooks, or even saw-like serrations. Some hummingbirds employ these aerial fencing techniques to chase off larger birds like hawks and owls. But the most extreme fights are between male hummingbirds competing for flowers and females. Fortunately, these duels are rarely deadly. After 15 to 20 seconds, one bird will typically surrender— flying off to seek its breakfast elsewhere. After all this fighting, feeding, and flying, hummingbirds sometimes need to sleep off the day's events in a mild form of hibernation called torpor. Their hearts— proportionally the largest in the animal kingdom— slow from 1,200 beats per minute to a mere 50. But when they wake up 4 to 7 hours later, their lightning-fast metabolism kicks back into gear. With all this speed and strength, it's no wonder the Aztecs revered these energetic birds as agents of the god of war Huitzilopochtli— a reminder that immense power can come in the smallest packages.

P40 2021-04-08 The surprising secrets of hummingbird flight - Kristiina J. Hurme and

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=40>)

翻译人员: Annie Hu 校对人员: Helen Chang 开始计时...现在就开始。你错过了吗? 这不是什么嗡嗡的虫子 或什么光的诡计。你刚才看到的是一只蜂鸟 正在表演牠惊人的空中杂技, 在空中吃饭, 给花授粉, 让后倒挂地逃避威胁--在几秒中之内。让我们把牠的行动慢下来 看一下牠快速动作的每一步。首先, 牠们快速地飞行。蜂鸟一般在一秒钟的时间里 拍打牠们的翅膀 30-40 次, 产生一种高频嗡嗡声, 这就是牠们名字的来源。为要这种速度的拍打翅膀, 蜂鸟的胸肌进化地十分强壮, 有些种类的胸肌重量 占身体总重量的 33% 以上。使牠们精确飞行的真正秘密 在于牠们的手腕。大部分的鸟只能在 翅膀往下压时产生升力, 然后用牠们翅膀往上翘时 准备下一次的翼拍。但是蜂鸟在上行时会转动牠们的腕, 把牠们翅膀的角度改一下, 然后划 8 字飞行。使牠们拍动翅膀的时候, 身体一直会向上升。加上牠们的超大胸肌, 这种特殊的举升技术帮助蜂鸟在空中停留, 一种其他的鸟没法完成的空中表演。在空中停留可以帮助蜂鸟迅速停止, 在空中观察周围的情况。然后朝着任何方向去飞行, 达到比战斗机还快的速度, 相对于鸟的大小。因为牠们可以在不同的速度和角度 拍打牠们的翅膀, 这些鸟可以在向后和倒挂飞的情况下表演出难以置信的旋转和转弯。当然, 这样子飞行很辛苦。空中停留是动物世界里最累人的运动形式之一。还有, 相对于牠们身体的大小, 蜂鸟在脊椎动物里有最快的代谢速率。这导致牠们吃得非常频繁, 在飞行时一个小时就会吃四顿。幸运的是, 牠们在空中可以 以异常角度在不栖息的情况下吃, 吃到一般的情况下 根本够不到的食物。是用牠们的细长的喙, 蜂鸟可以深入花朵内部, 并用牠们的细槽舌片抽出花粉。这种甜蜜的液体是蜂鸟最宝贵的营养, 牠们一天会吃六倍于体重的花蜜, 每天进食超过一百次。牠们每一次吃花蜜的时候会用以前粘在牠们的脚上的花粉 来给新花授粉。这只是大概概括蜂鸟几秒钟 就能够完成的实情。但是要是我们继续观察, 我们能看到考验牠们的 危险空中飞行技能。蜂鸟会追踪牠们最近采撷过的花, 还有牠们准备要采撷的花。每一只鸟会为了自己的领地 和牠们的对手: 其他的蜂鸟无情地斗争。使用牠们像剑一样锋利的喙, 还有令人眼花缭乱的快速飞行, 正在搏斗的蜂鸟会在空中追打, 使劲的相互啄和拔对方的羽毛。有些物种的喙是专门用来争斗的, 牠们带有刺尖, 钩子, 还有锯齿状。有些蜂鸟会用空中击剑技术来赶走一些像鹰和猫头鹰的大鸟。但最极端的打架发生在公鸟之间, 当牠们在为母鸟和食物竞争。幸运的是, 这些斗争很少致命。一般过了 15 到 20 秒以后 一只鸟会投降, 飞到别处去找吃的。等这些争斗、进食和飞行结束以后, 蜂鸟有时需要用一种 温和的冬眠形式来结束一天的活动, 称为麻木。牠们的心脏, 按比例是动物界最大的, 会从 1,200/分钟降到 50/分钟。但等牠们 4-7 个小时醒来之后, 牠们闪电般的新陈代谢重新启

动。像这么有力气和速度的鸟，难怪阿兹特克人尊敬牠们，把牠们当成所崇拜上帝 Huitzilopochtli 的代言人。让人们记得，最小的生物 可以有巨大的力量。

P41 2021-04-12 This tool will help improve your critical thinking - Erick Wilberding

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=41>)

Socrates, one of the founding fathers of Western philosophical thought, was on trial. Many Athenians believed he was a dangerous enemy of the state, accusing the philosopher of corrupting the youth and refusing to recognize their gods. However, Socrates wasn't feared for claiming to have all the answers, but rather, for asking too many questions. While he loathed formal lectures, the philosopher frequently engaged friends and strangers in lengthy conversations about morality and society. These discussions weren't debates, nor would Socrates offer explicit advice. In fact, the philosopher often claimed to know nothing at all, responding to his partner's answers only with further questions. But through this process, Socrates probed their logic, revealing its flaws and helping both parties reach a more robust understanding. These insightful questions made Socrates beloved by his followers. Two of his students, Plato and Xenophon, were so inspired that they replicated their mentor's process in fictional dialogues. These invented exchanges provide perfect examples of what would come to be known as the Socratic Method. In one of these fabricated dialogues, Socrates is conversing with a young man named Euthydemus, who is confident that he understands the nature of justice and injustice. Socrates probes the student's values by asking him to label actions such as lying and theft as just or unjust. Euthydemus confidently categorizes them as injustices, but this only prompts another question: is it just for a general to deceive or pillage a hostile army? Euthydemus revises his assertion. He claims that these actions are just when done to enemies, and unjust when done to friends. But Socrates isn't finished. He asks the young man to consider a commander lying to his troops to boost their morale. Before long, Euthydemus is despondent. It seems that every answer leads to further problems, and perhaps he's not quite sure what constitutes justice after all. In employing this question-oriented approach, Socrates described himself as a midwife, whose inquiries assist others in giving birth to their ideas. His method of questioning draws out an individual's unexamined assumptions, and then challenges those biases. It doesn't always provide definitive answers, but the method helps clarify the questions and eliminate contradictory or circular logic. And by following a line of inquiry where it logically leads, both the question asker and answerer can end up in unexpected places. This technique isn't limited by the conversation's content, making it incredibly useful in numerous fields. During the Renaissance, the method was used to teach clinical medicine. Students proposed their rationale for different diagnoses, while a doctor questioned their assumptions and moderated discussion. In this model, the method could even produce conclusive results. This same approach was later used in other sciences, such as astronomy, botany, and mathematics. Following the Protestant Reformation, it was adapted to tackle abstract questions of faith. In the 19th century, the method became an essential part of American legal education. Professors explored students' understanding of judicial reasoning by challenging them with unforeseen hypothetical situations. This approach is still used today by the Supreme Court to imagine the unintended impacts of passing a law. The Socratic Method can be adapted to teach almost any topic that relies on critical reasoning, but its success depends on the teacher employing it. An effective Socratic educator must be well versed in their subject. Rather than bullying their students or showing off their superior intellect, they should be modest, genuinely curious, and affirming of every contribution. In this regard, Socrates himself may not have been the most subtle Socratic teacher. Historians believe he was deeply critical of Athens' particular brand of democracy, and known to pass those concerns onto his followers. These subversive beliefs were distorted in public forums and thought to have inspired two of his pupils to treasonous ends. It was likely for these ideas Socrates was brought to trial, and eventually, sentenced to death. But even on his deathbed, artists depict a serene philosopher—ever curious to explore the ultimate question.

P41 2021-04-12 This tool will help improve your critical thinking - Erick Wilberding

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=41>)

翻译人员: 校对人员: Helen Chang 苏格拉底, 西方哲学奠基人之一, 在接受审判。许多雅典人觉得 他是危险人物、全民公敌, 便指控这位哲学误导青年, 亵渎神明。然而人们并不是害怕苏格拉底 声称自己全知, 而是害怕他提出太多的问题。他厌恶形式化教育, 经常召集朋友和陌生人一起深入探讨道德与社会。他们只讨论, 不辩论, 苏格拉底

也不明确给出自己的观点。事实上，这位哲学家时常称自己是无知者。面对他人的回答，他只会提出更深入的问题。借此，苏格拉底试探他们的逻辑思维，揭露其中的缺陷，使双方对此达成更深刻的理解。苏格拉底见解独到，这使他深受追随者的喜爱。他的两个学生，柏拉图和色诺芬深受启发，并以对话的形式把老师的名言记录了下来。这些创造性的对话构造了未来著名的苏格拉底法则。在其中一个虚构的对话中，苏格拉底与一个名为欧绪德谟的年轻人交谈，那名男子确信自己理解正义与不公的本质。为了探索学生的价值观，苏格拉底让他将一些行为进行分门别类，如撒谎和偷窃是否正义。欧绪德谟十分有把握地将这些行为归位不正义，但这引发了另一个思考：一名将军欺骗或抢掠敌军，这是正义的行为吗？欧绪德谟补充了自己的论断。他称这些行为对敌人是正义的，于朋友而言，是不义。但苏格拉底不会轻易放弃。他接着问，如果一名指挥官为鼓舞士兵的士气而撒谎呢？不久，欧绪德谟便感到沮丧。每一个回答似乎都能引起深刻的思考，或许他也不清楚正义到底是什么。在运用这一问答法时，苏格拉底觉得自己像是一名助产士，通过质疑，帮助他人诞生自己的想法。他先是提出未经考察的假设，再挑战那些偏见。使用这种方法或许不能提供确切的答案，但这能更好地阐明问题，解决矛盾，打破逻辑循环。通过一系列富有逻辑的质问，问题提出者和回答者都会有意想不到的收获。这一方法不受对话内容的限制，因此可以在多个领域使用。文艺复兴时期，该方法用于临床医学教学中。根据不同诊断结论，学生给出自己的诊断原理，而一名医生对他们的假设提出疑问，进而主导了讨论。在这种情况下，通过问答法，甚至可以得出一个明确的结论。同一方法后来也运用在其他学科中，如天文学、植物学和数学。在宗教改革之后，该方法用于解决抽象的信仰问题。在19世纪，此方法成为美国法律教育的重要组成部分。教授们假设不可预知的案例，以此检验学生对于司法推理的理解。今天，最高法院仍然使用这种方法来预测新法律可能带来的影响。苏格拉底法几乎适用于各种需要批判性思维的教学主题。但其效果取决于教师如何使用这一方法。若想通过苏格拉底法取得成效，该教师必须精通自己的学科。他们不应该欺负学生或是炫耀自己的聪明才智，而应该保持谦虚，真诚地好奇，肯定每一项贡献。在这方面，苏格拉底自己可能并没有察觉到，自己创建了这一方法。历史学家认为他对雅典特有的民主政治持猛烈的批评意见，并将其担忧传递给了他的追随者。这些颠覆性的信仰在公民大会上受到曲解，导致他的两个学生犯下叛国罪。很可能是因为这些想法，苏格拉底受到审判，最终判以死刑。但即使在临终之际，艺术家们也描绘了一位面容安详的哲学家，他总是好奇地探索终极问题。

P42 2021-04-13 Whatever happened to acid rain - Joseph Goffman

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=42>)

In 1963, scientists studying Hubbard Brook Experimental Forest in New Hampshire made a shocking discovery. Their most recent rainfall samples were nearly 100 times more acidic than usual. At these levels, additional downpours of acid rain would destroy the region's marine and arboreal ecosystems in a matter of decades. Urgently sharing their findings with fellow researchers, they were determined to answer two questions: what was causing this deadly rainfall? And what could be done to stop it? Rain is never just composed of water. Chemicals and particulates in the atmosphere can be found in every drop, and some compounds—like carbon dioxide—make even regular rainfall slightly acidic. But this pales in comparison to the powerful acids produced when water interacts with oxides of nitrogen or sulfur dioxide. On the pH scale which measures acidity, each whole number is 10 times more acidic than the one above it. And where normal rain has a pH of roughly 5.4, rain that's interacted with these gases can rank as low as 3.7. Oxides of nitrogen and sulfur dioxide can appear naturally as a short-lived byproduct of volcanic eruptions or lightning strikes. But power plants, refineries, and vehicles that use fossil fuels consistently pump large quantities into the air. These dangerous gases travel with the wind spreading hundreds of kilometers from the pollution's source. Acting like roaming clouds of destruction, their presence dramatically increases the acidity of local precipitation, creating acid rain, acid snow, and acid fog. These all acidify lakes and streams, kill crops and forests, and damage soil to inhibit future growth. Over time, acid rain can even corrode human structures made of stone or metal. By the 1970s, scientists in North America and Europe classified acid rain as a major environmental threat. But despite clear evidence tying the problem to air pollution, companies denied responsibility and cast doubt on the research. In the United States, corporations lobbied against regulating pollution, and convinced politicians that such policies would raise energy costs and threaten jobs. These obstacles led the government to delay changes, and mandate further research into the issue. But after a decade of mounting concern, Congress finally took action. Since the bulk of sulfur dioxide emissions came from power plants, the government set a limit on the total amount of it the electric power sector could emit each year. Then, they divided the permitted emissions into a fixed number of "allowances" distributed to each power plant. A plant could then choose to emit

as much sulfur dioxide as they were allowed, or reduce their emissions and sell their unused allowances to other power plants. This system, known as “cap and trade,” offered power plants the economic flexibility to keep costs low while strictly limiting pollution. Many critics called these allowances licenses to pollute, or said the government was selling clean air. But since the cap was set to lower five years into the program, it forced every utility company to reduce emissions in the long term. Some plants added desulfurizing scrubbers to their smokestacks, or switched to low-sulfur coal and natural gas. Oxides of nitrogen emissions were also reduced with relatively low-cost technologies. These advances allowed the power sector to grow while the cap kept pollution under control. By 1985, Canada and the European Union adopted their own solutions, and international treaties began circulating to reduce air pollution worldwide. Today, this science-driven economic policy has largely eliminated acid rain across the United States and Canada. And while many ecosystems still need time to recover, scientists have sped up the restoration of other areas by reintroducing essential organisms killed off by acid rain. Some countries, like Russia, India, and China still rely heavily on high-sulfur coal and continue to struggle with the environmental consequences. However, acid rain’s relatively quick journey from major threat to minor issue is rightly celebrated as a victory for policies that protect the environment. Cap and trade can’t solve every environmental problem. But by using scientific consensus to guide policy, adopting efficient technology, and being unafraid to impose reasonable costs for pollution, countries can stop a growing storm of destruction before it’s too late.

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[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=42>)

翻译人员: Lh T 校对人员: Helen Chang 1963 年, 在汉普郡哈伯德 布鲁克实验林学习的科学家们有了一个惊人的发现他们最近雨水样本的酸度 几乎是往常酸度的 100 倍在这样的酸度水平下, 更多的雨量将在几十年内摧毁地区的海洋和林木生态系统迫切地想与其他研究员 分享他们的这个发现他们决定回答两个问题:是什么使雨水变得致命? 我们能做什么去阻止它? 雨水不止是由水组成每滴雨水中都发现 含有大气中的化学物质和微粒和某些化合物,像二氧化碳使正常的雨水有些微酸性但和水与氮的氧化物 或与二氧化硫形成的强酸时相比这酸度就显得相形见绌了在用 pH 尺度衡量酸度时每个整数比后一个整数酸 10 倍正常雨水的 pH 大约是 5.4 雨水若是与这些气体作用 将会使此等级降至 3.7 含氮氧化物和二氧化硫能在火山爆发和雷击时 作为产生的天然副产物短暂在世停留但是发电厂, 提炼厂 和使用化石燃料的交通工具持续地将这些氧化物泵到空气中这些有害气体随风从源头地流动几百千米扩散到各地就像在漫游的有毁灭性的风它们的到来使当地雨水的酸度 有了显著的升高就产生了酸雨、酸性雪、酸雾这些酸性湖泊和溪流毁掉了作物和林木损害土壤, 抑制了植物以后的生长随着时间的推移, 酸雨也会腐蚀 人类用石头和金属所造的建筑在二十世纪 70 年代 北美和欧洲的科学家将酸雨视为排在首位的环境威胁但是即使空气污染和有害气体的排放有明显的联系企业也否认他们应该承担责任 并对此项调查提出了质疑在美国, 企业游说反对控制污染说服政客, 倘若实行这种政策将会耗费更多的能源资金且威胁到就业这些障碍让政府推迟了改变下令让此项目做进一步的研究但在十年后关注度越来越多以后 国会终于采取了行动因为大部分二氧化硫是 从发电厂排放出来的政府限制其电力部门每年容许的总排量然后, 他们将允许的排放量 分成固定数量的配额分配给每个发电厂工厂可以在允许范围内 选择排放尽可能多的二氧化硫或者缩小排放量, 并把他们 未使用的配额卖给其他发电厂这个体制名为“总量管制与交易”保障了当严格的污染限制条令下发时发电厂保持低成本的灵活经济性许多批评人士称这些为 免税额污染许可证或者说政府卖干净的空气但由于上限被设定为 五年后还要降得更低它迫使所有公用事业公司长期削减排放一些工厂在他们的烟囱增加了脱硫机或者改用低硫煤和天然气用相对低成本的技术 也减少了氮氧化物的排放这些进步使电力部门得以发展而上限使污染得到控制到 1985 年, 加拿大和欧盟 采用了各自的解决方案国际条约开始相继使用为了减少全球大气污染如今, 这种以科学为导向的经济政策 已在很大程度上消除了酸雨涵盖整个美国和加拿大尽管许多生态系统仍然需要时间来恢复科学家们通过引入 被酸雨杀死的必要生物体来加快修复其他地区的进程有些国家, 像俄罗斯、印度和中国仍然极度依赖高硫煤将继续与环境带来的后果作斗争然而, 酸雨相对迅速地 从重大威胁变成了次要问题是环境保护政策的胜利“总量管制与交易” 不能解决每个环境问题但通过运用科学共识指导政策运用有效的科技手段不惧因为污染施加的合理成本国家们还能在不算晚的日子 制止一场正在壮大的毁灭性风暴

P43 2021-04-15 Why are airplanes slower than they used to be - Alex Gendler

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=43>)

In 1996, a British Airways plane flew from New York to London in a record-breaking two hours and 53 minutes. Today, however, passengers flying the same route can expect to spend no less than six hours in the air— twice as long. So why, in a world where everything seems to be getting faster, have commercial flights lagged behind? The British-and-French-made Concorde began shuttling passengers across the sky in the 1970s. Jetting between destinations like New York, Paris, Bahrain, and Singapore, it clocked in at over 2,000 kilometers per hour, more than twice the speed of a normal airliner. However this was also about 800 kilometers per hour faster than the speed of sound. And that created a surprising problem for people on the ground. When an object moves at supersonic speed, it generates a continuous moving shockwave known as a sonic boom. This produces a loud, startling noise, as well as rattling windows and dislodging structural elements of buildings. Since a plane flying at an altitude of 15 kilometers can affect an area with an 80 kilometer diameter on the ground below, complaints and concerns from residents in the Concorde's flight path restricted it to mostly ocean routes. Because of these restrictions and other fuel and engineering requirements, supersonic flights turned out to be very expensive for both airlines and passengers. A single transatlantic round-trip could cost the equivalent of more than \$10,000 today. With additional strain on the airline industry due to decreased demand for flights after September 11th, 2001, this became unsustainable, and the Concorde was retired in 2003. So even when superfast flights existed, they weren't standard commercial flights. And while we might think that advances in flight technology would make fast flights less expensive, this hasn't necessarily been the case. One of the biggest concerns is fuel economy. Over the decades, jet engines have become a lot more efficient, taking in more air and achieving more thrust— traveling further for every liter of fuel. But this efficiency is only achieved at speeds of up to around 900 kilometers per hour— less than half the speed of the Concorde. Going any faster would increase air intake and burn more fuel per kilometer flown. A standard transatlantic flight still uses as much as 150,000 liters of fuel, amounting to over 20% of an airline's total expenses. So any reduction in fuel economy and increase in speed would significantly increase both flight costs and environmental impact. What about ways to make a plane faster without burning lots of fuel? Adjusting the wing sweep, or the angle at which wings protrude from the fuselage, to bring the wings closer in can make an aircraft faster by reducing aerodynamic drag. But this means the wings must be longer to achieve the same wingspan, and that means more materials and more weight, which in turn means burning more fuel. So while airplanes could be designed to be more aerodynamic, this would make them more expensive. And generally, airlines have found that customer demand for faster flights is not sufficient to cover these costs. So while military aircraft conduct high speed flights over water and at high altitudes, supersonic commercial flights seemed like a brief and failed experiment. But recent advances may make them feasible again. Research by NASA and DARPA has shown that modifying an aircraft's shape can reduce the impact of its sonic boom by 1/3. Extending the nose with a long spike can break the shockwave into smaller ones, while another proposed design features two sets of wings producing waves that cancel each other out. And new technologies may solve the energy efficiency problem with alternative and synthetic fuels, or even hybrid-electric planes. It may yet turn out that the last few decades of steady flying were just a brief rest stop.

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翻译人员: Jiasi Hao 校对人员: Yanyan Hong 在 1996 年, 一架英国航空的航班破记录用时 2 小时 53 分钟 从纽约抵达伦敦。不过如今, 乘坐同一航线的乘客至少要在空中花费 6 小时—— 记录时长的 2 倍。那么, 为何当整个世界加快步伐时, 商业航班是否已经落后? 在 1970 年代, 英法共同制造的协和式飞机开始运送乘客, 穿梭往返于纽约、巴黎、巴林和新加坡等目的地。该机型能以 2000 公里的时速飞行, 这是普通客机时速的 2 倍。然而, 由于这个时速 比音速还要快上 800 公里, 给地面上的居民 带来了意料之外的困扰。当物体以超音速移动, 它会产生连续移动的冲击波, 也就是所谓的“声震”。声震会发出巨大、吓人的噪音, 同时造成窗户震动, 使建筑物部件发生脱落。一架飞在 15 千米高空的航班可以影响到下方 直径为 80 公里内的地区, 因此, 遭到协和式飞机航线 周边居民的控诉与忧虑, 而将飞行限制在跨海洋航线。因为这些限制以及 其它的燃料和技术需求, 超音速飞行对航司和乘客而言就变得十分昂贵。一次跨大西洋往返的费用相当于今天的 1 万美元。自 2001 年 911 恐袭事件后, 人们对航班需求的减少给航空业带来了额外的压力, 高成本使其不可持续, 协和式飞机也于 2003 年退役。因此, 即使有超高速航班存在, 它们也不适用标准商用飞行。同时, 我们可能会想 随着航空技术的进步提高飞行速度的成本

会降低，事实却非如此。其中一个最大的担忧就是 燃油经济性。过去几十年， 喷气发动机变得更加高效，它们能吸收更多空气 并获得更大的推动力——每升燃油支持的航程会增加。然而达到这一燃油效率的前提是保持时速 900 公里左右的飞行——协和式飞机时速的一半。再快就会增加进气量 并在每公里的飞行中消耗更多的燃料。一次标准的跨大西洋航班 仍要使用多达 15 万升燃料，占航空公司总支出的 20% 以上。因此，任何燃油经济性的降低 和速度的提高都会大大增加 飞行成本和环境影响。那有办法不消耗大量燃油 使飞机飞得更快吗？调整机翼的后掠角 或机翼从机身延长出的角度，使机翼更接近， 可以通过减少空气动力阻力使飞机更快。但这意味着机翼必须加长 以达到相同翼展，意味着机翼需要更多材料， 飞机会因此变重，结果还是要增加燃料。所以，尽管飞机可以设计得 更符合空气动力学，但这会增加成本。总体来说，航司发现 乘客对于飞机提速的需求不足以弥补这些成本。所以，当军用飞机能在水上和高空进行高速飞行任务时，超音速商用飞机 似乎就像一个短暂且失败的实验。不过，近期的科学发展 或许能让它们再次变为可能。美国航天局和国防高级研究计划局的研究 表明改进飞机外形可以减少三分之一的声震影响。一种方案是用长钉子延长机头 将冲击波分解成更小的冲击波，另一种拟议的设计 则以两组机翼为特征产生冲击波，互相抵消。而新技术可以用替代和合成燃料，甚至是混合动力飞机， 解决能源效率问题。事实可能证明， 过去几十年的稳健飞行只是短暂的休息。

P44 2021-04-19 The world's most painful insect sting - Justin Schmidt

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=44>)

Welcome to It Hurts! One of these creatures is thought to possess the world's most painful insect sting. If you were to guess, would it be: the ant that forages in rainforest canopies? The bee that protects a hive of delectable honey? Or the wasp that paralyzes tarantulas? Let's find out! Ant, bee, and wasp venoms contain a variable cocktail of compounds designed to incite unsavory sensations and even compromise bodily functions. Entomologist Justin O. Schmidt's sting pain index describes and ranks the pain of around 100 kinds of insect stings. One of our three competitors claims the nastiest one. First, let's consider the Western honeybee's sting, Schmidt says it's like "a flaming match head has landed on your arm and is quenched first with lye and then sulfuric acid." This discomfort is accomplished with venom that's packed with a pain-causing peptide called "melittin" and flesh-softening enzymes that disperse the venom. These enzymes may also cause allergic reactions and even lead to fluid buildup in the lungs. Because worker honeybees have barbed stingers that burrow into certain victims, they usually can't sting without leaving part of their bodies behind, which ultimately kills them. Since only the queen bee has the ability to reproduce, a worker bee's self-sacrifice helps ensure that the colony—and their genes—will prevail. But before they go, they release an alarm pheromone that activates a mass attack and often targets some of the most vulnerable sites on their victim's body. The tarantula hawk wasp sting is, as Schmidt says, "blinding, fierce, shockingly electric ... A bolt out of the heavens. Lie down and scream." The sensation might last just 5 agonizing minutes for humans, but it leaves tarantulas—the wasp's preferred target—permanently paralyzed. After the wasp stings a tarantula, aiming for a crucial bundle of nerves, it lays an egg on the immobilized spider. Once hatched, the wasp's larva spends its formative days in the bountiful environment of the tarantula's body—devouring it alive. Aside from paralyzing the tarantula, the wasp's sting doesn't seem to do further harm. This functions to preserve the spider as fresh meat for the wasp's offspring. The rainforest-dwelling bullet ant's sting yields "pure, intense, brilliant pain. Like walking over a flaming bed of charcoal with a 3-inch nail embedded in your heel," according to Schmidt. And this torture often lasts more than 12 hours. A neurotoxic peptide called poneratoxin that our bodies struggle to degrade is what makes the pain last so long. In addition to agony, poneratoxin can induce trembling, cold sweats, nausea, vomiting, and even an abnormal heartbeat. The bullet ant is, in fact, crowned with the most painful insect sting. It's thought that they may have evolved such an excruciating defense because they forage in rainforest canopies loaded with predators looking for proteinaceous snacks. They can't simply jump or fly away, so perhaps they're better off with this reliable, rather off-putting weapon. The tarantula hawk wasp's formidable sting clocks in as the second most painful on the scale. And it's likely the reason this wasp has no known predators. Honeybee stings are in the middle of the pain scale. But when many sting simultaneously, what might've felt manageable at first becomes all the more dangerous. In fact, insect stings helped enable the evolution of complex colonies that would otherwise represent an easy feast to predators. Some stinging insects are, of course, more aggressive than others, but most of the time, they only sting us when we provoke them. The truth hurts.

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翻译人员: Annie Hu 校对人员: Helen Chang 欢迎来到好疼呀! 其中的一个昆虫好像有世界上最疼的叮咬。要是猜, 你会猜是: 雨林的蚂蚁? 保护自己美味蜂蜜的蜜蜂? 还是猜瘫痪狼蛛的黄蜂? 让我们看看吧! 蚂蚁、蜜蜂, 和黄蜂的毒液 有各种各样的化合物, 会造成不愉快的感觉, 甚至还损害身体的机能。昆虫学家 Justin O. Schmidt 的疼痛指数描述和排列差不多一百种 昆虫叮咬的疼痛。三者之一有最疼的刺。首先, 让我们看一下西方蜜蜂的刺, Schmidt 说就像 “正在燃烧的 火柴头掉到你的胳膊上, 先灌满碱液, 然后硫酸。“痛楚伴随着毒液, 名为“梅利疼”, 是一种会造成疼痛的肽, 还有会分散毒液的肉软化酶。这些酶还能造成过敏反应, 甚至导致肺部积液。因为蜜蜂有能够钻进身体的毒刺, 叮咬后必然会留下其身体的一部分, 最终造成它们死亡。因为只有女王蜂可以繁殖, 一只工蜂的自我牺牲能确保群体和基因获胜。但是它们死去之前会释放发动攻击的劲爆信息素, 通常针对受害者身上最脆弱的地方。Schmidt 说被狼蛛鹰黄蜂刺“会致盲, 极为剧烈, 就被电击, 天上打下来的电击, 会倒地惨叫。“刺在人身上, 可能会惨痛地持续 5 分钟, 但如果叮在黄蜂最喜爱的目标—— 狼蛛——的身上, 狼蛛会永远瘫痪。黄蜂叮狼蛛会瞄准关键的神经束, 在瘫痪的蜘蛛上下蛋。孵化后, 黄蜂的幼虫在成长期有蜘蛛身体提供的丰富营养, 生吃活蛛。除了瘫痪狼蛛之外, 黄蜂的刺看似没有什么其他的伤害。功用是为蜂的后代提供生鲜肉食。住在雨林的子弹蚁的刺会造成“纯、激烈, 和绝妙的疼痛。像走在燃烧的木炭堆上, 脚跟还踩着 3 寸的钉子“ Schmidt 说。这种这么经常会持续超过 12 个小时。我们的身体很难降解 一种叫红霉素的神经毒素是造成持久疼痛的原因。除了痛苦之外, 红霉素 还会造成发抖、冒冷汗、恶心、呕吐, 还有心跳异常。子弹蚁蛰伤其实最让人疼痛的。人们认为它们进化 如此疼痛的防备, 有可能是因为它们活在藏满了捕食者的环境下, 那些捕食者都在找有营养的零食。它们不能简简单单地跳走或飞走, 所以还不如有一种靠谱、勿近的武器。狼蛛鹰黄蜂强大的刺让它排在疼痛量表的第二名。这个原因很可能是 它没有已知捕食者的原因。蜜蜂刺在疼痛量表中排名在中间。但是许多蜜蜂同时叮的时候, 原可忍受的疼痛 就突然变得更危险了。其实, 昆虫的叮咬起到了 发展复杂的群体的作用, 要不然, 这些群体就容易被捕食了。当然, 有些带刺的昆虫 比其它的更具侵略性, 但通常只在我们激怒它们时 才叮咬我们。真相很伤人。

P45 2021-04-22 How do wind turbines work - Rebecca J. Barthelmie and Sara C. Pryor

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=45>)

Every 24 hours, wind generates enough kinetic energy to produce roughly 35 times more electricity than humanity uses each day. And unlike coal or oil, this resource is totally renewed each day. So how can we harness this incredible amount of energy, and is it possible to create a world powered entirely by wind? The basic principle of wind energy is simple. A series of sails or blades mounted around a rotor catch the wind and translate its kinetic energy into rotational energy. Traditional windmills use that rotational energy to grind wheat or pump water. But in modern wind turbines, it turns a generator that creates electricity. This conversion from wind to rotational energy to electricity has defined wind turbines since their invention in the late 19th century. And there are three primary factors that determine just how much energy they can produce: the size and orientation of the blades, the blade's aerodynamic design, and the amount of wind turning the rotor. First up, blade orientation. Wind turbines can be designed with their rotor on a vertical axis or a horizontal axis. Vertical blades can pick up wind coming from any direction, but with much less efficiency than horizontal axis rotors. Horizontal designs allow blades to capture the wind's full force by tracking the wind's direction and turning to face it. This turning process is called yawing, and older windmills achieved it through manual monitoring. Today, wind sensors and computer systems automatically adjust the blades with expert precision to capture as much energy as possible. Outside rotor orientation, the blades themselves need to be shaped to maximize efficiency. While early designs used flat blades, modern blades are curved like airplane wings. Wind travels faster over the curved surface, creating a low-pressure pocket above the blade that forces it upwards. Since the amount of lift depends on the angle at which the wind is moving relative to the blade, modern blades also incorporate a twist, optimizing how much of the blade can cut into the wind. Made of fiberglass and resin layers, these blades are strong enough to operate through rain, lightning, and blistering sunlight for over 20 years. Even with aerodynamic blades and a horizontal rotor, a wind turbine can only capture wind if it's in a windy environment. Wind speeds typically increase the higher into the atmosphere you travel. So today, most turbines are well over 100 meters tall, with equally large rotor diameters. A turbine of this height and size can capture a huge amount of wind, generating enough electricity every year to power 750 American homes. A wind farm of 200 similarly sized turbines could power over 150,000 American homes— or twice as many European homes— for

an entire year. Offshore wind farms contain an even greater number of even larger turbines. In 2019, the largest wind turbine ever built began operating off the coast of the Netherlands. With a rotor diameter of 220 meters, just one of these turbines can meet the annual power needs of 16,000 European households. Despite its amazing potential, wind energy still faces challenges. Wind may be a free and unlimited fuel, but no matter how large or efficient a turbine is there's a mathematical limit to how much wind it can convert into electricity. German physicist Albert Betz calculated that since some wind must remain to keep the blades spinning, a turbine can only ever capture 59.3% of the wind's energy. Additionally, some people feel turbines disrupt natural scenery, and wind energy's intermittent availability can make it difficult to integrate into electrical grids. But even with these challenges, modern wind turbines have made wind energy the most efficient and inexpensive source of electricity. Wind turbines already provide essential energy for communities around the world. And for many farmers, hosting a wind turbine can be a reliable source of additional income. With continued improvements in wind forecasting, electrical grid infrastructure and energy storage, wind power might blow away all our energy problems.

P45 2021-04-22 How do wind turbines work - Rebecca J. Barthelmie and Sara C. Pryor

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翻译人员: Helen Chang 校对人员: Wanting Zhong 每 24 小时, 风所产生的动能大约是全人类每日用电量的 35 倍。与煤炭或石油不同, 这种资源每天都会完全更新。那么, 我们能如何驾驭 如此大量的能源, 是否能让世界完全由风力供能? 风能的基本原则很简单。风吹动一系列叶片, 转动转子, 把风的动能转换为旋转能。传统的风车用旋转能磨麦或抽水。但现代的风力涡轮机 转动发电机来产生电力。自从 19 世纪后期发明以来, 这种从风到旋转能再到电力的转换 就定义了风力涡轮机。有三个主要因素决定 它们能够产生多少能量: 叶片的大小和方向, 叶片的空气动力学设计, 以及转动转子的风量。首先是叶片的方向。风力涡轮机的转子可设计在垂直轴或水平轴上。垂直叶片能捕获任何方向的风, 但效率比水平轴转子要低得多。水平设计能让叶片 追踪并正对来风的方向, 从而捕获全部风力。这种转向的过程称为偏航, 旧式风车需通过人工监控进行调整。如今, 风传感器和计算机系统 能以专业精度自动调整叶片, 以捕获尽可能多的能量。除了转子的方向, 叶片本身也要做成 能把效率最大化的形状。早期的叶片采用平板设计, 现代的叶片则像飞机机翼一样弯曲。弯曲的上表面能提高风速, 在叶片上方产生低压区, 迫使叶片上抬。由于升力大小取决于风相对于叶片的移动角度, 现代的叶片还加入了扭力, 能优化叶片切入风的程度。这些由玻璃纤维和树脂层 制成的叶片足够牢固, 能在雨中、闪电里和烈日下 运作超过 20 年。即使有空气动力学叶片和水平转子, 风力涡轮机也只能 在风大的环境中捕获风能。一般来说, 在大气层中越高, 风速就越大。所以当今大多数涡轮机 都超过 100 米高, 转子直径同样也很大。一座这种高度和尺寸的涡轮机 能捕获大量的风, 每年产生的电力 足够为 750 户美国家庭供电。一个风力发电厂 配备 200 组类似大小的涡轮机, 就能为超过 15 万户美国家庭——或超过 30 万户欧洲家庭——提供一整年的用电。离岸风力发电厂配备的涡轮机 数量与尺寸还要更大。2019 年, 有史以来 最大的风力发电机开始在荷兰沿海地区投入使用。它的转子直径为 220 米, 仅一台这样的涡轮机就足以供应 16,000 户 欧洲家庭一年的用电。尽管具有巨大的潜力, 风能仍面临着挑战。虽然风能免费且取之不尽, 但不管涡轮有多大、效率有多高, 可转化为电力的风能 仍存在数学上限。德国物理学家阿尔伯特·贝茨算出由于必须留出风力让叶片保持旋转, 涡轮机最多只能捕获 59.3% 的风能。此外, 有些人认为 涡轮机破坏了自然风光, 加上风能只是间歇性可用, 使其难以被整合进电网。但即使有这些挑战, 现代风力涡轮机已使风能成为了最高效、最便宜的电力来源。风力涡轮机已为世界各地的社区 提供了必不可少的能源。对于许多农民来说, 在耕地上架设风力发电机是可靠的额外收入来源。随着风预报、电网基础设施和储能技术不断改进, 风能或许可以吹散我们所有的能源问题。

P46 2021-04-26 Can you solve Dongle's Difficult Dilemma - Dennis E. Shasha

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=46>)

According to legend, when this planet was young and molten, three galactic terraformers shaped it into a paradise. When their work was done, they sought out new worlds, but left the source of their power behind: three powerful golden hexagons, hidden within dungeons full of traps and monsters. If one person were to bring all three hexagons together, they could reinvent the world however they saw fit. That was thousands of years ago. Today, you've learned of Gordon, an evil wizard dead set on collecting the hexagons and enslaving the world to his will. So you set off on a quest to get them first, adventuring through

fire, ice, and sand. Yet each time, you find that someone else got there first. Not Gordon, but a merchant named Dongle. At the end of the third dungeon, you find a note inviting you to Dongle's castle. You show up with a wallet bursting with the 99 gems you've collected in your travels, arriving just moments before Gordon, who also has 99 gems. Dongle has not only collected the golden hexagons, but he's used them to create 5 silver hexagons, just as powerful as their golden counterparts. Why did Dongle do all this? Because there's one thing he loves above all else: auctions. You and the evil wizard will compete to win the hexagons, starting with the three golden ones, making one bid for each item as it comes up. The winners of ties will alternate, starting with you. Whoever first collects a trio of either golden or silver hexagons can use their power to recreate the world. You've already bid 24 gems on the first, when you realize that your rival has a dastardly advantage: a mirror that lets him see what you're bidding. He bids zero, and you win the first hexagon outright. What's your strategy to win a matching trio of hexagons before your rival? Pause here to figure it out for yourself. Answer in 3 Answer in 2 Answer in 1 Dongle's dangled a difficult dilemma. Do you spend big to try to win the golden hexagons outright? Save as much as possible for silver? Or something in-between? Gordon can use his magic mirror and 99 gems to make sure that no matter what you bid on the second gold, he can bid one more and block you. So the real question is—how can you force Gordon to spend enough on the golds to guarantee that you'll win on the silvers? Here's a hint. Let's say at the start of the silver auctions you had a one gem advantage, such as 9 to 8. You need to win three auctions, so could you divide your gems into three groups of three and win? For simplicity, let's assume a set of rules that's worse for you, where Gordon wins every tie. If you bid 3 each time, the best he could do is win two silver hexagons, and have two gems left—which you'll beat with three bids of 3. Any one-gem advantage where your starting total is divisible by three will lead to victory by the same logic. So knowing that, how can you force Gordon's hand in the gold auctions so you go into silver with an advantage? Let's first imagine that Gordon lets you win the second gold auction by betting some amount X with a tie. You could then bid everything you have left on the third gold hexagon, and he'd have to match you to block. So if you could bid 51 on the third gold, you'd go into silver with a 51 to 48 advantage, which you know you can win. Solving for X reveals that in order to have 51 on round three, you should bid at most 24 on round two. But what about the other possibility, where Gordon wins the second gold against your bid of 24—would this strategy still work? The least he could bid to win the second gold is 25, making the total 75 to Gordon's 74. No one would then bid on round three, since you've each blocked the other from getting three golds. After that, you could bid 25 every time to win three silvers. The bidding war was close, but your ingenuity kept you one link ahead in the chain of inference, and the silver tri-source is yours. Now... what will you do with it?

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翻译人员: Ruishi (Jerry) Zhang 校对人员: Helen Chang 传说中, 当这个星球 还年轻并炽热的时候三个来自星系之外的异种 把这里变成了人间福地他们改造完星球后 开始了寻找新的星球的旅程但是他们把他们的力量源泉 留在了星球里三个有着强大力量的黄金六角宝石这三个宝石被放在 充满陷阱和怪物的地下城里如果有人集齐了这三个宝石他就可以依意愿来重新改造这个世界这件事发生在上千年前今天, 你得知一个叫戈登的邪恶巫师 要集齐这三个宝石并奴役这个世界所以你决定抢在戈登之前 拿到这三个宝石你经过了火焰、寒冰, 和狂沙的试炼但是每次都有另一个人 在你之前拿到宝石这个人不是戈登 他是一个叫当构的商人在第三个地下城里 你找到了来自当构城堡的邀请函你带着在冒险时得到的 99 个宝石到达了当构的城堡戈登在你之后也到了 而且他也有 99 个宝石当构不止拿到了仅有的三个六边金宝石他还用金宝石创造了五个六边银宝石并且银宝石和金宝石有着相同的力量为什么当构要这么做呢? 因为当构最喜欢拍卖你和邪恶的巫师要去竞拍这些六边宝石从三个金宝石开始一个物品能出价一次如果出价相同, 胜者会轮换从你开始第一个拿到三个相同颜色宝石的人 (不论金色还是银色) 可以用它们的力量重塑这个世界当你第一轮已经出了 24 个宝石的时候你发现你的对手用了卑鄙的手段一个可以让他看到你出价的镜子他的出价是 0 个宝石 你赢得了你一个宝石你要怎么在戈登之前 集齐三个六边宝石呢? 如果想自己先算出来, 在这里暂停三二一当构出了一个让人进退两难的难题你要花大钱试图直接赢得 全部的金六边宝石吗? 还是攒钱去买银六边宝石? 或者在这两者之间? 戈登可以用他的神奇镜子和 99 个宝石去确保不论你对第二个 金六边宝石的出价是多少他都能比你多出一个宝石, 胜过你那么问题来了——如何让戈登 在金六边宝石上花上够多的钱从而确保你能赢下银色的六边宝石呢? 给你点提示如果在开始竞拍银六边宝石的时候你比戈登多一个宝石 比如你有九个, 他有八个你需要赢下三次竞拍那么你能把你的宝石 分成三组并取得胜利吗? 为了让情况变得更简单 我们假设有一

个对你很不利的规则那就是每次出价一样都算是戈登获胜如果你每次出价三个宝石 戈登最多能赢下两个宝石并且只剩两个宝石那你就可以用你的三个宝石打败他一样的逻辑 只要你的宝石数可以除以三你就肯定能赢得最终的胜利知道了这个后,如何让戈登 把更多钱花在金六边宝石上以让你在银六边宝石的竞拍上 赢得优势呢?试想戈登出了和你一样数量的宝石让你赢了第二个金宝石接着不管你在第三个金宝石上出价多少他必须比你出的多 从而阻止你获得三个金宝石所以如果你在第三个金宝石上 出价 51 个宝石你将会以 51 比 48 的优势 参加银宝石竞拍,并且可以赢经过计算,如果你想在 第三个金宝石竞拍时有 51 个宝石你第二轮最多出 24 个宝石但是如果戈登在第二轮出价超过 24 个宝石这个计策还有用吗?如果戈登想赢第二轮 他最少出 25 个宝石这样的话你就有 75 个宝石 戈登有 74 个紧接着没有人赢得第三轮因为你和戈登互相牵制对方然后,你就可以每轮出价 25 并赢下三个银宝石竞拍结束了但是你的聪明才智使你比戈登更快一步你得到了三个银六边宝石那么现在,你要用它们做什么呢?

P47 2021-04-27 Demolition, disease, and death - Building the Panama Canal - Alex Gen

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=47>)

In the middle of the 19th century, the California gold rush brought thousands of settlers to America's west coast. But finding gold may have been easier than transporting it back east. The only hope for avoiding a grueling six month wagon journey was to travel the narrowest portion of the continent—the 48-kilometer Isthmus of Panama. By 1855, a railroad spanning the region significantly shortened the trip, but unloading and reloading ships at each port cost time and money. To truly connect these two bodies of water shipping interests needed a canal—a continuous maritime passage through the isthmus. The first attempt at this colossal construction project was taken up in 1881 by French diplomat Ferdinand de Lesseps. De Lesseps had supervised construction of Egypt's Suez Canal, but his success made him overconfident. He insisted on digging the canal at sea level, even though it required boring directly through the Continental Divide mountain range. Futile excavation efforts were buried under constant landslides. And since the diplomat had only visited the site briefly during Panama's dry season, his workers were unprepared for torrential storms, venomous jungle fauna, and tropical diseases. After spending \$287 million and losing a staggering 22,000 lives, the French abandoned the project. The United States had been considering building a canal through Nicaragua, but at this point, the chance to succeed where France failed was tempting. Panamanian leaders were also eager to complete a canal which would bring their country business and prestige. However, Panama was still a part of Colombia at the time, and the country was stalling negotiations with the U.S. Sensing an opportunity, President Teddy Roosevelt went straight to the Panamanians. With encouragement and military support from the U.S., Panama launched a coup in 1903. Within days, they became an independent nation and signed a treaty to begin construction of the canal. Just over a decade after the French left, the Americans were ready to dig in—and they were determined to avoid their predecessor's mistakes. Instead of cutting the mountain down to sea level, they would raise the sea up the mountain. The plan was to build massive steel gates separating the canal into multiple chambers with different water levels. As a ship passed through each successive gate would open, lowering the water level in the next chamber, while raising the ship and allowing it to move on. The design called for five of these so-called canal locks—three on the Atlantic side and two on the Pacific, raising traversing ships 26 meters above sea level. Operating this lock system would require a massive reservoir of water. And fortunately, the low-lying Chagres river valley provided a natural solution. By building a dam across the gap where the river flowed out to sea, the entire valley could be flooded. At 32 meters high and over 800 meters wide, the Gatun Dam would be larger than any built before. With this innovative plan, the Americans didn't need to excavate the entire mountain, but rather, just the pathway for the canal itself. Still, the work was staggering. Even after progress made by the French, it took over nine years for 24,000 workers to blow up, shovel, and drill out the Culebra Cut—a roughly 14 kilometer passageway through the Continental Divide. The railway, now upgraded and rerouted to follow the canal, carted away over 76 million cubic meters of excavated rock to be used at the Gatun Dam site. Construction was only half the battle. Leading army officials struggled to maintain infrastructure and sanitation, but accidents and diseases took the lives of 5,000 workers—mostly Black Caribbean migrants. Then, in the fall of 1913, the moment finally came. A telegraph signal from President Woodrow Wilson triggered a dike explosion, flooding the Culebra Cut and joining the Atlantic and Pacific Oceans. Today, nearly 14,000 vessels travel through the isthmus annually—each in under 12 hours. The canal remains Panama's chief source of revenue; and since the country gained ownership of the passage in 1999, it has also become a source of national pride.

P47 2021-04-27 Demolition, disease, and death - Building the Panama Canal - Alex Gen[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=47>)

翻译人员: Meiqi Jia 校对人员: Helen Chang 19 世纪中期, 加利福尼亚淘金热为美国的西海岸 带来了数千定居者。但是寻找黄金可能比运输 金子回东部容易。避免六个月舟车劳顿的唯一办法是去到美洲大陆最窄的地方——48 公里长的巴拿马地峡。直到 1855 , 横跨这个区域的铁路 极大程度上缩短了旅行时间, 但是在码头装载与卸载这些船只 耗费了很多时间和金钱。想真正的连接这两片水域, 航运业需要一个运河——一个通过地峡的连续海上通道。1881 年, 在法国外交官 费迪南德·德·雷赛布的带领下进行了这个庞大工程的第一次尝试。德·雷赛布监督了埃及 苏伊士运河的建造。但是他的成功使他过于自信。他坚持在海平面上修凿运河, 即便此举需要直接通过 大陆分水岭钻孔。无效的开采被持续的塌方所掩埋。还有, 由于外交官仅在巴拿马的 干旱期参观过开采场所, 他的工人们并没有为暴雨、 有毒的丛林动物, 和热带疾病作准备。在花费了 287 百万美金 和失去了 22,000 生命的情况下, 法国人放弃了这个项目。美国一直在考虑修建一个 穿过尼亚加拉的运河。但是在这样的情况下, 在法国失败的地方成功是吸引人的。巴拿马的领导们也希望建造一个可以给国家带来商机和威望的运河。即便如此, 当时巴拿马仍旧是 哥伦比亚的一部分, 哥伦比亚仍旧暂缓了与美国的谈判。察觉到机会, 泰迪·罗斯福总统直接找到了巴拿马人。美国的鼓励和军事帮助使得巴拿马在 1903 年 发动了军事政变。几天之内, 巴拿马便成为了独立的国家, 并且签署了条约, 开始了运河的建设。就在法国离开的十年后, 美国人便准备介入——并且决心避免前任的问题。与其把山降到海平面, 他们把海提高到了山的高度。计划是修建巨大的钢闸门, 把运河分成拥有不同 水位的不同室。当船只经过, 每个连续的闸门便会开启, 使另一个分割室的水位下降, 与此同时把船只变高, 让其行驶。这样的设计名为运河闸门——大西洋那边有三个, 太平洋那边有两个, 让船只比海平面高 26 米。运营这个闸门系统 需要极大储备的水。幸好, 低洼的查格雷河 提供了一个自然的解决方法。在河流流出大海的空隙处修建 一个大坝, 整座山谷都可能被淹。32 米高, 超过 800 米宽, 加通大坝会比以往的任何大坝都大。有了这个创新的计划, 美国人不需要撤离整座山谷, 相反, 只需要撤离运河的途径处。但是, 工程仍旧停滞不前。即便接续法国人已完成的部分, 仍然花费了超过九年时间, 由 24,000 工人引爆、铲除和钻穿库莱布拉水道——一个约 14 公里长, 跨越大陆分水岭的通道。升级与改道过后的铁路跟随运河, 运走了超过 76 百万 立方公尺的挖掘岩石, 用于加通大坝的修建。建设只是奋战的一半。带队的军队官员艰难地维持 基础设施与卫生, 但是事故和疾病带走了 5,000 名工人的生命——大部分是加勒比的黑人移工。然后, 在 1913 的秋天, 胜利时刻终于到来了。总统伍德罗·威尔逊的一则电报 引起了堤坝爆炸, 淹没了库莱布拉水道, 并且连接了大西洋和太平洋。今天, 每年大约有 14,000 支船舶行驶过地峡——行驶时间低于 12 小时。运河成为了巴拿马的主要收入来源; 自巴拿马在 1999 年 得到了运河的所有权, 它也变成了提升民族自豪感的来源。

P48 2021-04-29 How long should your naps be - Sara C. Mednick[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=48>)

Your eyes get heavy and gradually... close... But wait! It's only lunchtime and you still have so much to do. Would taking a nap help? Or would it derail your day? Our sleep, both at night and in naps, is made up of approximately 90 minute sleep cycles with four stages each. A nap can last anywhere from five minutes to three hours, so it can include full sleep cycles or just a few stages. As you fall asleep, you enter Stage 1: the first two to five minutes of sleep. Stage 2 comes next, for about 30 minutes. In Stage 2, body temperature drops, muscles relax, and breathing and heart rate become more regular. Your neurons start to fire in unison, creating waves of activity that sweep across the cortex, punctuated by rapid bursts of neural activity called sleep spindles. As you enter Stage 3, or slow wave sleep, the rolling waves increase as your neurons fire in coordination. This phase lasts about 20 to 30 minutes and is where your deepest sleep occurs. Then, you enter REM sleep, which lasts about 10 to 20 minutes in a nap. In REM, the brain becomes more active, more like your brain activity while awake. The end of REM signals the completion of a sleep cycle. OK, but will a nap make you feel better? Well, that depends on a few things—especially what stages of sleep the nap includes. Take a 30 minute nap, which consists mainly of Stage 2 sleep. Stage 2 sleep is associated with long-term potentiation, a process that's thought to strengthen the synapses between neurons, which is essential for learning. A 20 to 30 minute nap stops short of Stage 3's deep sleep, making it relatively easy to wake up from. A 30 to 60 minute nap, meanwhile, has the benefits of Stage 2 sleep and also takes you into the deeper sleep of Stage 3. During Stage 3, multiple brain areas work together to transfer information from short-term memory storage to

long-term storage, stabilizing and strengthening long-term memory by coupling sleep spindles with slow waves. Stage 3 is the most difficult stage to wake up from. So while a 30 to 60 minute nap can have cognitive benefits, those benefits often don't kick in until about 15 minutes after waking up. 60 to 90 minute naps enter the REM stage. While in REM, the prefrontal cortex, which is largely responsible for inhibition and cognitive control, becomes much less active. Meanwhile, the amygdala and cingulate cortex, regions associated with emotion and motivation, are highly active. Researchers have posited that the combination of these things leads to bizarre dreams during REM sleep: the decrease in inhibition and cognitive control might lead to wild associations— and, thanks to the amygdala and cingulate cortex activity, those associations can be between emotionally charged topics. Some researchers think this stage might help us make innovative connections between ideas upon waking. Because the brain activity during REM is closer to waking, it may be easier to wake up from REM than Stage 3, even though the nap is longer. The time of day also matters. Our need for deep Stage 3 sleep progressively increases throughout the day. So if you nap later, you may rob yourself of the sleep pressure needed to go to sleep at night. This doesn't happen for REM sleep. Longer periods of REM occur during morning hours, so morning naps are dominated by REM, midday naps have about equal parts of REM and deep sleep, and evening naps contain more deep sleep. On top of all this, it seems that we're just about evenly split between nappers and non-nappers. Nappers consistently show cognitive benefits from napping, but non-nappers may not. Researchers think this could be because nappers are able to stay in a lighter sleep and move through sleep stages more easily. Meanwhile, non-nappers may experience more deep sleep while napping, making them groggy afterward. So will a nap help? Well, there's only one way to find out...

P48 2021-04-29 How long should your naps be - Sara C. Mednick

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=48>)

翻译人员: Yanyan Hong 校对人员: Jiasi Hao 你的眼皮变得沉重，慢慢地……合上……但等等！才刚到午餐时间，而你还有这么多事情要做。打个盹会有帮助吗？还是说这会妨碍你的一天？我们的睡眠，无论是夜间还是午睡都是由大约 90 分钟的睡眠周期组成，每个周期分四个阶段。小睡可以持续 5 分钟到 3 小时，所以它可以包括完整的睡眠周期或者只是几个阶段。当你入睡时，你进入了第一阶段：睡眠开始的 2-5 分钟。接下来是第二阶段，大约 30 分钟。在第二阶段，体温下降、肌肉放松，呼吸和心率变得更加规律。你的神经元开始齐射，产生扫过大脑皮层的活动波，被名为“睡眠纺锤波”的高频爆发神经活动打断并结合。当你进入第三阶段，或慢波睡眠时，随着你的神经元协作发射，滚动波增加。这个阶段持续约 20 至 30 分钟，也是你进入深度睡眠之际。然后，你进入快速眼动睡眠，在小睡中大约持续 10 至 20 分钟。在快速眼动睡眠时，大脑变得更加活跃，更像大脑清醒时的活动。快速眼动睡眠信号结束 标志着一个睡眠周期的完成。好吧，但打个盹会让你感觉更好吗？那取决于一些要素——尤其是小睡包括哪些睡眠阶段。比方说 30 分钟小睡，主要包括第二阶段的睡眠。第二阶段的睡眠与长时程增强作用有关，长时程增强作用被认为能加强神经元之间的突触，这对学习至关重要。20 到 30 分钟的小睡在第三阶段的深层睡眠前就会停止，因此从睡梦中醒来相对容易。30 到 60 分钟的小睡，同样，会带来第二阶段睡眠的好处，也会让你进入第三阶段的深度睡眠。在第三阶段，多个大脑区域协同工作将信息从短期记忆储存转移到长期记忆，通过将睡眠纺锤波与慢波耦合，稳定并加强长期记忆。第三阶段是最难醒来的阶段，因此，虽然 30 到 60 分钟的小睡有利于认知能力，但这些好处往往要到醒后 15 分钟左右才会显现出来。60 至 90 分钟的小睡会进入快速眼动阶段，而在快速眼动阶段，主要负责抑制和认知控制的前额叶皮层变得不那么活跃。同时，杏仁核和扣带皮层，与情绪和动机相关的区域反而高度活跃。研究人员认为，这些现象的结合会在快速眼动睡眠期间催生出怪异的梦境：抑制和认知控制的减少可能会导致疯狂的联想——而且，由于杏仁核和扣带回皮层的活动，这些联想可能常处在情绪化的话题中。一些研究人员认为这个阶段可能有助于我们在醒来后在想法间产生创新的联系。因为，大脑活动在快速眼动睡眠期间与清醒时相似，尽管小睡的时间更长，但可能比第三阶段更容易醒来。一天中小睡的时间也很重要。我们对第三阶段深度睡眠的需求在一天中随着时间推移逐渐增加，因此，如果你晚点打盹，你可能会让自己晚上睡不着。但对于快速眼动睡眠这不成问题，长时间的快速眼动发生在早晨，所以早晨的小睡主要是快速眼动，中午的小睡有相当部分的快速眼动和深度睡眠，而晚上睡觉多数是深度睡眠。总之，似乎喜欢小睡和不喜欢小睡的人平分秋色。喜欢小睡的人总是表现出小睡对认知的好处，但不喜欢小睡的人则没有。研究人员认为这可能是因为喜欢小睡的人能够保持较轻的睡眠状态，更容易转换于不同睡眠阶段。同时，不喜欢小睡的人在打盹时可能会经历更多的深度睡眠，让他们醒来后昏昏沉沉。那么小睡一下会有帮助吗？只有一个办法可以知道……

P49 2021-05-03 Meet the bluefin tuna, the toughest fish in the sea - Grantly Galland

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=49>)

What's as big as a polar bear, swallows its prey whole, and swims at 40 miles an hour? It's not a shark or a killer whale. It's the Atlantic bluefin tuna. The largest and longest-lived of the 15 tuna species, the Atlantic bluefin has a unique set of adaptations that make it one of the most dominant predators in the ocean. It starts as a tiny hatchling in the Gulf of Mexico or the Mediterranean Sea, no bigger than a human eyelash. Within its first year of life, It develops something known as regional endothermy—the ability to regulate its body temperature. An Atlantic bluefin gets oxygen from cold ocean water using its gills. This process cools its blood. Then, heat the tuna generates swimming and hunting warms the blood. In most fishes, this heat would be lost back out into the ocean through the gills. But in the Atlantic bluefin, a mechanism called countercurrent exchange traps the heat. Cold blood on its way to the large swimming muscles passes close to warm blood leaving those muscles in a specialized network of blood vessels known as a rete mirabile. Here the heat “jumps” to the cold blood and stays in the body. This makes bluefin one of the few warm-blooded fishes, a huge advantage in the marine environment. Cold-blooded animals whose body temperature depends entirely on the environment become sluggish in colder waters. But a bluefin's ability to keep warm means it has sharper vision, can better process information, and can swim faster than its prey. It thrives in cold, deep, subarctic water. Thanks to their warm bloodedness, their powerful muscles, and their streamlined torpedo shape with fins that fold into grooves to reduce drag, bluefin tuna can reach speeds few other animals can match. Their maximum speed of 40 miles per hour is faster than that of a great white shark or orca whale, and even at their comfortable cruising speed, they can cross the Atlantic in a couple months. All this swimming requires a great deal of oxygen, but the bluefin is adapted for this as well. The faster it swims, the more water passes over its gills, and the more oxygen it can absorb from that water. This need for a constant flow of water means the tuna must always remain on the move. It also means bluefin cannot suck prey into their mouths the way most other fishes do. Instead, they must chase down their prey with their mouths open. They eat smaller prey than most predators their size, including squid, crustaceans, and smaller fish species like mackerel. The bluefin's temperature-regulating ability doesn't just make it a superior hunter—it gives it nearly unlimited range. As soon as they're strong enough to swim against the current, Atlantic bluefin leave the warm waters of their spawning grounds and spend their lives hunting all over the Atlantic Ocean. Tunas from both the Gulf of Mexico and the Mediterranean Sea frequent the same feeding grounds and range from Brazil and Texas to Iceland and Senegal and beyond. But when the time comes to reproduce around age 10, they always return to their sea of origin. Here, groups of males and females release millions of eggs and sperm into the water. They'll migrate back and forth between feeding and spawning grounds annually for the rest of their lives. Atlantic bluefin can live for over 40 years, growing all the while. The largest specimens are tens of millions of times heavier than when they hatched. The same huge size that makes bluefin tuna indomitable in the ocean has made them vulnerable to one predator in particular: us. Humans have a long history of fishing Atlantic bluefin—it's even stamped on ancient Greek coins. But in recent decades, demand has skyrocketed as bluefin are hunted for sashimi, sushi, and tuna steaks. An individual fish can sell for \$10,000 or more, promoting overfishing and illegal fishing. But if recent conservation efforts are redoubled and quotas are better enforced, bluefin populations can begin to recover.

P49 2021-05-03 Meet the bluefin tuna, the toughest fish in the sea - Grantly Galland

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=49>)

翻译人员: Lingyan Ning 校对人员: Helen Chang 什么的体型和北极熊一样大能一口吞下它的猎物游泳时速可达 40 英里? 它不是鲨鱼或杀人鲸它是大西洋蓝鳍金枪鱼是现存的 15 种金枪鱼中 体型最大、身长最长的大西洋蓝鳍金枪鱼有它自己独特的适应机制使它成为了海中主要的捕食者之一它在地中海或是墨西哥湾中孵化幼年形态极小 与人类的眼睫毛一般大小在它的第一年里它学会了一项本领——局部体温调节它可以调节自身体温蓝鳍金枪鱼通过鳃 从冰冷的海水中滤出氧气这一过程会使它的血液冷却同时, 金枪鱼通过游泳和捕猎 使自身血液升温大多数鱼类的热量通过鳃 散失到海洋里了但在蓝鳍金枪鱼身上有一种名为逆流交换的机制 可以捕获这些热量流向大块游泳肌肉的冷血与离开这些肌肉的温血很靠近那高度特化的血管网称为细脉网在这里, 热量由温血“跃”至冷血 继续保留在身体中这使得蓝鳍鱼成为了 为数不多的的温血鱼类正是它在海洋生存的一大优势冷血鱼类的体温完全取决于环境

温度在低温海水中，它们会变得活动迟缓但蓝鳍鱼有维持体温的本领 意味着它们视力更敏锐处理信息更快 游得比猎物更快得以在冰冷的亚北极地区的深海 生长壮大得益于它们的温血系统 它们拥有了发达的肌肉拥有了如鱼雷般流线型的身形以及可以折叠进凹槽的鱼鳍来减小阻力蓝鳍金枪鱼的速度少有动物能及它们最高时速可达 40 英里比大白鲨或是杀人鲸还要快即使是以它们日常的巡航速度也可以在两个月内横跨大西洋所有游泳都需要耗费大量氧气但蓝鳍鱼对此也适应得很好它游得越快，流经鳃的水就越多它可以从海水中获取的氧气就越多这要求它要始终处于流水中意味着蓝鳍金枪鱼 必须时刻保持运动状态同时这也意味着蓝鳍金枪鱼 不能像其他大多数鱼类一样用口吸入猎物恰恰相反，它们在追逐猎物的过程中 始终大张着嘴巴相比起与它们同等大小的捕食者 它们吃的的猎物体型更小包括乌贼、甲壳动物 以及如鲭等小型鱼类蓝鳍金枪鱼的体温调节能力并不仅仅是助其成为出色的捕猎者这一本领给它的远不止这些当蓝鳍金枪鱼强壮到足以逆洋流而行时它们会离开适宜产卵的温暖流域将捕猎范围扩大到整个大西洋孵化自墨西哥湾和地中海的金枪鱼经常出没于同样的觅食区域下至巴西、德克萨斯州， 上至冰岛、塞内加尔或是更北的地区但当它们到了大约 10 岁—— 产卵繁殖的年纪它们总是会回到出生的海域在这里，成群结队的雌鱼和雄鱼 在水中产下它们的卵子和精子在余下的岁月中它们会来回往返于觅食区域和产卵地大西洋蓝鳍金枪鱼寿命可达 40 余年 终身都在生长最大的蓝鳍鱼标本的体重 是它们刚孵化时的千万倍其巨型身形使其海中霸主的地位 不可动摇但也令其在面对唯一的捕食者 我们人类时非常脆弱人类捕杀大西洋蓝鳍金枪鱼的历史 由来已久——古希腊的钱币上就印有蓝鳍金枪鱼但在近几十年间，需求量猛然上涨是因为蓝鳍鱼可做成刺身、 寿司、金枪鱼排单单一一条金枪鱼的售价 可高达 10000 美元甚至更高过高的售价进一步加剧了 过度捕捞和违法捕捞不过，如果近年来的保护力度加倍 并更好地执行配额捕捞蓝鳍金枪鱼的种群还是可以逐渐恢复

P50 2021-05-04 How to get a word added to the dictionary - Ilan Stavans

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=50>)

“Dictionary:” noun, “a malevolent literary device for cramping the growth of a language and making it hard and inelastic.”
“Lexicographer:” noun, “a writer of dictionaries; a harmless drudge.” While the concept of a dictionary dates back to ancient civilizations, the first English dictionary was published by Robert Cawdrey in 1604. In the centuries that followed, many more dictionaries were written by individual authors who chose what to include or exclude. They not only defined words, they openly showcased their creators’ opinions—like Ambrose Bierce’s definition of “dictionary” and Samuel Johnson’s definition of “lexicographer.” After their authors’ deaths, many of these dictionaries quickly became outdated. But one 19th century dictionary had a different fate. In 1828, American lawyer and author Noah Webster published “An American Dictionary of the English Language” with a lofty goal: to give the United States its own version of the English language. He believed that as a new nation, the United States needed its own distinct version of English to assert its independence from Britain. In his dictionary, Webster sought to describe and officialize the way Americans spoke. Most dictionaries in Webster’s time were prescriptive: they dictated how words should be used, rather than documenting the way people actually used language in daily life. When Webster broke this convention and included slang words in his dictionary, critics accused him of polluting the English language. But he argued that these words captured local variations of language—a vital part of what made American English unique. He also believed spelling rules were unnecessarily complex, and that we should write the way we speak as much as possible. Still, Webster’s own opinions influenced the words he included and the way he defined them. He excluded slang words from Black communities because he didn’t consider them proper. And when he defined “woman,” he added that “women are soft, mild, pitiful, and flexible.” By the time of his death, Noah Webster was a household name. Seeing a lucrative business opportunity, brothers George and Charles Merriam bought the rights to Webster’s Dictionary. Together with Webster’s son-in-law, the Merriams made a new, revised edition. It was the beginning of the Merriam-Webster Dictionary. Today, the Merriam-Webster Dictionary begins to address a contradiction in Webster’s goal: he wanted to represent an entire nation, but he based his work on just one person’s opinion: his own. Since Webster’s death, each new edition of the dictionary has been curated by a group of language experts rather than by a single authority. The current criteria for including a word in the dictionary are that it has “widespread, sustained, and meaningful use.” This clearly includes profanities, which were sometimes excluded from dictionaries in the past. Racial slurs also meet the criteria for inclusion, but some argue that including them might legitimize them. Dictionaries don’t just add new words— they also redefine old words to reflect changing attitudes and usage. One 1736 dictionary defined “wife” as “a married woman whose will, in the judgment of the law, is subject to the will of her husband: for which reason a wife is said to have no will.” Today, “wife” is defined simply as

“a female partner in a marriage.” In 2019, Merriam-Webster’s word of the year was “they.” The word has been in regular use for centuries, but has only recently gained a new recognized meaning, as a pronoun for one person whose gender identity is nonbinary. The question of which words belong in the dictionary impacts all of us— when our words and definitions are represented, they’re affirmed; if not, they— and we— are minimized. Today, lexicographers have expanded word sourcing to include the dictionary’s users: tracking which words are most searched, and adding them to the dictionary. So, who decides what’s in the dictionary? More than ever before the answer is: we do. All of us shape language every day. When we collectively embrace one word or redefine another, eventually, those words and meanings are reflected in our dictionaries.

P50 2021-05-04 How to get a word added to the dictionary - Ilan Stavans

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=50>)

翻译人员: Yu Xie 校对人员: Jiasi Hao “词典”: 名词, “一种恶意的文学手段用以限制语言的发展, 并让其变得困难死板。”“词典编纂者”: 名词, “一位词典的作者, 一位无害的苦力。”词典的概念可追溯至古文明时期, 但直到 1604 年, 罗伯特·考德雷 (Robert Cawdrey) 第一本英语词典才出版面世。接下来的几个世纪, 越来越多的词典由独立作者自行删选、编撰完成。他们不仅定义单词, 同时也展示自己作为创造者的想法——比如上述安布罗斯·比尔斯 (Ambrose Bierce) 对“词典”的定义和塞缪尔·约翰逊 (Samuel Johnson) 对“词典编纂者”的定义。在这些词典的作者逝世后, 许多词典很快就过时了。但是一本于 19 世纪诞生的词典 却有着不同的命运。在 1828 年, 美国律师兼作家 诺亚·韦伯斯特 (Noah Webster) 出版了“一本美国的英语词典”。他有着一个崇高的目标: 对英语, 给出美国自己的理解版本。他相信作为一个新的国家, 美国需要拥有 自己的与众不同的英语词典以维护美国独立于英国的地位。在他的字典里, 韦伯斯特试图描述并官方化美国人说话的方式。韦伯斯特时期的大多数字典 通常具有规范性: 他们规定了应该如何运用这些词语, 而非记录日常生活中 人们实际是如何使用这些词语的。当韦伯斯特打破这一常规, 在自己的字典里加入俚语, 批评家们指责他玷污了英语。但他反驳到这些单词 捕捉了英语的本土化——这是使美式英语独一无二的 一个重要部分。他同时认为拼写规律过分复杂, 我们应该尽可能按照口语习惯 进行书写。然而, 韦伯斯特的观点 对他本人选入的词语以及定义方式产生了影响。他删去了黑人社区流传的俚语, 因为他认为这些俚语不合适。他在定义“女人”时, 他又附上“女人是柔软的, 温和的, 可怜的和灵活的”。到他逝世的时候, 诺亚·韦伯斯特成了一个家喻户晓的名字。梅利亚姆兄弟 (George & Charles Merriam) 发现了一个利润丰厚的商机, 买下了韦氏字典的版权。和韦伯斯特的女婿一起, 梅里阿姆家族编撰了一本新的修订版词典。这就是韦氏词典的开始。(Merriam-Webster Dictionary) 如今, 韦氏词典开始向着与韦伯斯特初衷相反的方向发展了: 韦伯斯特想要代表整个国家, 但是他只凭借一个人的观点进行编撰。他自己的观点。自韦伯斯特逝世以来, 词典的每一个新版都由语言专家组, 而非单一权威, 进行编写。一个新单词入选词典的标准是这个新单词有: “广为流传的, 可持续的以及有意义的用途。”这一标准显然包含了不雅词汇, 而这按照过去的标准 有时是要被剔除的。种族歧视的用词也符合纳入标准, 但是一些人认为纳入 这些词语意味着将它们合法化。词典并不仅仅是加入新词——它们也会根据态度与用法的变化 对旧词进行重新定义。一本 1736 年的词典里 把“妻子”定义为“一位成婚的女人, 她的意志, 依据法律的判断, 需服从于她丈夫的意志: 基于这一点, 一位妻子没有个人意志。”如今, “妻子”仅仅被简单定义为 “婚姻中的女性合伙人。”在 2019 年, 韦氏词典的 年度单词是“他们”。这个单词已经日常使用了好几个世纪, 但是直到最近它才有了 一个新的公认含义: 代词, 指代一个性别非二元的人。词典纳入哪些单词 影响着我们所有人——当词语和它们的定义被纳入词典, 它们就被肯定了; 如果没有被归入词典, 这些词和我们便被轻视了。现在, 词典编纂者扩大了词语来源, 例如囊括词典的使用者: 追踪搜索次数最多的用词, 把它们加到词典里。那么, 谁能决定词典的内容呢? 最终的答案是: 我们。我们所有人 每一天都在对语言进行改造。当我们共同接受一个单词 或者重新定义一个单词, 最终, 这些词语和定义 都会在我们的字典里得以反应。

P51 2021-05-06 How one design flaw almost toppled a skyscraper - Alex Gendler

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=51>)

In 1978, Diane Hartley was writing her undergraduate architecture thesis when she made a shocking discovery. Her paper focused on the Citicorp Center, a skyscraper in midtown Manhattan. And after weeks poring over the building’s plans, she’d stumbled on a potentially deadly mistake. An oversight that threatened to topple the 59-story tower into one of New York City’s most densely populated districts. When it was built two years earlier, Citicorp Center was one of the world’s tallest

buildings. Its sloped roof was unique in the city skyline, but its more distinctive feature lay at the base. Since the construction site was already occupied by St. Peter's Lutheran Church, the new skyscraper had to be built on columns supporting it, like stilts. Using stilts on a building's corners wasn't unheard of, but because the church stood at the corner of the block, these stilts had to be placed at the center of each side. While this novel design worried some of the building's backers, chief structural engineer William LeMessurier took numerous precautions to ensure the building's stability. The outside would consist of v-shaped chevrons, forming a strong exoskeleton to support the skyscraper. This external structure also made the building much lighter, meaning there'd be less weight to support overall. This design did leave the building vulnerable to strong winds. But LeMessurier had another state-of-the-art solution—a tuned mass damper. This 400-ton counterweight was controlled by computerized sensors designed to counteract any swaying. With these structures in place, calculations showed that each side of the building could withstand powerful winds. And with all safety issues resolved, the building opened for business in 1977. But when Hartley was studying the tower a year later, she noticed something odd. It was true that each face of the building could endure powerful winds. And since a building's broad sides catch the most wind, these would typically be the strongest winds a building encounters. However, the tower's unique base meant that winds blowing on the building's corners were actually the bigger threat. And since traditional designs didn't warrant safety calculations for corner winds, it seemed to Hartley that the threat had gone unaccounted for. When Hartley contacted LeMessurier's firm about the issue they assured her the building was strong enough to handle these winds. But checking the plans again, LeMessurier noticed an alarming detail. A change approved without his knowledge had replaced the exoskeleton's welded joints with cheaper and weaker bolted joints. This alone wasn't enough to topple the tower thanks to the mass damper. But if a storm knocked out the building's power, it would deactivate the counterweight's sensors, leaving the building vulnerable to winds of just 112 kilometers per hour. Given available weather data, a storm this strong had a one-in-sixteen chance of hitting New York City every single year. LeMessurier never told Hartley what she'd uncovered. In fact, everything he did next was top secret. After filling in the architects and executives at Citicorp, LeMessurier's team worked with city officials to craft a confidential plan. Without warning the residents, construction crews began a string of night-time shifts to reinforce the bolted joints. This delicate work began in mid-August 1978, and was only halfway complete when Hurricane Ella approached the city in September. City officials and Citicorp executives planned an emergency evacuation for a 10-block radius, but at the last minute, the hurricane veered out to sea. These secret evacuation plans were never used, and the reinforcements were completed just a month later. Typically, it would've been impossible for this covert construction to go unnoticed. But the press was occupied with a newspaper strike spanning the length of the reinforcement project. In fact, the public didn't learn how close they'd come to disaster until 1995, when a New Yorker article revealed the story to the city, and to Diane Hartley. Like LeMessurier, the article failed to give credit where it was due, but at least Hartley knew that her homework had saved lives.

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翻译人员: A G 校对人员: Helen Chang 1978 年, 当戴安娜·哈特利 正在编写她的本科建筑论文时, 她有了一个惊人的发现。论文的重心在花旗中心, 曼哈顿中城的摩天大楼。在对建筑计划经过几周的研究后, 她发现一个潜在的致命错误, 可能会让这 59 层大楼坍塌, 位于纽约市人口最密集的地区之一。当两年前刚建成时, 花旗中心大厦 是世界上最高的建筑之一。倾斜式屋顶在城市中十分显眼, 但更独特的是它的根基。由于圣彼得路德教会 已经占领了建造区域的一角, 这座新大楼需要像踩高跷一样 用柱子在下面支撑着。用柱子支撑建筑物的角落 这种方法不是前所未闻, 但因为教会矗立在建筑区域的角落, 这些柱子需要放置在每边的中心。为了消除投资者们的不安, 首席结构工程师威廉·勒梅苏里尔采取了许多预防措施 以确保建筑的稳定性。第一, 建造 v 形状的外层, 以构成强大的外骨骼结构 用于支撑大楼。让整体更加光亮的同时, 也减少了需要支撑的重量。但这样的设计会让楼层 在起大风时非常脆弱。这让勒梅苏里尔想出一个超前的解决方案——一个调谐质量阻尼器。这个 400 吨的配重 由电脑传感器来控制, 可以抵消任何摆动。如果设置到位, 计算显示每边可以均匀地承受强风。做完所有的安全措施后, 大厦在 1977 年正式对外开放。但当一年后哈特利研究时, 她注意到了一些奇怪的事情。确实, 建筑的每个面都可以承受强风。由于一个建筑的宽边能承受最多的风, 因此这通常也是建筑物 会遇到的最强的风。然而, 这座塔独特的地基意味着吹在角落的风其实更危险。由于传统设计没有 保证角风的安全计算, 对哈特利来说, 这是个 没人注意到的危险要素。之后哈特利联络 勒梅苏里尔的公司说明情况, 他们保证了建筑强度 已经足够应付强风。但是当勒梅苏

里尔再一次查翻方案后发现一个细节警讯，那是他未被知会却被许可的细小改动：外骨骼的焊接接头已经被更便宜更弱的螺栓连接所替换。由于质量阻尼器，仅凭这一点还不足以使高楼倒下。但如果电力因为风暴突然关闭，平衡重的感应器也会随着关闭，使建筑容易受到风的影响，即使每小时仅仅 112 公里的风。鉴于可靠的天气数据，这么强的风暴每年有 16 分之一的机会来到纽约市。勒梅苏里尔没有告诉哈特利她发现了什么。实际上，他接下来所做的一切都是最高机密。在告诉花旗公司的建筑师和高管后，勒梅苏里尔的团队与市政府官员合作制定了一项保密计划。在未警示居民的情况下，施工人员开始了一系列夜班以加强螺栓连接。这精巧的工程于 1978 年 8 月中旬开始，但在 9 月飓风艾拉侵袭城市时只完成了一半。市政府官员与花旗公司高管只能计划紧急疏散附近十个街道的范围，所幸在最后一刻，飓风转向了大海。这些秘密疏散计划从未被使用过，加强螺栓的工程在一个月后完工。通常这种隐蔽的施工不可能被忽视。但是新闻报道被报纸罢工占去了，长达一整个加固工程期。事实上，公众直到 1995 年才知道他们离灾难有多近，到那时《纽约客》的一篇文章才向纽约市民和黛安·哈特利揭露此事。像勒梅苏里尔一样，这篇文章没有归功给正确的人，但至少哈特利知道她的作业救了人。

P52 2021-05-10 What's in the air you breathe - Amy Hrdina and Jesse Kroll

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=52>)

Take a deep breath. In that single intake of air, your lungs swelled with roughly 25 sextillion molecules, ranging from compounds produced days ago, to those formed billions of years in the past. In fact, many of the molecules you're breathing were likely exhaled by members of ancient civilizations and innumerable humans since. But what exactly are we all breathing? Roughly 78% of Earth's atmosphere is composed of nitrogen generated by volcanic activity deep beneath the planet's crust. The next major ingredient is oxygen, accounting for 21% of Earth's air. While oxygen molecules have been around as long as Earth's oceans, oxygen gas didn't appear until ocean dwelling microorganisms evolved to produce it. Finally, .93% of our air is argon, a molecule formed from the radioactive decay of potassium in Earth's atmosphere, crust, and core. Together, all these dry gases make up 99.93% of each breath you take. Depending on when and where you are, the air may also contain some water vapor. But even more variable is that remaining .07%, which contains a world of possibilities. This small slice of air is composed of numerous small particles including pollen, fungal spores, and liquid droplets, alongside trace gases like methane and carbon dioxide. The specific cocktail of natural and man-made compounds changes dramatically from place to place. But no matter where you are, .07% of every breath you take likely contains man-made pollutants—potentially including toxic compounds that can cause lung disease, cancer, and even DNA damage. There's a wide variety of known pollutants but they all fall into two categories. The first are primary pollutants. These toxic compounds are directly emitted from a man-made or naturally occurring source. However, they don't always come from the places you'd expect. Some large factories mostly generate water vapor, with only small quantities of pollutants mixed in. Conversely, burning wood or dung can create polycyclic aromatic hydrocarbons; dangerous compounds that have been linked to several types of cancer, as well as long-term DNA damage. In all cases, pollutants interact with regional weather patterns and topography, which can keep compounds local or spread them kilometers away. When these molecules travel through the air, a transformation occurs. Natural compounds called oxidants, formed by oxygen and sunlight, break down the pollutants. Sometimes, these reactions make pollutants more easily washed out by rain. But in other cases, they result in even more toxic secondary pollutants. For example, when factories burn coal, they release high concentrations of sulfur oxides. These molecules oxidize to form sulfates, which condense with water vapor in the air to form a blanket of fine particles that impair visibility and cause severe lung damage. This so-called sulfurous smog was well-known in 20th century London and continues to plague cities like Beijing. Since the advent of cars, another secondary pollutant has taken center stage. Exhaust from fossil fuel-burning vehicles releases nitrogen oxides and hydrocarbons which react to form ozone. And while some ozone in the upper atmosphere helps shield us from ultraviolet rays, on the ground, this gas can form alongside secondary particles and create photochemical smog. This brown fog can be found covering densely packed cities, making seeing difficult and breathing hazardous. It also contributes to climate change by trapping heat in the atmosphere. In recent decades, industrial activity has contributed to a huge spike in various trace gas emissions, fundamentally changing the air we all breathe. Many places have already responded with countermeasures. Most cars produced since the 1980's are equipped with catalytic converters that reduce the emission of carbon monoxide and nitrogen oxides. And today, places like Beijing are battling smog by electrifying their energy infrastructure and limiting automobile emissions altogether. But while moving away from fossil fuels is essential, there's no universal remedy for air

pollution. Different regions need to respond with unique regulations that account for their local pollutants. Because no matter where you live, we all share the same air.

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翻译人员: Yue Sun 校对人员: Helen Chang 深呼吸当你吸入一口空气你的肺里充满了大约 25 乘以 10 的 21 次方个分子 (25 后面跟着 21 个 0) 有的化合物是几天前刚刚形成的有的却已经存在了数十亿年事实上很多你吸入的分子很可能是古人曾经呼出的并且经过了无数人的呼吸但我们呼吸的空气里到底有什么呢? 氮气构成了约 78% 的地球大气层这些氮气是地底火山活动产生的另一个主要成分是氧气 它占地球空气的 21% 虽然早在地球有海洋的时候氧分子就出现了但在海洋微生物进化到 可以产生氧气时氧气才出现最后, 我们的空气中 有 0.93% 是氩气地球大气、地壳和地核中的钾元素 进行放射性衰变从而形成了钾分子所有这些干燥气体合在一起 占每次呼吸的 99.93% 由于你所处的时间和地点不同 空气中可能还含有一些水蒸气但更大的变数是剩下的 0.07% 这是一个充满可能性的世界这一小部分空气由许多小颗粒组成包括花粉、真菌孢子和液滴以及甲烷和二氧化碳等微量气体这种由天然和人造化合物 组成的特殊混合物因地而异但不管你在哪里你每次呼吸的 0.07% 都可能含有人造污染物可能包括能导致肺病、癌症、甚至 DNA 损伤的有毒化合物已知的污染物种类繁多 但它们都可分为两类一种是原生污染物这些有毒化合物的直接来源可能是人为的或天然产生的但是它们的来源可能出乎你的意料一些大型工厂排放出的主要是水蒸气仅混入了少量污染物燃烧木材或粪便反过来 会产生多环芳烃这种危险的化合物与多种癌症以及长期 DNA 损伤密切相关污染物普遍会与区域气候 和地形相互作用这会使化合物保持在当地范围内 或传播到数公里之外这些分子在空气中传播时会发生转变有一种天然化合物叫氧化剂 它是由氧气和阳光形成的氧化剂可以分解污染物有时这些反应会使污染物 更容易被雨水冲走但在其他情况下 它们也会导致毒性更大的二次污染物例如工厂燃烧煤炭时会释放出高浓度的硫氧化物这些分子氧化形成硫酸盐与空气中的水蒸气 凝结形成一层细小的颗粒状物质不仅降低能见度 还会对人体肺部造成严重损伤这种所谓的硫磺烟雾 在 20 世纪的伦敦广为人知并持续困扰着北京等城市自汽车问世以来另一种二次污染物占据了中心位置燃烧化石燃料的车辆排放的废气中 包含了氮氧化物和碳氢化合物它们会发生反应形成臭氧虽然上层大气中的臭氧有助于保护我们免受紫外线的伤害但在地面上, 这种气体会与次级粒子 一起形成光化学烟雾这种棕色的雾往往会笼罩于 人口集中的城市上空有碍于视线 甚至造成呼吸困难它还在大气中吸收热量 引起气候变化近几十年来工业活动导致 各种微量气体的排放量激增从根本上改变了 我们所有人呼吸的空气许多地方已经采取了应对措施自 1980 年代以来生产的大多数汽车 都配备了催化转化器可以减少一氧化碳和氮氧化物的排放如今北京等地正在通过为其能源基础设施供电和限制汽车排放来对抗雾霾虽然远离化石燃料是必不可少的但对于空气污染 尚未有普适的补救措施不同地区需要针对当地的污染物制定特定的法规因为无论你住在哪里 我们都分享着同样的空气

P53 2021-05-11 What really happened during the Attica Prison Rebellion - Orisanmi Bu

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=53>)

“We are men. We are not beasts and we do not intend to be beaten or driven as such... What has happened here is but the sound before the fury of those who are oppressed.” These words were spoken during the 1971 Attica Prison Rebellion by one of its leaders, Elliott Barkley. At the time, Attica prison was severely overcrowded. Its majority Black and Latino population faced constant physical and verbal abuse. All prison guards were white. Some were members of white supremacist hate groups. Guards threw away letters that weren't written in English and prohibited Muslim religious services. They punished white prisoners for fraternizing with non-white men. Prisoners were allowed one shower a week and one roll of toilet paper a month. Among those imprisoned at Attica were Elliott Barkley, Frank Smith, and Herbert X. Blyden. “I'm dying here little by little every day...” Barkley wrote his mother. She contacted authorities, but nothing changed. He began writing a book about life at Attica. Meanwhile, Smith worked a position called the “warden's laundry boy” for 30 cents a day. His grandmother had been enslaved. Because Smith and others were treated as less-than-human at the will of their keepers, they viewed prison as an extension of slavery. And Blyden had participated in prison strikes and rebellions. He and others saw the violence of prison as symptomatic of a societal problem where individuals are denied justice based on their class and race. They felt people shouldn't be stripped of their rights to health and dignity upon being sentenced. Instead, resources should go towards meeting

people's basic needs to prevent crime in the first place. In the summer of 1971, Blyden co-founded the Attica Liberation Faction. The group compiled a manifesto and petitioned Corrections Commissioner Russell Oswald and Governor Nelson Rockefeller for better treatment. Though largely ignored, they continued organizing. After activist George Jackson was killed at a California prison, 700 men at Attica participated in a silent fast. Just weeks later, on September 9th, a spontaneous uprising began. A group of prisoners overpowered guards, sparking the Attica Rebellion. Prisoners broke windows, started fires, and captured supplies. They beat many guards. One of them, William Quinn, would die from his injuries. Soon, over 1,200 prisoners had assembled in the yard with 42 hostages, preparing to demand change. They established a medical bay, delegated men to prepare and ration food, protected and sheltered guards, and elected a negotiating committee. They appointed Blyden chief negotiator, Smith as security chief, and Barkely as a speaker. Later that day, Barkley presented their demands to the press. When his mother saw him on TV, she was terrified. He was just days from being released. But she believed authorities would want retribution. Over the next four days, prisoners held negotiations with officials. They called for a minimum wage, rehabilitation programs, better education, and more. They promised all remaining hostages would be safe if they were given amnesty for crimes committed during the uprising. Meanwhile, Governor Rockefeller began crisis talks with President Nixon. The president told his chief of staff that the rebellion should be quelled to set an example for other Black activists. Commissioner Oswald announced he'd meet a number of the demands, but refused to guarantee amnesty. Prisoners refused to surrender. As warnings of an imminent siege mounted, they threatened to kill 8 hostages if attacked. Nevertheless, Rockefeller ordered troops to retake the prison. Helicopters tear-gassed the yard. Troopers shot over 2,000 rounds of ammunition, killing 29 prisoners and 10 guards, and wounding many others. Witnesses say troopers found Barkley and shot him in the back. Officers stripped surviving men naked, tortured them, and deprived them of medical attention. Blyden was starved for days. Smith was sexually violated, burned with cigarettes, dragged into isolation, and beaten. Directly after the attack, Governor Rockefeller thought prisoners were responsible for the deaths of the 10 guards. He called it "a beautiful operation." President Nixon congratulated Rockefeller and told his chief of staff that the way to stop "radicals" was to "kill a few." But autopsies soon confirmed that prisoners hadn't killed any guards during the attack, as threatened. Government forces had. Nixon told Rockefeller to stand his ground. Those who survived the massacre continued fighting for revolutionary change. Long after being released, Smith and Blyden campaigned for social justice and prison abolition. The demands men made at Attica in 1971 remain at the core of ongoing protests— within and beyond prison walls.

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[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=53>)

翻译人员: YUE QIU 校对人员: Helen Chang“我们是人！我们不是野兽！我们也不想 像野兽一样被打、被驱赶……这里所发生的一切仅仅是那些被压迫的人愤怒的呼声。”这些话来自 1971 年 阿提卡监狱暴动的一位领导人埃利奥特·巴克利。当时，阿提卡监狱严重超员。监狱所关押的囚犯 主要是黑人和拉丁裔，他们受到持续不断的身体、语言虐待。所有的警卫都是白人，其中有些来自白人至上主义团体。警卫们把那些 不是用英语写的信件扔掉，禁止穆斯林宗教礼拜。他们惩罚那些 对非白人友善的白人囚犯。囚犯们每周只能洗一次澡， 每个月只发放一卷厕纸。在阿提卡监狱关押的有 埃利奥特·巴克利、弗兰克·史密斯以及赫伯特·X·布莱登。“我在这里一天天地走向死亡……”，巴克利向母亲写道。她联系了当局，但是什么都没有改变。巴克利开始撰写一本 关于阿提卡监狱生活的书。同时，史密斯在一个叫作 “典狱长的洗衣童”的岗位上工作，每天的工资只有 30 美分。史密斯的祖母曾经是奴隶。因为史密斯和其他人在狱警的意愿下 遭受低人一等的待遇，他们把监狱视作奴隶制度的余毒。布莱登参与监狱中的罢工和暴动。他和他的同伴们认为 监狱里的暴力暴露的是社会问题，人们因为自己的阶级和种族 而被剥夺了正义和公平。他们认为人们不应该因为犯了罪而被剥夺拥有健康和尊严的权利。相反，人们的基本需求应该被满足，这样才能防范于未然， 避免犯罪的发生。1971 年夏天，布莱登与同伴们 共同创立了“阿提卡解放团”。他们编写了一个宣言向惩戒专员拉塞尔·奥斯瓦尔德和纳尔逊·洛克菲勒州长请愿， 希望得到更好的对待。尽管他们被无视， 他们一直开展相关工作。在活跃分子乔治·杰克森 在加州的一个监狱中被杀后，阿提卡监狱中有 700 名囚犯 参与静坐绝食。仅仅几个星期后，9 月 9 日， 一场自发的暴动发生了。一群囚犯制服了警卫， 引发了阿提卡监狱暴动。囚犯们打破窗户、纵火、收缴物资。他们殴打了很多警卫。其中一个警卫， 威廉姆·奎因伤重不治。很快，超过 1200 名囚犯挟持 42 名人质 聚集在监狱的院子里准备要求改变待遇。他们建立了一个医疗室， 分派人员准备和分配食物，保护警卫，并选出了一个谈判委员会。他们指派布莱登为首席谈判代表， 史密斯担任安全主管，巴克利作为发言

人。当日稍晚，巴克利 把他们的要求告诉了媒体。当他的母亲在电视上看到他时， 她吓坏了。因为再有几天他就该刑满释放了。她相信当局一定会报复他的。接下来的四天里， 囚犯们与政府开展了多次谈判。他们呼吁最低工资、康复措施、更好的教育等等。他们承诺只要暴动期间 所犯的罪行能被赦免，他们就能保证剩下的人质的安全。同时，洛克菲勒州长把危机的情况 汇报给尼克松总统。总统告诉他的幕僚长 暴动应该被镇压，以儆效尤。奥斯瓦尔多局长宣称 他同意了一系列要求，但是不能保证赦免 暴动期间所犯的罪行。囚犯们拒绝投降。作为对迫在眉睫的包围的警告，他们威胁道，如果遭受进攻， 他们将杀死 8 名人质。尽管如此，洛克菲勒州长 依然下令军队夺回监狱。直升机向院内投放了催泪瓦斯。军队发射了 2000 多发子弹，击毙 29 名囚犯，误杀了 10 名警卫， 并射伤多人。目击者声称军队找到巴克利， 从背后枪杀他。警察们把囚犯的衣服脱光并拷打他们，而且剥夺他们的医护。布莱登被饿了数天。史密斯被性侵，被雪茄烫，拖入禁闭室，殴打。此次夺回监狱的进攻后， 洛克菲勒州长认为囚犯们应该对 10 名警卫的死负责。他说这次进攻是一个“漂亮战”。尼克松总统恭贺洛克菲勒州长 并告诉自己的幕僚长 阻挡“那些激进分子”的办法 就是“杀上一批人”。但是尸检很快证明囚犯们并没有像之前所威胁的那样 在遭到进攻时杀掉哪怕一名警卫。杀死他们的是军队。尼克松叫洛克菲勒站稳立场。屠杀中的幸存者继续为改革而奋斗。获释后很长的一段时间内，史密斯和布莱登 为寻求社会正义、废除监狱而奔走。时至今日，那些 1971 年阿提卡的囚犯所提出的要求，依然是监狱高墙内外 持续不断抗议的核心议题。

P54 2021-05-13 Should you donate your DNA to help cure diseases - Greg Foot

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=54>)

So here's the thing: developing a new drug and getting it to you can take a long time. When we have to work out the cause of a condition— for example, with multiple sclerosis or heart disease— developing a new drug takes significant trial and error and lots of money. Which is why we only have drugs for a small proportion of diseases. But you could change all this. You could help discover new, cheaper drugs for currently untreatable diseases. It's all about medical crowdsourcing. However, researchers aren't asking you to donate your money, they're asking you to donate something more personal... First, though, some drug development history. Many of the first medicines were discovered by chance. Natural philosophers then took these and identified the active chemicals inside. And pharmaceutical companies then turned those into drugs. The thing is, for a long time, we didn't know why those drugs worked. Until scientists figured out that disease happens when the molecular machines that keep your body going— your proteins— start misbehaving. Drugs treat disease by targeting those disruptive proteins. Researchers realized that if they can identify which malfunctioning proteins cause a specific disease, they can then try to find or develop a drug that stops those proteins acting up, and that will prevent the disease. It's a great plan, but it's a slow process. So far, they've only identified these therapeutic targets for a small proportion of diseases. However, this is where you can help. Researchers are now turning their attention to DNA, to the genetic instruction manual that tells our bodies how to make our proteins. They want to know which small changes in someone's genome can lead to the production of those dodgy proteins that cause a disease. The thing is, that's a big job. DNA is huge, and each disease is likely to have hundreds, possibly thousands, of proteins involved. But if they have lots of people's genomes, they can compare them and spot patterns. They can look at multiple people suffering from the same currently untreatable disease, find any small genetic changes they share, identify the faulty proteins they code for, and there you go: those are brand new therapeutic targets for a currently untreatable disease. Now the researchers have three options: 1. Has one of those new target proteins been previously linked to a different disease that is treatable? If so, the drug for that disease may target this protein and work for this disease, too. To find out, start a clinical trial. 2. If not, has one of those new target proteins being previously linked to a different disease that had a promising drug that didn't ultimately work? If so, its promise may have come from successfully targeting this protein and it may work for this disease. Start a clinical trial to find out. 3. If this is a brand new protein target never identified before for any disease could they design a new drug to affect it? This involves AI machine learning and some very cool chemistry. And a lot of time, effort, and cost too. Researchers are excited about all this because they think 1 in 5 of the proteins in your body either have, or are likely to have, a drug that will bind to them. And, as any common disease is likely to have hundreds, possibly thousands, of proteins involved, they're hopeful they'll be able to identify a few of those proteins they've already got a drug for. But this all relies on finding those new therapeutic targets, and that's why they need you. Well, your data— both your genetic data and your health history data, so they can compare the genomes of people with similar conditions. So would you give your data for research? There are two questions you may have: who will have access to my data, and what

could they do with it? One group is health care providers who are starting to consider using genetic analysis to give patients more personal care. Another group is private consumer genetic testing companies. Some have already sold genetic data on to pharmaceutical companies for profit, but that was with their customers consent. However, it raises another question: if your data goes towards making new drugs, should pharmaceutical companies recognize that contribution and offer drugs more cheaply? Your best bet is to research the organizations who are asking for your data to find out what they will do with it and how they will protect it. We'll each have our own take on this, but what is clear is genomics could be a powerful tool to cut the current time and cost it takes to develop new drugs for currently untreatable diseases. So, what do you think?

P54 2021-05-13 Should you donate your DNA to help cure diseases - Greg Foot

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=54>)

翻译人员: Jiasi Hao 校对人员: Wanting Zhong 大家都知道: 一种新药从研发到上市需要花费很长时间。当我们还要研究病因时 (例如多发性硬化症或心脏病), 研发新药就需要大量的试错和资金。【只有百分之四的药物能通过开发】【一次几百万美元, 由我们支付】这也是为什么 只有少部分疾病有治疗药物。但你可以改变现状。你的一臂之力能有助于 为目前的不治之症发现更便宜的新药。这一切都与医疗众筹相关。不过研究人员并不是要让你捐钱, 而是想请你捐出某件更私人的东西.....不过首先, 让我们回顾一下 药物研发的历史。许多最早的药物都是偶然发现的。自然哲学家们随后鉴定出了 其中的活性成分。之后药企再把这些成分制作成药。可问题是, 在很长一段时间里, 我们并不知道这些药为什么会起效。直到科学家们发现, 当保持你身体运作的分子机器, 即蛋白质, 开始作祟的时候, 你就会生病。药品通过靶向作用于 那些破坏性蛋白质来治疗疾病。研究人员意识到, 如果他们可以辨别哪些功能失常的蛋白质 能引起某种特定疾病, 他们就可以尝试寻找或发明一种能阻止那些蛋白质作怪的药, 从而预防疾病。这是一个很棒的计划, 但过程漫长。至今, 科学家们只识别了 很小一部分疾病的药物靶点。不过这就是你能帮忙的地方。研究人员现在将注意力转向了 DNA: DNA 是一份指导我们身体 如何生产蛋白质的遗传说明书。他们想知道基因组中有哪些微小变化会导致生成有缺陷的蛋白质, 从而引发疾病。这可是一项浩大的工程。DNA 存储了大量信息, 【DNA 全长 30 亿个字母】而且每一种疾病都可能涉及上百, 甚至上千个蛋白质。但如果研究人员有很多人的基因组, 他们就能加以比对, 并发现规律。他们可以研究多个患有目前无法治疗的 同一种疾病的人, 找出他们共有的微小的遗传突变, 识别这些突变所编码的故障蛋白质, 那么这些突变就是目前不治之症的全新药物靶点。现在研究人员有三个选项: 1. 【适应症扩展】这些新的靶蛋白中, 是否有哪个 曾与另一种可治疗的疾病相关联? 如果有, 治疗那种疾病的药物 或许能针对这一蛋白质, 并治疗当前这种疾病。【心脏病】【类风湿性关节炎】可以启动临床试验进行验证。2. 【重定位】如果没有, 这些新的靶蛋白中是否有哪个曾与另一种疾病相关联; 该疾病有过前景良好的药物, 但最终未能凑效? 如果有, 当时的前景 可能是因为成功靶向了这一蛋白, 或许能对当前疾病起效。【勃起障碍】【心绞痛】可以启动临床试验来求证。3. 【设计】如果这是一个 全新的蛋白质靶点, 从未和任何疾病有所关联, 他们是否能设计一种新药 来影响这种蛋白质? 这个问题涉及人工智能、机器学习, 以及一些很酷的化学研究, 并且同样需要 耗费大量的时间、努力和金钱。研究人员对这些选项非常激动, 因为他们认为人体内五分之一的蛋白质 都已有, 或可能发现, 能与之结合的药物。而且, 由于任何一种普通疾病都可能涉及成百上千的蛋白质, 研究人员希望他们能识别出几种已有对应药物的蛋白质。但这一切都依赖于 找到那些新的药物靶点, 这就是为什么研究人员需要你, 或者说, 你的数据—— 包括你的基因数据和病史数据, 这样他们就可以比对 患有类似疾病的人的基因组。那么, 你会为研究贡献你的数据吗? 对此, 你可能会两个问题: 谁有权访问我的数据? 他们能拿我的数据做什么? 一个群体是医疗保健提供者, 他们已经开始考虑利用遗传分析为患者提供 更加个性化的护理服务。另一个群体是私营的 消费级基因检测公司。有一些公司已经向药企出售了 基因数据以获取利润, 不过前提是已经取得了顾客的同意。然而, 这就引发了另一个问题: 如果你的数据被用于研发新药, 药企是否应该承认这一贡献, 并以更实惠的价格销售药品? 最好的办法, 就是研究那些 请求你提供数据的机构, 了解他们将如何使用 以及保护这些数据。我们每个人对此都会有自己的看法, 但明确的是, 基因组学 可以成为一个强大的工具, 对于当前无药可医的疾病, 它能削减目前开发新药 所需的时间和成本。所以, 你怎么看?

P55 2021-05-17 What happens to your brain during a migraine - Marianne Schwarz

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=55>)

A throbbing, pounding headache. Bright zigzagging lines across your field of vision. Sensitivity to light, lingering fatigue,

disrupted sleep. A migraine can include any of these symptoms. While an incapacitating headache is one of the most common experiences of migraine, the word “headache” doesn’t really capture the wide array of experiences a migraine can entail. No two are alike, and some don’t even involve a headache. So what then is a migraine? What’s happening in the brain to cause it? To trace a migraine’s anatomy, we have to begin in the days and hours leading up to a migraine, when people often identify warning signs ranging from fatigue or mood changes, to bursts of yawning, sleep disruption, nausea, light and sound sensitivity, or even increased thirst. These warning signs point to a particular part of the brain: the hypothalamus. The hypothalamus normally controls the systems behind these symptoms—our body’s internal hormonal balances, circadian rhythms and water regulation. It has wide connections throughout the brain, and is more active than usual in the days before migraine. Another common warning sign is the migraine aura, which can take the form of transient visual changes, tingling, or even trouble speaking. These sensations come from a change in charge across cell membranes that leads to spreading changes in brain activity and blood flow across the brain. We don’t know what triggers this change in charge, but it can spread quickly over the surface of the brain, causing different aura symptoms depending on the affected area. If it inches over the visual cortex, for example, it may cause an image or blind spot to spread over the visual field. During the headache phase, the trigeminal nerve plays a key role. The trigeminal nerve normally transmits touch, temperature, and other sensations from the skin to most of the face, part of the scalp, and some of the blood vessels and layers covering the cerebral cortex. Once activated, the trigeminal nerve transmits pain signals. During a migraine, this pain pathway becomes sensitized, meaning the threshold for provoking pain is lowered. Sensations that would usually be pain-free, such as coughing, bending over, or light and sound, can become painful. Migraines are as common as they are diverse, affecting as many as 33% of women and 13% of men in their lifetimes. Still, there’s much we don’t know about them. We can see that migraine is a neurological disorder affecting multiple parts of the brain—the brainstem, cerebral hemispheres, and the nerves themselves. But we don’t know for sure what exactly triggers each step, why some people get migraines and not others, why so many more women do than men, or why people’s migraine patterns sometimes change over their lifetimes. Hormonal fluctuations are thought to have a role in some of these things: some women experience a significant reduction in migraine frequency after menopause, when sex hormone fluctuations are fewer. Meanwhile, just before menopause, these fluctuations increase, and some women experience worsening or new headaches. People with migraines are more likely to suffer from depression, panic disorder, sleep disorders, and strokes, among other illnesses. The relationship with these diseases is likely complex, possibly reflecting the effect of migraine on those diseases or vice versa, or reflecting their shared genetic basis. Genetics almost certainly play a role, although with a few exceptions, there’s no single gene that causes migraines. Certain genes control how easily our brains’ neurons are excited by environmental stimuli and how readily they transmit painful signals. It’s possible that the neurons in the brains of people who experience migraines are more easily triggered by environmental stimuli and less likely to block painful signals. While there’s no simple way to explain what happens in our brains with this complex disorder, one thing is for sure: migraine is much more than a headache.

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[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=55>)

翻译人员: Wanting Zhong 校对人员: Yanyan Hong 抽痛的、剧烈的头痛。明亮的之字形线条划过你的视野。对光敏感、疲劳感挥之不去、睡眠出现障碍。偏头痛可能包括上述任何症状。虽说令人虚弱无力的头痛是偏头痛最常见的体验之一，但“头痛”这一词并不能真正概括偏头痛可能带来的各式体验。没有哪两种是相同的，有些甚至不涉及头痛。那么偏头痛究竟是什么？大脑中发生了什么导致了偏头痛？要想追踪偏头痛的解剖学原理，我们必须回溯到偏头痛发作前的几天或几小时，此时人们常常能辨别出预警信号，从疲劳、情绪变化，到一阵阵打哈欠、睡眠紊乱、恶心、对光和声音敏感，甚至口渴加剧。这些预警信号都指向了大脑中的某个特定区域：下丘脑。下丘脑通常控制这些症状背后的系统——我们身体的内部激素平衡、昼夜节律和水调节。它和整个大脑各个区域都有广泛的连接，在偏头痛发作前几天下丘脑比平常更为活跃。另一个常见的预警信号是偏头痛先兆，它可以是短暂的视觉变化、刺痛感，甚至言语困难。这些感觉来源于细胞膜电位的变化，导致脑活动和血流的变化在大脑中扩散。我们不知道是什么触发了电位变化，但它能快速在大脑表面传播，根据影响区域的不同，引起不同先兆症状。例如，如果它侵入了视觉皮层，它就有可能导致图像或盲点在视野内扩散。在头痛阶段，三叉神经起到了关键作用。三叉神经一般会传递来自大部分脸部皮肤、部分头皮、以及覆盖大脑皮层的一些血管和膜层的触觉、温度和其它

感觉。一旦被激活，三叉神经会传递痛觉信号。当偏头痛发作时，这个痛觉通路会变得敏感化，意思是能触发痛觉的阈值下降了。那些平时不会疼痛的感觉，比如咳嗽、弯腰，或者声和光，都有可能变得让人疼痛。偏头痛不仅多样，还很常见，多达 33% 的女性和 13% 的男性 在一生中会受到偏头痛的困扰。尽管如此，我们对偏头痛 仍然知之甚少。我们知道偏头痛是一种神经系统疾病，影响了大脑的多个部分——脑干、大脑半球，还有神经本身。但我们并不确切知道 每一步究竟是由什么触发的，为什么有的人会患上偏头痛， 而别人却不会受其所扰，为什么女性患者比男性多了这么多，为什么患者的偏头痛模式 有时会随着年龄增长发生变化。激素水平波动被认为 与其中一些问题有关：更年期之后，性激素的波动减少，有些女性的偏头痛频率也会大幅下降。同时，在更年期之前，这些激素波动会增加，有些女性的头痛症状会加重， 或出现新的头痛。有偏头痛的人更有可能患上抑郁症、恐慌症、睡眠障碍、中风等疾病。偏头痛与这些疾病的关系可能很复杂，或许反映了偏头痛 对这些疾病的影响，反之亦然；或者反映了它们共同的遗传基础。虽然存在少数例外， 遗传几乎肯定起了一定作用。导致偏头痛的并不是单一的基因。有些基因能控制我们大脑的神经元有多容易被环境刺激激活、 能多轻易地传递痛觉信号。患有偏头痛的人脑中的神经元可能更容易被环境刺激激发，且更不容易阻断痛觉信号。虽然没有简单的办法可以解释 这个复杂的疾病让我们大脑里发生了什么，但有一点是肯定的： 偏头痛远远不只是头痛。

P56 2021-05-18 Can you be awake and asleep at the same time - Masako Tamaki

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=56>)

Many animals need sleep. Even brainless jellyfish enter sleep-like states where they pulse less and respond more slowly to food and movement. But all of the threats and demands animals face don't just go away when it's time to doze. That's why a range of birds and mammals experience some degree of asymmetrical sleep where parts of their brain are asleep and other areas are more active. This is even true for humans. So how does it work? All vertebrate brains consist of two hemispheres: the right and left. Brain activity is usually similar across both during sleep. But during asymmetrical sleep, one brain hemisphere can be in deep sleep while the other is in lighter sleep. And in an extreme version called "unihemispheric sleep," one hemisphere may appear completely awake while the other is in deep sleep. Take bottlenose dolphins. Their breathing is consciously controlled, and they must surface for air every few minutes or they'll drown. When they have a newborn calf, they must actually swim nonstop for weeks in order to keep it safe. So dolphins sleep unihemispherically, with just one hemisphere at a time. This allows them to continue swimming and breathing while snoozing. Other marine mammals also need asymmetrical sleep. Fur seals might spend weeks on end migrating at sea. They slip into unihemispheric sleep while floating horizontally, holding their nostrils above the surface, closing their upward-facing eye, and keeping their downward-facing eye open. This may help them stay alert to threats from the depths. Similar pressures keep birds partially awake. Mallard ducks sleep in groups, but some must inevitably be on the peripheries. Those ducks spend more time in unihemispheric sleep, with their outward-facing eyes open and their corresponding brain hemispheres more active. Other birds have been shown to catch z's in midair migration. While undertaking non-stop transoceanic flights of up to 10 days, frigatebirds either sleep with one or both hemispheres at a time. They do so in seconds-long bursts, usually while riding air currents. But the frigatebirds still sleep less than 8% of what they would on land, suggesting a great tolerance for sleep deprivation. It's currently unclear whether asymmetrical sleep packs the same benefits as sleep in both hemispheres and how this varies across species. In one experiment, fur seals relied on asymmetrical sleep while being constantly stimulated. But in recovery, they showed a strong preference for sleep across both hemispheres, suggesting that it was more restorative for them. Dolphins, on the other hand, have been observed to maintain high levels of alertness for at least five days. By switching which hemisphere is awake, they get several hours of deep sleep in each hemisphere throughout a 24-hour period. This may be why unihemispheric sleep alone meets their needs. So, what about humans? Have you ever woken up groggy after your first night in a new place? Part of your brain might've spent the night only somewhat asleep. For decades, scientists have recognized that participants sleep poorly their first night in the lab. It's actually customary to toss out that night's data. In 2016, scientists discovered that this "first night effect" is a very subtle version of asymmetrical sleep in humans. They saw that, during the first night, participants experience deeper sleep in their right hemisphere and lighter sleep in their left. When exposed to infrequent sounds, that lighter sleeping left hemisphere showed greater bumps in activity. Participants also woke up and responded to infrequent sounds faster during the first night than when experiencing deep sleep in both hemispheres during nights following. This suggests that, like other animals, humans use asymmetrical sleep for vigilance, specifically in unfamiliar environments. So,

while your hotel room is obviously not trying to eat you and you're not going to die if you don't continue moving, your brain is still keeping you alert. Just in case.

P56 2021-05-18 Can you be awake and asleep at the same time - Masako Tamaki

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=56>)

翻译人员: Jingxuan Wang 校对人员: Yanyan Hong 大多动物都需要睡觉, 甚至没有大脑结构的水母 都会进入类似睡眠的状态, 即脉冲减少, 它们会减缓 对食物和周围活动的反应。但是动物所面临的威胁和需求, 并不会因为睡眠而自动消失。这就是为何许多鸟类和哺乳类动物会经历某种程度的“半睡眠”现象, 即大脑的一部分处于休眠状态, 而另一部分则处于清醒状态。甚至人类也会这样。那这究竟是怎样做到的呢? 所有脊椎动物的大脑 都由两个半球组成: 左脑和右脑。通常, 左右脑 在睡眠状态中有相似活动。但在“半睡眠”状态下, 大脑的其中一个半球会进入深度睡眠, 而另一个半球则会进入浅度睡眠。在一种叫“单半球睡眠”的 极端情况下, 其中一个脑半球会处于完全清醒的状态, 而另一个则处在深度睡眠中。以宽吻海豚为例, 它们需要时刻控制呼吸, 每几分钟就需要浮上水面呼吸, 不然就会有溺水的危险。当海豚有了新生的幼崽, 它们会不停地游上好几周以便守在幼崽的身边保证它的安全。所以海豚是单半球睡眠生物, 每次只用一边大脑睡觉。这使得它们在打盹的同时, 也能继续游泳和呼吸。还有其他海洋哺乳动物 需要单半球睡眠, 像是毛皮海豹, 迁徙时会 在海里游上数周, 其间会横向漂浮在水面 进入单半球睡眠, 将鼻孔伸出水面, 闭上露出水面的那只眼睛, 同时睁开水面以下的那只眼睛。这可以使它们 对海底深处的威胁保持警觉。类似的生存压力 也让鸟类保持“半睡半醒”的习惯。绿头鸭喜欢抱团睡觉, 但总有一些会不可避免落单在边上, 那些在边上的鸭子 多数时间都处于单半球睡眠。它们会睁开朝外的那只眼睛, 与此同时, 相对应的大脑半球 也会比较清醒。研究证明其他一些鸟 能在半空迁徙时睡觉。当进行长达 10 天 不眠不休的越洋迁徙时, 军舰鸟可以只有一边大脑在休息, 或是同时两侧大脑都在休息。它们会在快速猛冲时以这种方式入睡, 尤其是穿过气流的时候, 但军舰鸟在空中的睡眠时间 仍比在陆地上少 8%, 可见它们对睡眠不足 有很强的耐受力。目前我们仍不清楚, “半睡眠”是否与“完全睡眠”一样的好处, 并且这一现象是如何因物种而异的。在一项实验中, 面对不断的刺激, 毛皮海豹倾向于依赖“半睡眠”。但在补充体力时, 它们表现出了大脑两侧同时睡觉的强烈倾向, 说明这种方式 更有利于它们体力的恢复。另一方面, 海豚在至少五天时间内 都保持着高度警惕。通过对两侧大脑的交替使用, 它们的每一侧大脑 在二十四小时内都得到了几小时的深度睡眠时间, 这也许是因为“半睡眠”足以满足它们的需求。那么, 人类又是怎样的呢? 当你在新环境过夜后, 醒来是否会觉得大脑昏昏沉沉? 那是因为你的部分大脑 没有得到完全的休息。几十年来, 科学家们已经意识到 实验对象在实验室过夜的第一天, 睡得并不好, 所以, 通常他们会 放弃当晚的实验数据。2016 年, 科学家们发现这种“初夜效应”, 是一种非常不明显的人类“半睡眠”的例子。他们发现, 在第一晚实验对象的右脑会经历更深度的睡眠, 而左脑则是较浅的睡眠。当出现低频率声音时, 较浅睡眠的左脑在活动中 显示出了更大的波动, 在第一晚实验对象也会醒来 并对低频声音做出更快的反应, 而第二晚大脑两侧则都处于深度睡眠。这一研究结果表明, 像其他动物一样, 人类的“半睡眠”是警惕的表现, 特别是当他们处于不熟悉的环境中。显然, 你的宾馆房间不会吃了你, 即使你一动不动, 你也不会死, 这只是你的大脑表现警惕的方式, 以防万一。

P57 2021-05-20 Run, sail, or hide How to survive the destruction of Pompeii - Gary D

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=57>)

It's a bustling day in Pompeii. Fabia visits the Temple of Venus and offers a sacrificial dove to the goddess, asking her to bless her brother's upcoming wedding. After a quick visit to the market, she spots her brothers, Lucius and Marcus, crossing the Forum. They're off to relax at the public baths. Marcus spent the morning helping a master craftsman lay a grand mosaic floor while Lucius worked in the brickyard. It's been 17 years since an earthquake hit Pompeii and its neighbor Herculaneum, and there's still construction and repair work to do. Fabia and her brothers discuss the recent tremors everyone's been feeling. Lucius jokes that there'll always be work for men who rebuild walls in Pompeii. He tells them how eager he is to bind hands with his sponsa, or bride-to-be. The siblings begin discussing tomorrow's wedding— but a deafening boom interrupts them. They watch Vesuvius spew smoke, ash, and rock high into the air— and realize they've been living in the shadow of a volcano. They embrace and pray to Venus for protection and Vulcan for mercy. Each must now choose how to survive. They have three options: seek shelter, escape to the south on foot, or flee to the west by sea. Lucius rushes home but can't find his sponsa. He

decides to wait for her and lights an oil lamp. Ash and pumice begin raining over Pompeii. Fabia shelters with her husband, Claudius, and their daughters. But after a few hours, their roof groans under the weight of volcanic debris, and they realize they can't stay. They decide to travel southeast, away from the volcano. The family joins swarms of people wading through hot ash on the cardo maximus and begins navigating towards one of Pompeii's southern gates. Marcus finally reaches his home in Herculaneum and gathers his wife and children. They decide to escape by sea. But as they approach the docks, they discover waves brimming with volcanic matter, making it impossible for boats to navigate close enough to shore. Trying to keep calm for their children, they huddle underneath covered boat docks. Now, the deadliest phase of the disaster begins. At this point, the force throwing the volcanic material, or tephra, into the air diminishes, and it comes crashing down. Hot ash and noxious gas billow out in a wave known as a pyroclastic surge. This first surge engulfs Herculaneum. One hour later, another three times as strong collapses the town's remaining structures. These have yet to reach Pompeii, but buildings are ablaze in the hot, sulfurous air. Lucius climbs out of his closet and tries his front door, but a deep blanket of ash and stone won't let it budge. His lamp flickers and dies. After more than 14 hours, at times walking through ash up to their chests, Fabia, her family, and the others who left early enough, climb the southern Lattari mountains. They reach a peak and pause to look back. Another pyroclastic surge rushes across the valley, crashes into Pompei, and sheers off the upper levels of the town's buildings. Fighting back tears, Fabia continues to push her family on towards safety, praying for her brothers and fellow townspeople. According to modern analysis, the eruption may have lasted days or weeks. When it was over, almost 300 square kilometers were decimated, and Pompeii and Herculaneum lay under up to 65 feet of tephra. Despite some disorganized looting and digging, these towns remained buried until official excavations began in the mid-1800s. Archaeologists have since analyzed skeletal evidence and volcanic deposits to reconstruct a timeline of Herculaneum and Pompeii's final moments. They've revealed a poignant glimpse at the experiences of the eruption's victims. Much of our understanding of ancient Roman life—from food and furniture to architecture and economics—comes from these ruins. In their time, they were simply provincial towns in the Bay of Naples. But their rediscovery has given us an unparalleled view into the ancient world and the lives that were devastated by disaster.

P57 2021-05-20 Run, sail, or hide How to survive the destruction of Pompeii - Gary D

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=57>)

翻译人员: 校对人员: Helen Chang 这是庞贝城忙碌的一天。法比娅来到维纳斯神殿 并为女神送来一只鸽子作为祭品, 祈求女神祝福她兄弟即将到来的婚礼。在市场的一次短暂停留后, 她看到她的兄弟们, 路西斯和马库斯, 从集会区穿过。他们要去公共浴场放松。马库斯早上帮一位工匠老师傅 铺了一片气派的马赛克地板, 同时路西斯则在砖厂里干活。离上次庞贝和它的邻城赫库兰尼姆 发生地震已经十七年了, 仍有很多维修工作要做。法比娅和她的兄弟们讨论了 大家最近都有感觉到的小震动。路西斯开玩笑说, 在庞贝, 修墙人总会有活干。他告诉两人自己有多等不及 来牵起自己未婚妻的手。兄弟姐妹开始谈论明天的婚礼 —but 一声震耳欲聋的巨响打断了他们。他们看到维苏威火山向天空 高高地喷出了浓烟、灰烬和岩石, 意识到他们一直住在火山阴影下。他们向维纳斯祈求庇护 并向火神祈求宽恕。每人现在必须选择如何求生。他们有三个选择: 寻找庇护所, 向南步行逃跑, 或者向西从海上逃脱。路西斯冲回家里 却找不到他的未婚妻。他决定在家等她, 并点了一盏油灯。火山灰和浮岩开始洒落在庞贝城上。法比娅和丈夫克劳迪亚斯 以及女儿们躲在一起。但是几小时后, 他们的屋顶 在火山碎屑的重压下嘎吱作响, 他们意识到他们不能留在那。他们决定往东南方走, 远离火山。一家人加入了大批在中心大街上 踏着热灰前行的人们开始向着庞贝的南方大门之一前进。马库斯终于到达 他位于赫库兰尼姆的家并找到了他的妻儿。他们决定从海上逃脱。但是当他们走近港口, 他们发现海浪上满是火山碎屑, 这使得船只不可能靠近海岸。马库斯和妻子为了孩子试着保持镇定, 他们蜷缩在船坞的屋顶下。此时这场灾难最致命的阶段开始了。这时候, 将火山物质(火山灰) 抛向天空的力量减弱, 灰烬猛然落下。炙热的灰烬和有毒的气体以一种被叫做火山碎屑流的波浪形式 从火山里滚滚而出。第一道奔涌吞噬了赫库兰尼姆城。一小时后, 另一道三倍强度的碎屑波摧毁了城里剩下的建筑。这些还没波及到庞贝城, 但是房屋已在滚烫 且充满硫磺味的空气中猛烈燃烧。路西斯从他的衣柜里爬了出来 并试着打开他家前门, 但是厚厚的灰烬和岩石让门纹丝不动。他的油灯摇曳着熄灭了。超过十四小时后, 走在及胸口深的灰烬里, 法比娅、他的家人 还有其他走得足够早的人爬上了南边的拉塔里山脉。他们爬上了一座高峰 并停下回头看了看。又一道火山碎屑流冲过了山谷, 撞进了庞贝城, 削去了城里建筑的上半部分。强忍着泪水, 法比娅继续 带着家人向安全的地方前进, 并为她的兄弟们还有其他居民祈祷。根据现代分析, 这次爆发 可能持续了几天或是几星

期。灾后将近三百平方公里的土地 被严重破坏，而庞贝和赫库兰尼姆古城 被埋在深达 65 英尺的火山灰下。尽管有些无组织的盗掘，这些城镇在十九世纪中期的 官方挖掘开始前一直被埋着。考古学家自那以后 分析骸骨取证和火山沉积来为庞贝和赫库兰尼姆古城的 最后时刻重建一条时间线。他们揭示了这次喷发遇害者 所经历的令人心酸的景象。我们对古罗马生活的很多理解 —从食物到家具再到建筑和经济 —来自这些遗迹。当时它们只是那不勒斯湾的 两座省级城镇。但是它们的重新发现给与我们 无与伦比的机会来看向古代世界和受到灾难摧残的生命。

P58 2021-05-24 The woman who stared at the sun - Alex Gendler

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=58>)

In the spring of 1944, Tokyo residents experienced numerous aerial attacks from Allied bombers. Air raid sirens warned citizens to get indoors and preceded strategic blackouts across the city. But 28-year old Hisako Koyama saw these blackouts as opportunities. Dragging a futon over her head for protection, Koyama would gaze at the night sky, tracking all sorts of astronomical phenomena. However, her latest endeavor required the light of day. By angling her telescope towards the sun, Koyama could project the star's light onto a sheet of paper, allowing her to sketch the sun's shifting surface. She spent weeks recreating this set up, tracking every change she saw. But while Koyama didn't know it, these drawings were the start of one of the most important records of solar activity in human history. To understand exactly what Koyama saw on the sun's surface, we first need to understand what's happening inside the star. Every second, trillions of hydrogen atoms fuse into helium atoms in a process called nuclear fusion. This ongoing explosion maintains the sun's internal temperature of roughly 15 million degrees Celsius, which is more than enough energy to transform gas into churning pools of plasma. Plasma consists of charged particles that produce powerful magnetic fields. But unlike the stable charged particles that maintain magnetic activity on Earth, this plasma is constantly in flux, alternately disrupting and amplifying the sun's magnetic field. This ongoing movement can produce temporary concentrations of magnetic activity which inhibit the movement of molecules and in turn reduce heat in that area. And since regions with less heat generate less light, places with the strongest magnetic fields appear as dark spots scattered across the sun's surface. These so-called sunspots are always moving, both as a result of plasma swirling within the sphere, and the sun's rotation. And because they're often clustered together, accurately counting sunspots and tracking their movement can be a challenge, depending greatly on the perception and judgment of the viewer. This is precisely where Koyama's contributions would be so valuable. Despite having no formal training in astronomy, her observations and sketches were remarkably accurate. After sending her work to the Oriental Astronomical Association, she received a letter of commendation for her dedicated and detailed observations. With their support, she began to visit the Tokyo Museum of Science, where she could use a far superior telescope to continue her work. Koyama soon joined the museum's staff as a professional observer, and over the next 40 years, she worked on a daily basis, producing over 10,000 drawings of the sun's surface. Researchers already knew magnetic currents in the sun followed an 11 year cycle that moved sunspots in a butterfly shaped path over the star's surface. But using Koyama's record, they could precisely follow specific sunspots and clusters through that journey. This kind of detail offered a real-time indication of the sun's magnetic activity, allowing scientists to track all kinds of solar phenomena, including volatile solar flares. These flares typically emanate from the vicinity of sunspots, and can travel all the way to Earth's atmosphere. Here, they can create geomagnetic storms capable of disrupting long range communication and causing blackouts. Solar flares also pose a major risk to satellites and manned space stations, making them essential to predict and plan for. During an interview in 1964, Koyama lamented that her 17 years of observation had barely been enough to produce a single butterfly record of the solar cycle. But by the end of her career, she'd drawn three and a half cycles— one of the longest records ever made. Better still, the quality of her drawings was so consistent, researchers used them as a baseline to reconstruct the past 400 years of sunspot activity from various historical sources. This project extends Koyama's legacy far beyond her own lifetime, and proves that science is not built solely on astounding discoveries, but also on careful observation of the world around us.

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翻译人员: Alvin Lee 校对人员: Jiasi Hao 1944 年春天，东京居民们 遭受了来自盟军轰炸机的数次空袭。长鸣不止的

空袭警报警示人们躲进室内，全城同时实施灯火管制。但 28 岁的小山久子却将灯火管制 视为难得的机会。她拉了条床褥子盖在头顶，躲在遮挡保护下，小山凝望夜空，持续追踪各种天文现象。然而，她最近的工作需要在白天进行。通过将望远镜以某种角度对着太阳，小山可以将阳光投射到一张纸上，从而能够用手绘制出太阳 不断变化的表面。她花了数周的时间不断调整这一套装置，记录她看到的每一点变化。当时小山并不知道，这些手绘文档标志着人类历史上 记录太阳活动观测的开端，且是最重要的文件之一。要理解小山从太阳表面观察到的 到底是什么，我们首先需要了解 在这颗恒星内部发生了什么。每一秒钟，就有数万亿氧分子 与氢分子发生结合。这一过程叫做核聚变。这一持续发生的爆炸 将太阳的内部温度维持在 1500 万摄氏度左右。这一温度蕴含的能力足以将气体转化为不停搅动翻腾的等离子体。等离子体由众多带电粒子组成，这些带电粒子又形成强力的磁场。但不像地球上由稳定的带电粒子 所形成的稳定的磁场，这些等离子体持续处于流通状态，交替扰乱并放大太阳的磁场。这一持续发生的运动能暂时将磁场活动集中变强，从而抑制该区域的分子活动，导致温度降低。由于温度较低，产生的光也就越弱，因此磁场最强的地方看起来就会像黑点分布在太阳表面。这些太阳黑子总是在移动，一方面是因为等离子体在太阳球体内搅动，另一方面是太阳本身的旋转。又因为这些黑子总是成群出现，因此确定它们的数量 并且跟踪它们的运动就变得十分困难，十分依赖观测者的感知和判断。正因为此，小山的贡献才显得如此珍贵。尽管从未接受过天文学方面的正规训练，小山的观测和记录却异常精确。东亚天文学会在收到她的观测成果后，给她发来了嘉奖信，赞扬了她的辛勤付出和详尽的观测记录。在他们的支持下，小山来到东京科学博物馆，使用更先进的望远镜继续她的工作。很快小山以职业观测者的身份 成为了博物馆的一员，并在接下来的 40 多年里，她每天都在博物馆工作，绘制了超过 1 万幅太阳表面的手稿。当时研究人员已经知道 太阳的磁场遵循 11 年为周期，以蝴蝶状的路径 在太阳表面形成移动的黑子。但利用小山的记录，在这一过程中，研究人员可以准确跟踪特定的黑子或黑子群。这个级别的细节 可以实时反应出太阳的磁场活动，从而让科学家 能够追踪各种各样的太阳现象，包括爆炸性的太阳耀斑。这些耀斑通常在太阳黑子附近爆发，并可以一路直冲地球大气层，掀起地磁风暴。由此能扰乱远距离通信 并引起大规模停电。太阳耀斑还能对卫星和载人空间站 造成巨大威胁，因此预测太阳耀斑并采取对策 变得尤为重要。在 1964 年的一次采访中，小山叹息到，自己 17 年的观测才勉强能绘出一个太阳周期的蝴蝶图。但到她职业生涯末年，她已经画了 3.5 个周期——这是有史以来最长的记录之一。更棒的是，她绘图的质量始终如一得高，因此研究人员将其绘图作为基准线，通过众多历史资料，重构了过去 400 年的太阳黑子活动。这一项目让小山观测图的影响 远远跨越了她自己的时代，并且证明了科学 不仅仅是建立在惊人的发现上，同时也建立在 仔细观察我们周围的世界。

P59 2021-05-25 Could you survive the real Twilight Zone - Philip Renaud and Kenneth

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=59>)

You're traveling deep beneath the ocean's surface, where faint lights flicker and toothy grins flash. You are now entering... the Twilight Zone. Your mission is to survive these depths and journey to the surface after sundown to feed. You may now pick your player. Just kidding—you don't have a choice. You're a hatchetfish. And almost everything else is trying to eat you. The tools at your disposal are a uniquely shaped body, shiny scales, and glowing spots on your belly. You're going to need a lot of skill and a little luck. Your first challenge is to begin your upwards trek. Your swim bladder allows you to precisely control your buoyancy. Come nightfall, you slowly fill it up, becoming less dense and rising towards the surface. You can't swim fast, but your narrow build makes you maneuverable. This is especially important since predators could spring out of the darkness at any moment. In fact, a fangtooth is gliding beneath you. It has the ocean's biggest tooth-to-body size ratio. Food is hard to come by in the Twilight Zone, so predators have fearsome adaptations to make every attack count. The fangtooth's skin is ultra-black: it reflects less than 0.5% of the light that hits it, making this fish particularly hard to spot. Fortunately, the bioluminescent organs lining your belly are regulated to match the intensity and pattern of the faint light from the ocean's surface. This counter-illumination disguises your silhouette. So when the fangtooth gazes upwards, you're almost invisible. A bright spot appears in the distance. You go to check it out, but something's looming in the darkness. The light is a bioluminescent lure belonging to an anglerfish. You dart away before it quickly opens its jaws, sucking in a hapless fish that got too close. Another narrow escape, but you're nearly there. Although more than 90% of deep-sea creatures are bioluminescent, only one group produces the color red: dragonfishes. One of them is near. Because red light is quickly absorbed by seawater, most deep-sea inhabitants can't see it. The dragonfish emits red light from organs by its eyes, using an invisible headlight to locate unsuspecting prey that its scoops into its cavernous jaw. You can't see your enemy, but your

silvery, mirror-like scales scatter and soften direct light, keeping you hidden. After three close calls, you reach... the Photic Zone. You've just participated in the world's largest migration. It takes place every night as trillions of organisms rise from the ocean's depths to enjoy the surface's rich resources under the cover of darkness. The payoff is huge. Here, your light-sensitive eyes take in a buffet of small crustaceans and gelatinous zooplankton. During the day, phytoplankton use sunlight to turn dissolved carbon dioxide into energy and build their own cells. They become food for small grazers, forming the base of the food web, which extends back down to the Twilight Zone—and beyond. Organic matter generated up here—like bits of skin, poop, and dead animals—eventually sinks or is transported in the stomachs of animals returning from their nightly migrations. These materials then feed the creatures below that don't migrate. This ensures that some of the carbon from the atmosphere is locked away in the ocean for hundreds of years to come. That's why this process is known as the biological carbon pump. Without it, there'd be much more carbon dioxide in the atmosphere, where it contributes to climate change. Your avatar, the hatchetfish, is part of this crucial process. Your first quest is complete, but you must repeat this journey every night for the rest of your life. As the sun rises, the surface becomes dangerous, and you descend back into the shadows of the Twilight Zone.

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[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=59>)

翻译人员: Bella He 校对人员: Helen Chang 你遨游在大海深处, 这里时有微光闪烁, 时有利齿闪现。你即将进入.....暮色带。你的任务是在这深海之中生存下来, 日落后游向海面觅食。现在你来选择角色。逗你玩呢——你没有选择。你是条小银斧鱼。几乎所有生物都试图吃掉你。你独特的身型、反光的鳞片 和腹中能发出光亮的部位是你能利用的手段。你将需要动用许多技巧, 借用一点运气。你迎来的第一个挑战是向上远游。鱼鳔让你能够准确控制你的浮力。夜幕降临, 你往鱼鳔里慢慢充气; 自身密度变小, 渐渐浮向水面。虽然你游得不快, 但窄小的身型 保障了你的灵敏度。这点极其重要, 鉴于掠食者随时有可能从黑暗中冲出来。实际上, 一条尖牙鱼在你身后游过。它有着水生生物中最大的头身比。因为暮色带内食物稀缺, 所以掠食者经过惊人的进化, 以保障每一次都是有效攻击。尖牙鱼拥有着超黑肤色, 表皮的光反射率低于 0.5%, 使得发现这尖牙鱼变得极其困难。幸运的是, 排列在腹部的发光器官 调节亮度, 以与来自海洋表面的微光强度 和特征相匹配。消光剪影掩饰你的轮廓。因此尖牙鱼往上看时, 你几乎隐形了。远处出现一道光。你前往查看, 但有什么潜伏在黑暗中。这道光是琵琶鱼的荧光诱饵。在它猛然张开血盆大口前, 你迅速躲开; 它此刻吸入离它很近的倒霉小鱼。又一次死里逃生, 但这次离死神很近。尽管 90% 以上的深海生物都发光, 只有一类产出红光——海蛾鱼。有一条正在靠近。由于海水快速吸收红光, 大多深海生物看不见红光。海蛾鱼通过眼旁的器官发出红光, 利用隐形的头灯去定位 毫无戒心的猎物, 舀进牠巨穴似的下巴。你看不见敌人, 但如镜子般的银色鳞片发散、弱化直光, 使你保持隐形状态。经历三次险入“虎”口, 你终于抵达透光带。就在刚才你参与了世界上 最大型的迁徙。迁徙每晚都会进行——数以万亿计的微生物就着夜色从深海向上浮以享有表层丰硕的资源。回报十分显著。这里, 你光敏发达的双眼捕捉到 各种小型甲壳动物和胶质浮游动物。白天, 浮游植物利用阳光将 溶解的二氧化碳转化为能量, 合成自身细胞。浮游植物成为小型草食动物的食物, 这形成食物网的基础, 食物网向下延伸至暮色带, 甚至到更深处。在透光带这里产生的有机物, 如: 皮屑、排泄物和死去的动物, 最终会下沉或进了动物的肚子里, 这些动物在夜徙归途中带回。然后, 这类物质成为 不迁徙的动物的食粮。这样确保了部分来自大气层的碳元素在未来几百年仍存于海洋之中。因此, 这个过程俗称生物碳泵。如果生物碳泵不存在, 大气层中 二氧化碳含量将大大升高, 进一步加剧气候变化。你的阿凡达, 那条银斧鱼, 就是 这不可或缺过程中的一环。你完成了第一次探险, 但你须在余生中的每一晚 反复进行同样的征程。太阳升起, 表层变得危机四伏, 你随即下潜到昏暗的暮色带之中。

P60 2021-05-27 Can you solve the Trojan War riddle - Dennis E. Shasha

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=60>)

The Trojan War has been raging for 10 years, with neither Greeks nor Trojans prevailing. Gods and humans alike are desperate for a break, so when a divine omen races across the sky, the two sides agree to a 10 day truce. From high up on Olympus you've been waiting for an opportunity to bring this bloody war to its conclusion. When you go to consult the Fates, they advise: should the peace last for a full 10 days, all will end soon. However, if the truce is broken, the ensuing battle will lead

to 10 more devastating years of war. The Fates' loom has shown them the exact conditions that will keep the truce intact. The great Trojan plain can be viewed as a grid of Greek and Trojan encampments. If they're organized in such a way that any Greek can reach any other Greek camp without having to pass through a Trojan camp, and likewise for Trojans, plus neither side completely surrounds the other, peace will prevail. Anyone can move to a horizontally or vertically adjacent camp, but never diagonally. The problem is, they're currently arranged like this. Tonight, you can use your powers to swap up to six pairs of camps that are horizontally, vertically, or diagonally adjacent. No camp can be moved more than once. Which swaps do you make to keep the peace? Pause here to figure it out yourself. Answer in 3 Answer in 2 Answer in 1 The first insight here is to divide this into two sub-problems. There's the matter of connecting 4 clumps of Greeks without putting holes in the Trojan line. And then there's dealing with the thorny center space. Let's consider the Greeks first. To connect any Greek clumps, you'll have to mess with the nice, straight Trojan lines. If you try to do that anywhere in the center of these arms, you'll create new isolated clusters of Trojans. So the only option is to go to the perimeter of the field and move some Trojans diagonally, say here, here, and here. Now for the center. there's no way to connect the Trojan arms without swapping a Trojan in. But continuing to shift that arm of Trojans inward would require moving the same Greek camp multiple times. However, you could shift the whole Trojan arm up and to the right, closing this gap. There are several solutions with slight variants, but as long as you perform this maneuver on the short arm of Trojans, you can achieve peace in exactly 6 moves. You make the swaps and all is well until the fifth night. One of your rival gods wants to see the bloodshed continue, and has taken advantage of a forgotten prophecy. He's convinced one Trojan camp to make a swap with their horizontal, vertical, or diagonal Greek neighbors that will break up the Greek connectivity. Once again, you consult the Fates, who prophesize the following: the meddling Trojan camp is somewhere within four grid spaces of the perimeter of the battlefield. They won't go through with a swap if it only breaks up Trojan connectivity. And finally, you can make at most two swaps with the same rules as before to thwart them. Which swaps do you make to block the troublesome Trojan camp? Answer in 3 Answer in 2 Answer in 1 You won't be able to identify the scheming camp precisely, but there's a lot you can do to at least narrow down the options. They have to be somewhere in this area. And they have to be able to block Greek camps from each other in a single swap. That doesn't leave many options; the only possible blockages are at the end of these two arms, where a Trojan camp could plug a hole without opening a new one. So they must be in one of these four camps. Let's look at the right arm first. There's a threat here because this column has two Trojan camps. If one moves to the right, the other will still be in place, blocking Greeks from crossing. so we can thwart them by moving either one a column left into this square. and the same principle applies to the bottom arm. Your effort maintains the peace for the final 5 days. But it seems that a certain Greek general noticed what was happening and left the Trojans a parting gift...

P60 2021-05-27 Can you solve the Trojan War riddle - Dennis E. Shasha

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=60>)

翻译人员: Fangyu Zhang 校对人员: Helen Chang 特洛伊战争已经肆虐了十年希腊人和特洛伊人没有占据上风上帝和人类都极度渴望休息所以当天空中划过一道圣兆时战争的双方达成共识, 休战十天在高高的奥林匹斯山上, 你一直在等待一个 能够结束这场残酷战争的机会你去向命运三女神求助, 她们说道: 如果和平能够持续整整十天, 那么一切都会很快结束然而, 如果休战被打断那么接下来将迎来十年 更具毁灭性的战争命运三女神的织布机显示 能够维持这次休战的具体条件特洛伊大平原可被视为 希腊和特洛伊人营地的网格如果网格的排布能使任何一个希腊人 可以不用经过特洛伊营地就到达另一个希腊营地而特洛伊人也同样如此同时双方的营地 都没有被对方完全包围时和平就可以持续下去任何人都可以到达 水平或垂直相邻的营地但不能走对角线问题是, 营地现在是这样排布的今晚, 你可以用你的力量 去交换最多六对水平、垂直或者对角线相邻的营地每个营地只能被移动一次为了维持和平 你会选择哪些营地进行交换? [暂停一下, 自己动动脑][倒计时: 3][暂停一下, 自己动动脑][倒计时: 2][暂停一下, 自己动动脑][倒计时: 1]这个问题可以先被划分成两个子问题首先要在不打断特洛伊营地线的时候 把四大块希腊营地连接起来然后是处理棘手的中心区域让我们先来考虑希腊营地要想把任何两大块希腊营地连接起来都要打断那些漂亮笔直的特洛伊营地线如果你试图在四条营地线的 中间位置这样操作你会创建出一块孤立无援的 特洛伊营地群所以唯一的选择就是移动末端的营地对角线移动一些特洛伊营地 比如这里、这里和这里现在来看中心区域不把特洛伊营地换进来 就无法连接特洛伊营地线但如果继续把这一端的 特洛伊营地向内移动就需要多次移动同一个希腊营地然而, 你可以将这一端的特洛伊营地 整体向右上方移动把空缺补齐有几种略微不同的解决方案

但只要你在特洛伊营地线 较短的那一端执行这个操作就可以用刚好六次移动来获得和平你交换了营地，一切顺利直到第五个晚上你的一个敌对神 想让这场血腥之战继续下去利用了一个被遗忘的预言他说服了一个特洛伊营地与同它水平、垂直或对角线相邻的 希腊营地 进行交换这个交换会打破希腊营地的内部联结你再一次向命运三女神求助，她们预言了以下内容：捣乱的那个特洛伊营地就在 距离战场边缘四格的范围内如果只是中断特洛伊营地的连接 他们就不会进行交换最后，你最多可进行两次交换去阻止它其余的规则都和之前一样为了阻碍那个捣乱的特洛伊营地 你会选择哪些营地进行交换？[倒计时：3][倒计时：2][倒计时：1]你无法准确地识别出那个密谋的营地但你至少可以缩小选择的范围那个营地一定在这个区域内它只进行一次交换 就能够打断希腊营地之间的联系这样一来，剩余的选择可就不多了唯一可能造成阻碍的营地 就在这两翼的末端在这里，特洛伊营地 可以把两块希腊营地隔开同时不产生新的连接点所以捣乱的那个营地一定在这四个之中我们先来看右端这一列有两个特洛伊营地 可能会造成威胁如果一个营地向右移动 另一个即使留在原地也仍旧可以将希腊营地隔开为要阻止，可以把这两者之一 向左移动一格，放在这里这个原理同样适用于下端的营地你的付出维护了最后五天的和平但似乎有一位希腊将军注意到了这件事并给特洛伊人留下了一个告别礼.....

P61 2021-06-01 The epic of Gilgamesh, the king who tried to conquer death - Soraya F

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=61>)

In 1849, in the ancient city of Nineveh in northern Iraq, archaeologists sifted through dusty remains, hoping to find records to prove that Bible stories were true. What they found instead was one of the oldest libraries in the world. Inscribed on crumbling clay tablets was a 4,000-year-old story so riveting the first person to translate it started stripping from excitement. Called the epic of Gilgamesh, the story starts with Gilgamesh, king of the city of Uruk, crashing every wedding and sleeping with the bride before she has a chance to sleep with her husband. To tame Gilgamesh, the goddess Aruru created a rival called Enkidu. Enkidu lived beyond the walls of the city, where chaos reigned and wild animals, invaders, and evil spirits prowled. After a priestess of the goddess Ishtar seduced Enkidu, the wild animals beyond the wall rejected him and he ventured into the city. There, he encountered Gilgamesh up to his usual tricks. Enkidu stepped in to stop him. Almost perfectly matched, the two men wrestled all through the city streets until Gilgamesh won the fight by a hair. Afterwards, they were inseparable. With his new friend, Gilgamesh turned his attention from the brides of Uruk to proving his strength in combat. They set out to slay Humbaba, a creature with a thousand faces who guarded the trees of the Forest of Cedar. They tracked Humbaba and ambushed him. Cornered, he begged for his life, then cursed them as Gilgamesh dealt the final blow. Back home in Uruk, the goddess Ishtar took a romantic interest in Gilgamesh. Knowing she tended to lose interest and curse her former flames, Gilgamesh refused her advances. So Ishtar unleashed the Bull of Heaven on Uruk to destroy crops and kill people. When Gilgamesh and Enkidu slayed the creature defending the city, the gods killed Enkidu. He entered the House of Dust, the shadowy Mesopotamian underworld where the spirits of the dead knelt eternally on the ground, eating dirt and drinking stone. Grieving for Enkidu and terrified of meeting this fate himself, Gilgamesh set off beyond the cosmic mountains to seek immortality. He passed scorpion people and groves of gemstone trees, travelled beneath the mountains and outran the rising sun, until he finally came to the end of the world, where he found a bar. The bartender was a goddess named Shiduri, who urged Gilgamesh to give up his quest. She told him all mortals must die, but until death comes, he should enjoy his life. But Gilgamesh refused to give up. Reluctantly, Shiduri gave him directions to cross the Waters of Death and meet the immortal man Utanapishti. The gods had granted Utanapishti immortality following a great flood, during which he built a boat, loaded two of every animal onto it, and landed on a mountain peak. Utanapishti also encouraged Gilgamesh to accept that death comes for everyone. But Gilgamesh still would not budge. So Utanapishti told him that if he could conquer sleep, the gods might grant him immortality. Gilgamesh intended to stay awake for seven days, but fell asleep immediately. Utanapishti then told him about a magical plant that grew at the bottom of the ocean and granted eternal youth. Though Gilgamesh successfully retrieved the plant, a snake stole it on his way home. But when Gilgamesh laid eyes on his beautiful city again, he made peace with his mortality and vowed to spend his lifetime doing great deeds. He wrote his story on a lapis lazuli tablet and buried it under the city walls for future generations to find and learn from. The tablets uncovered in Nineveh were part of the library of the Assyrian king, Ashurbanipal. Though the story is mythical, Gilgamesh was probably a real king of Uruk. Versions of his tale date to 2000 BCE and perhaps even longer ago, and still echo through literature today.

P61 2021-06-01 The epic of Gilgamesh, the king who tried to conquer death - Soraya F

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=61>)

翻译人员: Wanting Zhong 校对人员: Helen Chang 1849 年, 在北伊拉克的尼尼微古城, 考古学家们在沙尘弥漫的遗迹中筛土, 希望能找到可以证实圣经故事的记录。而他们发现的却是 世界上最古老的图书馆之一。在碎裂的泥板上刻着 一个四千年前的故事, 如此引人入胜, 第一位翻译的人 甚至激动得脱起了衣服。这个故事叫做《吉尔伽美什史诗》, 开篇讲述了乌鲁克国王吉尔伽美什擅闯每一个婚礼, 强行霸占每位新娘的初夜。为了降服吉尔伽美什, 女神阿鲁鲁 为他创造了一位对手, 名叫恩奇都。恩奇都生活在城墙之外, 以蛮荒为伴, 野兽、侵略者 和恶灵在周围徘徊。女神伊什塔尔的女祭司 引诱了恩奇都之后, 城外的野兽们开始排斥他, 于是他便向城里进发。在那里, 他遇到了 恣意妄为的吉尔伽美什, 恩奇都便上前制止。两人势均力敌、不分伯仲, 在乌鲁克街上扭打得难解难分, 直到吉尔伽美什险胜毫厘。两人从此形影不离。结识新朋友后, 吉尔伽美什不再滥抢民女, 而是决意在战斗中证明力量。他们出发去讨伐芬巴巴, 一只守卫雪松之林的千面怪物。他们追踪芬巴巴, 发起伏击。芬巴巴进退维谷, 乞求饶命, 在吉尔伽美什砍下最后一击时 诅咒他们。回到乌鲁克后, 女神伊什塔尔 对吉尔伽美什动了芳心。吉尔伽美什知道她常常 对旧爱始乱终弃、降下诅咒, 因此拒绝了她的求爱。于是伊什塔尔在乌鲁克降下天之公牛, 践踏庄稼、屠戮人民。在吉尔伽美什和恩奇都 杀死公牛、守护城市之后, 众神杀死了恩奇都。他来到了尘土之家, 美索不达米亚阴暗的冥界, 在那里的亡魂永世跪地, 以泥土为食、以石砾为饮。吉尔伽美什为恩奇都悲痛不已, 也对命定的死亡感到惶恐, 于是便翻越宇宙之山, 踏上了寻求永生的旅程。他经过蝎子人守卫, 穿过宝石树林, 在山底之路跋涉, 与初升旭日赛跑, 终于抵达了世界的尽头, 在那里发现了一家酒馆。老板娘是一位名叫西杜丽的女神, 她试图劝阻吉尔伽美什对永生的追求。她告诉他, 所有凡人必将死亡, 但在死亡来临之前, 应当学会享受人生。但吉尔伽美什不愿放弃。西杜丽只能勉为其难地指点他 渡过死亡之海, 去见永生者乌特纳庇什提。众神在大洪水之后赐予了乌特纳庇什提永生; 在大洪水前, 他造了一艘船, 载上每种动物中的一对, 最后停靠在了山顶。乌特纳庇什提同样告诫吉尔伽美什, 接受人人必将死亡的命运。但吉尔伽美什依然不依不饶。于是乌特纳庇什提告诉他, 如果他战胜睡眠, 众神或许就会赐予他永生。吉尔伽美什本想六天七夜保持清醒, 但他立刻睡着了。乌特纳庇什提又告诉他, 在海底生长着一种仙草, 能够让人长生不老。虽然吉尔伽美什成功摘得了仙草, 但在回家路上却不幸被蛇偷吃。但当吉尔伽美什 再度看见自己美丽的城市, 他便接受了人固有一死的宿命, 并发誓要用余生建功立业。他把自己的故事写在青金石板上, 埋在城墙下, 供后人发现学习。在尼尼微出土的泥板是亚述国王亚述巴尼拔 图书馆的藏品。尽管史诗是神话传说, 乌鲁克国王 吉尔伽美什可能确有其人。他的故事有诸多版本, 可以追溯到 公元前 2000 年, 甚至更早, 时至今日仍在文学之中回响。

P62 2021-06-03 Why do we have hair in such random places - Nina G. Jablonski

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=62>)

We have lots in common with our closest primate relatives. But comparatively, humans seem a bit... underdressed. Instead of thick fur covering our bodies, many of us mainly have hair on top of our heads— and a few other places. So, how did we get so naked? And why do we have hair where we do? Human hair and animal fur are made of the same stuff: filaments of the protein keratin that grow out of organs known as follicles, which go through cycles of growth and shedding. Across mammalian species, hairs have been modified for numerous purposes, ranging from the soft fluff covering rabbits to the rigid quills protecting porcupines. But for many mammals, hair grows in two layers consisting of a shorter undercoat of ground hairs covered by longer guard hairs. Together, they help insulate the animal's body and protect its skin. Human hairs, on the other hand, are kind of a combination of these hair types. Unfortunately, hair is rarely found in fossils, making it hard for researchers to pinpoint when and how our ancient ancestors lost their coats. But scientists have developed some working hypotheses. It seems that, millions of years ago in Africa, early hominins first transitioned out of trees and adopted a more active lifestyle. Keeping cool became increasingly important. Eventually, they developed more sweat glands, which helped them lose heat by evaporating moisture through the skin. In fact, humans have 10 times more sweat glands than chimpanzees, for instance. But efficiently losing heat by sweating is harder to do when you're covered in fur. Scientists believe that early humans lost much of their coat around this time to help their sweat evaporate faster. However, if losing our hair was so advantageous, why do we have any left at all? It seems that there are unique uses for hair in different parts of our bodies. When it comes to the tops of our heads, temperature regulation likely played a part again. Since early humans began venturing

into the open, their heads would've been exposed to the scorching sun. Thicker, longer-growing hair protects our sensitive scalps and keeps our brains from overheating. Dark tightly curled hair is most effective at keeping solar radiation off of skin. Other kinds of head hair evolved as humans moved to different places. Meanwhile, researchers think eyebrows are especially useful for communication because they sit atop active facial muscles that convey our feelings. Eyelashes have been shown to minimize airflow over our eyeballs, preventing them from drying out and catching debris. And maybe facial hair proved helpful in distinguishing identity from a distance, but we really don't know. Evidence is stubbly at best. Why we have hair in other regions is... more pungent. Our armpits, nipples, and pubic areas are dotted with apocrine glands. They produce oily, smelly secretions which the thick, curly hair that often grows in these spots helps disperse. The secretions that waft off these hairy patches may be useful for identification. For example, several studies have shown that people are able to identify their own armpit odors as well as those of people they're close with. The final type of notable human hair is the vellus hair that covers our bodies. We don't know if these hairs serve any purpose themselves, but the follicles vellus hair grows from are essential banks of stem cells that repair damaged skin after injury. They're also important sites of nerve endings that convey signals of gentle touch to the brain. In fact, although it's much finer, humans have roughly the same density of body hair as apes of comparable sizes. So despite all this talk of human nakedness, we're not actually as hairless as we look.

P62 2021-06-03 Why do we have hair in such random places - Nina G. Jablonski

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=62>)

翻译人员: It's hard to think a name Yeah that's me 校对人员: Helen Chang 我们与我们最亲近的灵长类亲戚 有很多相同点。但相比之下, 人类似乎毛发...有些少。相较身上覆盖着厚厚的毛, 大多数人的毛发主要集中在头顶—和其他几个地方。那么我们何以变得如此“赤裸”呢? 我们的毛发为什么长在 它们所在的地方呢? 人类的毛发和动物的皮毛 都是由同一种东西形成的: 角蛋白(protein keratin)的单纤维 从毛囊中长出来, 经过一个生长和脱落的周期。对于哺乳动物来说, 毛发在经历改变后有了多种作用。从被柔软的绒毛覆盖的兔子到用坚硬的刺来保护自己的豪猪。但很多哺乳动物的头发有两层, 一层相对短的里层毛发被另一层相对长的外层粗毛所覆盖。这两层毛发有助于为动物的身体保温和保护牠的皮肤。在另一方面, 人类毛发 是这类毛发的一种组合。不幸的是, 毛发很少在化石中被发现, 这使得研究者很难去查明 我们的祖先在什么时候以及如何失去他们的皮毛。但是科学家们已经推导出 一些有用的假设了。看起来, 在数百万年前的非洲, 早期古人类首次从树上下下来, 还选用更活跃的生活方式。保持凉爽变得极具重要。最终, 他们衍变出了更多的汗腺, 这有助于他们通过皮肤 蒸发水分而散热。事实上, 例如, 人类拥有比黑猩猩多 10 倍的汗腺。但是被皮毛所覆盖的你 难以通过出汗的方式有效地散热。科学家们相信早期人类在这段时间 失去他们大量的毛发, 以助于让他们的汗蒸发地更快。但是, 如果失去毛发这么有益, 那我们为什么还会有任何余下来的毛发呢? 似乎我们身体不同部位的毛发 都有独特的用途。当我们谈论到我们的头顶时, 温度调节可能再次发挥了作用。由于早期人类开始进行野外冒险, 他们的头会暴露在烈日下。更厚, 更长的头发可以起到 保护我们敏感头皮的作用并且防止我们的大脑变得过热。深色紧紧卷曲的头发 最能有效地防止太阳辐射照射皮肤。其他种类的头发也随着人类 搬去不同的地方而进化。同时, 研究者们认为眉毛 在沟通交流的时候尤其地有效, 因为它们坐落在活跃的面部的肌肉上 传达我们感受。睫毛已经被证实 能使流经眼球的气流最小化, 防止眼球变干并粘上碎物。还有, 或许面部的毛发 能够有助于从远处区分身份。但是我们不知道真假。证据充其量也只是零星的。为什么我们在其他区域有毛发 这件事...更呛(双关语: 有味道)。我们的腋窝、乳头和阴部 布满了大汗腺。它们会产生油腻、有臭味的分泌物, 浓密的卷发通常长在这些位置来散味。这些从小区域的毛发中飘出的分泌物 可能有助于辨别身份。例如, 一些研究表明人们有能力辨别出他们自己的腋窝气味 以及与他们亲近的人的腋窝气味。最后一种值得注意的人类毛发 是覆盖我们身体的绒毛。我们不知道这些毛发本身 是否有任何用途, 但长出毛发的毛囊 是必不可少的干细胞库, 可以修复受伤后受损的皮肤。它们也是向大脑传递轻柔触摸信号的神经末梢的重要部位。事实上, 尽管它相对更细, 但人类的体毛密度 与大小相当的猿类大致相同。所以尽管说了这么多 关于人类如何赤裸的讨论, 我们实际并没有看起来那么的无毛。

P63 2021-06-07 A day in the life of an Ancient Greek oracle - Mark Robinson

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=63>)

As the sun rises over Delphi in 500 BCE, Aristonike hurries to the temple of Apollo. Like all Greeks, she's known the legend

of Delphi since childhood. Two eagles released by Zeus from opposite ends of the Earth met on the slopes of Mount Parnassus, identifying Delphi as the center of the world. Marking this spot was a mysterious stone guarded by a legendary serpent called the pytho. But when Apollo killed the pytho, he made Delphi his home— establishing the city as the best place in the world to seek guidance directly from the God of Prophecy. Well, almost directly. At any given time, a single oracle known as the Pythia communicates Apollo's will. Reserved only for women, this is the most important job in the city— and one that Aristonike will soon have to take on as the current Pythia-in-training. Despite serving in the Temple of Apollo for many years, Aristonike is still uncertain that she's wise enough to fulfill this role. But these doubts will have to wait. Today she'll be shadowed by officials from the city's governing council. If her performance meets their standards, this is the day she'll become the new Oracle of Delphi. In the heart of the temenos, or sacred enclosure, Aristonike greets the current Oracle and the city officials. The group joins the procession to the Castilian Spring, where the Pythia performs a purification ceremony to prepare for a day of prophecy. To establish whether Apollo is willing to be consulted, Aristonike brings water from the spring to the temple priests, who sprinkle it on a goat. If the goat shudders, it will be a prophecy day. If not, travelers from as far away as modern day Sicily, Egypt, and Afghanistan will have to wait an entire month to consult the Oracle again. Fortunately, Apollo is in a communicative mood. Delphians are first in line, most seeking advice about business or marriage. Following the locals are other Greeks and then non-Greeks, including ambassadors from great cities who plan to ask about whether to go to war, or where they should found new colonies. Most supplicants bring two options for the Pythia to choose between, alongside the obligatory sacrificial cake. Aristonike reports back to the Pythia, pointing out important figures and sharing some of their concerns— all while the city counselor takes notes on her performance. Then the Pythia disappears into her oracular chamber known as the adyton. Inside, she'll channel the inspiration of Apollo, uttering ambiguous prophecies the questioners must interpret. The adyton is the one place in the temple Aristonike isn't allowed to go. So while consultations continue, the Oracle-in-training sets off to collect wood for the temple's eternal flame. While gathering branches from the sacred laurel trees, Aristonike spies wealthy Greeks training for the upcoming Pythian Games. Second in importance only to the Olympics, these games bring great riches and attention to Delphi. Typically, Aristonike would pause to admire the athletes, but today she's more focused on impressing her observer. Taking the exact amount of branches necessary, she hurries back to the temple for her long awaited evaluation. The counselor who shadowed her shares his notes with the other officials, and after a brief discussion, their leader nods. He endorses Aristonike as the new Oracle— and the Pythia offers Apollo's blessing on their verdict. Approaching Aristonike beside the sacred hearth, the Pythia finally unveils the secrets of her trade. Passed directly from one Oracle to the next, no history book will ever record these details. But the Pythia's insights will guide all of Aristonike's future prophecies— shaping wars, politics, and relationships for years to come, and making Aristonike one of the most powerful women in the ancient world. As the Pythia concludes her final lesson, she points to two inscriptions on the temple walls: "know yourself" and "nothing in excess." Left alone to ponder these ideas, Aristonike feels the first touch of Apollo's inspiration— the insight that keeping an open mind may be more important than finding a single answer.

P63 2021-06-07 A day in the life of an Ancient Greek oracle - Mark Robinson

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=63>)

翻译人员: Lixin Foo 校对人员: Wanting Zhong 公元前 500 年, 当太阳 在德尔斐 (Delphi) 城里升起时, 阿里斯托尼克 (Aristonike) 正匆匆地 赶往阿波罗 (Apollo) 的神庙。如同所有的希腊人一般, 她从小就听过了德尔斐的传说。宙斯从大地两端放出的两只老鹰在帕纳索斯山的山坡上相逢, 从此将德尔斐标为世界的中心。标记着这个地方的神秘之石则由一条名为皮同 (pytho) 的 传奇之蟒镇守。但阿波罗在斩杀了皮同之后, 将德尔斐化为了自己的圣地——并把此处变成了世界上直接向预言之神祈求引导 最灵验的地方。好吧, 几乎是直接的。无论何时, 这里都有一名被称为皮媞亚 (Pythia) 的先知 传达阿波罗的意志。这个专属于女性的职责 是城里最重要的职位——也是身为现任皮媞亚学徒的 阿里斯托尼克即将担任的职责。虽然她已经在阿波罗的神庙里 侍奉了多年, 阿里斯托尼克仍然不确定自己 是否有足够的智慧来胜任这一角色。不过现在可不是迷茫的时候。今天, 城邦理事会的官员 将会考察她的工作。如果她的表现达到他们的标准, 她今天就会被封为 新一任的德尔斐先知。在特米诺斯 (temenos, 圣域) 的中心, 阿里斯托尼克迎接了 现任先知和城市官员。他们一行人加入了前往 卡斯塔里亚圣泉的队伍, 皮媞亚将在这里履行净化仪式, 为一天的预言做好准备。为了确认阿波罗是否愿意接受咨询, 阿里斯托尼克取来泉水 交给神庙祭司, 由他们泼洒在一头山羊身上。如果山羊颤栗了, 今天便能进行预言。如果不然, 那从现代的西西里、埃

及和阿富汗远道而来的旅人必须等上足足一个月 才能再次拜问神谕。所幸的是，今天阿波罗愿意传话。排在前面的是德尔斐本地人， 请教的大多与生意或姻缘有关。排在其后的是别处的希腊人， 然后是非希腊人， 包括来自伟大城市的使者， 前来拜问是否应该开战， 或者应在哪里建立新的殖民地。除了必需的祭品糕点， 大多数咨询者都提供了两种选项， 让皮媞亚从中选择。阿里斯托尼克向皮媞亚汇报， 指出重要人物， 解释他们的忧虑——城市议员则一直记录她的表现。随后， 皮媞亚进入了名为阿底顿（adyton）的神谕内殿里。在这里， 她将让阿波罗的灵感附身， 吐露出模棱两可的预言， 由询问者自行诠释。阿底顿是阿里斯托尼克 在神庙里唯一不能进入的场所。所以在神谕继续进行的时候， 身为先知学徒的她前去 为神庙里的不灭圣火收集木柴。在从神圣的月桂树上收集树枝时， 阿里斯托尼克窥见了在为即将开幕的 皮媞亚竞技场训练的希腊富人。这项运动会的重要性仅次于奥运会， 将让德尔斐获得大量金钱与瞩目。阿里斯托尼克通常 会停下来欣赏运动员， 不过今天， 她更专注于 为考察者留下好印象。她撷取了数量恰到好处的树枝， 匆匆赶回神庙， 迎接期待已久的评估。考察她的议员 与其他官员分享了记录。在短暂的讨论之后， 他们的领袖点了点头， 将阿里斯托尼克拥为新任先知——而皮媞亚则对这一决定 奉上了阿波罗的祝福。皮媞亚走向了 站在圣炉旁的阿里斯托尼克， 终于揭晓了皮媞亚一职的秘密。这些秘密在先知之间口口相传， 永远不会记载于任何史书之中。但是皮媞亚的见解将会引导 阿里斯托尼克日后的所有预言——塑造未来多年的战争、政治与人际关系， 从而让阿里斯托尼克跻身 古代最有权力的女性。在最后一堂课后， 皮媞亚指向了 刻在神庙墙上的两道字：“认识你自己” 与 “凡事勿过度”。独自留下思考这些理念的 阿里斯托尼克， 第一次感受到了 阿波罗启示的触动——维持开明的思想或许比找出单一的答案更为重要。

P64 2021-06-08 Ugly History - The U.S. Syphilis Experiment - Susan M. Reverby

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=64>)

In the 1930s, the United States was ravaged by syphilis. This sexually transmitted infection afflicted nearly 1 in 10 Americans, producing painful sores and rashes that persisted for roughly two years. After these initial symptoms, late-stage syphilis was known to cause organ damage, heart and brain disorders, and even blindness. It was incredibly difficult to slow the disease's spread. Experts cautioned against unprotected sex, but the infection could also be passed during childbirth. Worse still, existing treatments like mercury and bismuth were considered unreliable at best and potentially harmful at worst. Today these heavy metals are classified as toxic, but at the time, doctors were still uncovering their dangerous side effects. Amidst the uncertainty, health care professionals had two key questions. Did late-stage syphilis warrant the risks of existing treatments? And, did the infected individual's race change how the disease progressed? Many physicians were convinced syphilis affected the neurological systems of white patients and the cardiovascular systems of Black patients. There was little evidence for this theory, but the U.S. Public Health Service was determined to investigate further. In 1932 they launched a massive experiment in Tuskegee, Alabama. The town had already possessed a small hospital, and the area was home to a large population of potential participants. The PHS collaborated with local doctors and nurses to recruit roughly 400 Black men presumed to have noncontagious late-stage syphilis, as well as 200 non-syphilitic Black men for their control group. But their recruitment plan centered on a lie. While the researchers planned to observe how syphilis would progress with minimal treatment, participants were told they would receive free drugs and care for their condition. At first, researchers gave the men existing treatments, but these were soon replaced with placebos. Under the false pretense of providing a special remedy, researchers performed painful and invasive spinal taps to investigate the disease's neurological consequences. When patients died, the PHS would swoop in to study the body by funding funerals in exchange for autopsies. In their published studies, they listed the men as volunteers to obscure the circumstances under which they'd been recruited. Outside Alabama, syphilis treatment was advancing. A decade after the study began, clinical trials confirmed that penicillin effectively cured the disease in its early stages. But in Tuskegee, researchers were determined to keep pursuing what they considered vital research. They had yet to confirm their theories about racial difference, and they believed they would never have another opportunity to observe the long-term effects of untreated syphilis. The study's leadership decided to withhold knowledge of new treatments from their subjects. During World War II, researchers convinced the local draft board to exempt men from their study, preventing them from enlisting and potentially accessing penicillin. The study even continued through the 1950s when penicillin was shown to help manage late-stage syphilis. By today's bioethical standards, withholding treatment in a research study without a patient's informed consent is morally abhorrent. But for a large part of the 20th century, this practice was not uncommon. In the 1940s, US led studies in Guatemala infected numerous prisoners, sex workers, soldiers, and mental health patients with

sexually transmitted infections to study potential treatments. And other studies throughout the 50s and 60s saw doctors secretly infecting patients with viral hepatitis or even cancer cells. Eventually, researchers began objecting to these unjust experiments. In the late 1960s, an STI contact tracer named Peter Buxtun convinced the PHS to consider ending the study. But after leadership decided against it, Buxtun sent his concerns to the press. In July of 1972, an exposé of the Tuskegee study made headlines across the country. Following public outcry, a federal investigation, and a lawsuit, the study was finally shut down in 1972— 40 years after it began and 30 after a treatment for syphilis had been found. No evidence of any racial difference was discovered. When the study ended, only 74 of the original 600 men were alive. 40 of their wives and 19 of their children had contracted syphilis, presumably from their husbands and fathers. In the wake of this tragedy, and concerns about similar experiments, Congress passed new regulations for ethical research and informed consent. But systemic racism continues to permeate medical care and research throughout the US. To truly address these issues, the need for structural change, better access to care, and transparency in research remains urgent.

P64 2021-06-08 Ugly History - The U.S. Syphilis Experiment - Susan M. Reverby

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=64>)

翻译人员: Lingyan Ning 校对人员: Helen Chang 20 世纪 30 年代, 梅毒在美国肆虐近十分之一的美国人 感染这种性传播疾病患者要经受近两年之久 疼痛难忍的溃疡和皮疹这些初期症状过后 晚期的梅毒症状则是器官损害心脏、脑部的功能受损, 甚至失明遏制梅毒的传播极为困难专家们告诫大众, 要警惕不安全性行为但梅毒仍可通过母婴垂直传播更糟糕的是 当时的治疗药物包括汞和铋最理想的情况下也不具有好的疗效最坏的情况则是对机体有潜在性的伤害在今天看来 这些重金属已被归类为毒物但当时的医生仍未认识到它们危害性在充满着不确定性的迷雾中 医疗专家抓住了两个关键问题: 晚期的梅毒症状是否表明 现有治疗手段的危害性? 以及受感染个体的种族 是否改变了疾病的进展方式? 许多医生坚信对于白人, 梅毒侵害其神经系统对于黑人, 梅毒侵害其心血管系统几乎没有任何证据支持这一理论但美国公共卫生服务部 决定采取进一步的调查 1932 年, 他们在阿拉巴马州的 塔斯克基城开展了大型实验当地已有的一家小医院它即将成为大批潜在实验者的基地美国公共卫生服务部 与当地的医护人员合作招募了近 400 名无传染性 晚期梅毒的黑人作为实验组另外招募了 200 名 未感染梅毒的黑人作为对照组但他们的招募计划却是以谎言为基础当研究人员准备观察在最小剂量的治疗药物下 梅毒患者的病情如何发展变化实验者被告知他们将会得到 免费的药物和治疗来改善病情实验的开始, 研究人员给他们用了 现有的治疗药物但之后, 这些治疗药物 就被替换成了安慰剂以提供特殊疗法为借口研究人员对实验者实施了 痛苦的侵入性脊髓穿刺以便观察梅毒所带来的神经系统改变即使实验者身亡 他们也会通过为他举行葬礼这一方法来换取遗体进一步剖验在发表的文章中 他们将实验者归为志愿者以掩盖他们是被招募的实验者这一事实阿拉巴马州以外的地方 梅毒治疗方法也在发展距离这项实验开展之后的第十年临床实验证实了在梅毒的早期使用青霉素 就可以有效治愈然而, 塔斯克基城的研究人员仍在进行着这项他们自认为 至关重要的实验他们仍未能证实种族差异这一论点同时他们也认为这个机会十分难得能够观察到未经治疗的梅毒患者 如此长时间的症状和体征研究团队的高层决定隐瞒 梅毒新疗法的消息在二战时期, 研究人员 说服了当地征兵局阻止招募的实验者入伍以防他们可以 (从军队) 得到青霉素这项实验一直持续到 20 世纪 50 年代末而此时, 青霉素已被证实 可以缓解晚期梅毒症状以当今的生物伦理学标准来看未经实验者知情同意的情况下 在研究中拒绝给予其治疗从道德层面上看, 是极其可憎的但在 20 世纪的大部分时期 这类实验并非罕见在 20 世纪 40 年代 美国在危地马拉开展实验让不计其数的囚犯、性工作者、军人 精神病患者染上了性传播疾病是为了研究潜在的治疗方法还有其他横贯了整个五六十年代的实验医生偷偷使患者感染了病毒性肝炎或是偷偷注射癌细胞最终, 研究人员开始反对 这种不公平的实验在 20 世纪 60 年代末一位名叫彼得·巴克斯顿的 性病患者的接触追踪员试图说服了公共卫生服务部 考虑终止该实验但他得到的是高层的反对 随后他将他的担忧诉诸媒体 1972 年 7 月, 塔斯克基城的实验曝光 成为了轰动全国的头条新闻随之而来的是公众抗议 联邦调查、一纸诉讼这项实验最终在 1972 年被终止距离实验的开展已有 40 年距离发现梅毒的有效治疗药物已有 30 年没有发现任何种族差异的证据实验终止时, 最初的 600 名 黑人实验者仅存 74 名其中, 40 名实验者的妻子 和 19 名实验者的孩子被感染了梅毒想必由其丈夫或其父亲传染的悲剧发生之后 以及对类似实验的担忧美国国会通过了关于伦理研究和知情同意的新规但是, 已成系统的种族主义仍继续渗透到整个美国的 医疗保健和实验研究中为了能真正解决这些问题我们迫切需要结构性改革 医疗资源分配均衡以及提高实验研究的透明度

P65 2021-06-10 How do you know what's true - Sheila Marie Orfano

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=65>)

A samurai is found dead in a quiet bamboo grove. One by one, the crime's only known witnesses recount their version of the events that transpired. But as they each tell their tale, it becomes clear that every testimony is plausible, yet different. And each witness implicates themselves. This is the premise of "In a Grove," a short story published in the early 1920s by Japanese author Ryūnosuke Akutagawa. Though many know this tale of warring perspectives by a different name: "Rashomon." In 1950, Japanese filmmaker Akira Kurosawa adapted two of Akutagawa's stories into one film. This movie introduced the world to an enduring cultural metaphor that has transformed our understanding of truth, justice and human memory. The Rashomon effect describes a situation in which individuals give significantly different but equally conceivable accounts of the same event. Often used to highlight the unreliability of eyewitnesses, the Rashomon effect usually occurs under two specific conditions. The first: there's no evidence to verify what really happened. And the second: there's pressure to achieve closure, often provided by an authority figure trying to identify the definitive truth. But the Rashomon effect undermines the very idea of a singular, objective truth. In the source material, Akutagawa and Kurosawa use the tools of their media to give each character's testimony equal weight, transforming each witness into an unreliable narrator. Without any hints on who's sharing the most accurate account, the audience can't tell which character to trust. Instead, each testimony takes on a truthful quality, and the audience is left doubting their convictions as they guess who ended the samurai's life. Some might find this frustrating because the plot subverts expectations of how mysteries usually end. But by refusing to provide a clear answer, these two artists capture the messiness and complexity of truth and human memory. Neuroscientists have found that when we form a memory, our interpretation of visual information is influenced by our previous experiences and internal biases. Some of these biases are unique to individuals, but others are more universal. For example, egocentric bias can influence people to subconsciously reshape their memories in ways that cast a positive light on their actions. Even if we were able to encode a memory accurately, recalling it incorporates new information that changes the memory. And when we later recall that event, we typically remember the embellished memory instead of the original experience. These underlying psychological phenomena mean that the Rashomon effect can pop up anywhere. In biology, scientists starting from the same dataset and applying the same analytical methods, frequently publish different results. Anthropologists regularly grapple with the impact personal backgrounds can have on an expert's perception. In one famous case, two anthropologists visited the Mexican village of Tepoztlan. The first researcher described life in the town as happy and contented, while the second recorded residents as paranoid and disgruntled. Experts aside, the Rashomon effect can also impact the general public, particularly when it comes to the perception of complicated world events. For example, following a 2015 security summit between the United States and leaders from the Arab States, media reports about the summit varied enormously. Some stated that it had gone smoothly, while others called it a complete failure. It's tempting to fixate on why we have competing perceptions, but perhaps the more important question the Rashomon effect raises is, what is truth anyway? Are there situations when an "objective truth" doesn't exist? What can different versions of the same event tell us about the time, place and people involved? And how can we make group decisions if we're all working with different information, backgrounds, and biases? Like most questions, these don't have a definitive answer. But the enduring importance of Akutagawa's story suggests there may be value in embracing the ambiguity.

P65 2021-06-10 How do you know what's true - Sheila Marie Orfano

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=65>)

翻译人员: Wanting Zhong 校对人员: Yanyan Hong 一位武士陈尸于僻静的竹林中。命案仅有的几位证人 逐一从各自的视角描述了事件经过。然而,当他们逐个叙述时,显然,每个人的证词 都能自圆其说,却又互相矛盾,而且每位证人都承认自己涉案。这就是日本作家芥川龙之介 早在 1920 年发表的短篇小说《竹林中》的引文。不过,大多数人知道的可能是 这扑朔迷离故事的别名:《罗生门》。1950 年,日本导演黑泽明 将芥川的两篇小说改编成了一部电影。这部电影向世界介绍了一个经久不衰的文化隐喻,这个隐喻转变了我们 对真相、正义和人类记忆的所知。罗生门效应描述的情况是,个体对同一个事件给出了截然不同 却又同样可信的描述。罗生门效应常常被用来强调 目击证人的不可靠,这种效应经常在两种特定条件下发生。其一:没有证据印证究竟发生了什么。其二:有人施压想要了结事件,这种压力通常来自 试图对真相得出定论的权威人物。但罗生门效应动摇了 存在单一、客观真相的想

法。在原始作品中，芥川和黑泽分别在小说与电影中，给每个角色的证词以同等权重，从而使得每位证人的证词都不可靠。因为没有任何线索告诉我们 谁分享的事件经过最确切，观众也无法判断该信任哪个角色。相反，每段证词都具备真实性，观众只能一边猜测 谁夺走了武士的性命，一边怀疑自己的判断。有些人可能会感到沮丧， 因为剧情颠覆了人们以往对悬疑小说结尾的期望。但正因为没有提供明确答案，这两位艺术大家捕捉到 真相与人类记忆的纷乱与复杂。神经科学家发现， 当我们记忆形成时，我们对眼前信息的解读会受到过往经历和内在偏见的影响。有些偏见是个人独有的，有些则更为普遍。比如说，自我中心偏差能让人潜意识地重塑记忆，让自己的行动显得更为积极。即使我们能准确地记住，在回忆时也会加入新信息， 让记忆发生改变。之后再回忆事件时，我们通常会记住经过修饰的记忆，而不是原始的经历。这些基本的心理现象意味着罗生门效应 随时随地都能出现。在生物学中，科学家们用同样的分析方法研究同样的数据集， 却常常会发表不同的结果。人类学家经常要面对个人背景对专业认知产生的影响。一个有名的例子就是，两位人类学家 探访了墨西哥的迪坡斯特兰村镇。第一位研究学者描述说，镇里的生活幸福而满足；而第二位学者则记录的是， 居民既偏执又不满。抛开专家不谈，罗生门效应 也能影响普通公众，尤其是在对复杂的世界事件的看法上。例如，在 2015 年美国和阿拉伯国家领袖的安全峰会后，媒体对该峰会的报道大相径庭。有的声称峰会进行顺利， 而有的则大呼峰会彻底失败。虽然很容易纠结于 我们为什么会有互相矛盾的感受，但也许罗生门效应 提出了一个更重要的问题：真相到底是什么呢？是否有“客观真相”不存在的情况？同一事件的不同版本 是否能让我们了解时间、地点和涉及人物？如果我们的信息、 背景和偏见各不相同，我们又该如何做出集体决策呢？与大多数问题一样， 这些并没有明确答案。但芥川故事里的重要意义经久不衰，表明了接受不确定性 或许也有其价值。

P66 2021-06-14 The sharks that hunt in forests - Luka Seamus Wright

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=66>)

In the coastal waters of the Bahamas, a young lemon shark is on the run from a surprising predator: an adult shark of her own species. Half of her 17 siblings have already been eaten by the older generation, and it looks as though she's about to join them. But just as the predator closes in, she disappears into a thicket of underwater roots, safe in the refuge of the mangrove forest. Forests don't usually come to mind as a habitat for sharks. But various marine forests cover roughly 4.2 million square kilometers of the planet, providing food and shelter for 35% of the world's sharks. Deadly tiger sharks blend into seagrass meadows before pouncing on sea cows and sea turtles. White sharks hunt down seals in forests of kelp towering 65 meters tall. And lemon sharks stalk forests of mangroves—the only trees on Earth that live in the ocean. All these ecosystems have their quirks, but mangroves may be the most unique of all. Harboring life between their roots and among their crowns, mangroves function as an essential bridge between land and sea. And to survive between these worlds, different mangrove species have evolved various adaptations that protect them and their resident sharks. Taking root in the unstable ground of muddy coastal regions is difficult, so mangrove seedlings germinate attached to their mother plant. Once they've grown large enough to survive on their own, these partially developed plants begin to ride the current. Most take root nearby, while some travel for several months before landing in a different part of the world. Once they've settled down, mangroves deploy tall, skinny stilt roots, crutch-like prop roots or wavy buttress roots, to support themselves in their unsteady terrain. These newly established mangroves have to contend with two additional problems: seawater is high in dehydrating and potentially toxic salt, and the mud contains little to no oxygen. This combination would be lethal to most trees, but mangroves make the most of their marshy surroundings. Rather than being completely buried, mangrove roots are largely above the ground. This allows the microscopic pores on these roots to take in oxygen during low tide before closing to create a waterproof seal during high tide. Many mangroves also grow snorkel roots, which can take in oxygen through the same mechanism, or directly produce it via photosynthesis. To stop salt from entering their system, some mangrove species use incredibly fine filters in their roots. Others concentrate salt inside special cellular compartments, bark or dying leaves, that then drop off. Some species can even excrete the excess minerals through specially adapted salt glands. All these processes make mangroves more than a little salty, but that doesn't deter coastal life from living in their nooks and crannies. While birds nest among mangrove branches, fish lay eggs amidst their sprawling, complex root systems. Symbiotic sponges and sea squirts protect their host trees from hungry woodboring crustaceans. Crabs, snails, and shrimp eat algae, mussels, barnacles, and salty mangrove detritus. These animals in turn feed fish, which are devoured by shark pups roaming the roots— alongside occasional vegetarian meals of seagrass. But sharks aren't just the beneficiaries of marine forests, they're part of the glue that holds them together. Sharks limit the

abundance of animals which would otherwise overgraze these essential plants. Just as marine forests provide shelter to vulnerable baby predators, those predators grow up to protect their forest homes. Unfortunately, both sides of this delicate balance are under threat. Overfishing has decimated shark populations worldwide, and many marine forests are being polluted or cut down for coastal development. This destruction is especially dangerous because marine forests are one of the single most important ecosystems in mitigating climate change. Mangroves and seagrasses trap carbon between their roots, and fast-growing kelps export vast amounts of carbon to the deep ocean. Together, marine forests sequester around 310 million tonnes of carbon every year, capturing 3% of our annual global carbon emissions. So, like the sharks that inhabit them, humans need to fight tooth and nail to protect these essential ecosystems.

P66 2021-06-14 The sharks that hunt in forests - Luka Seamus Wright

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=66>)

翻译人员: Frank Xu 校对人员: Helen Chang 在巴哈马沿海水域, 一条幼年柠檬鲨正在躲避 一个令人意外的捕猎者: 一条成年的柠檬鲨。她 17 个兄弟姐妹中的半数 已经被前辈吞食, 而现在似乎牠也即将加入牠们的行列。但正当捕食者逼近之时, 牠消失于一片茂密的水下根茎之中, 安全地藏于红树林的庇护之中。几乎没有人会把森林 和鲨鱼的栖息地联想起来, 但多种海上森林覆盖了这座星球, 约 420 万平方公里的面积, 为世界上 35% 的鲨鱼 提供食物和栖息地。致命的虎鲨们在 猛扑向海牛和海龟之前埋伏在海草丛中。白鲨在高达 65 米 的海带林里狩猎海豹。而柠檬鲨则穿梭在红树林中——地球上唯一活在海里的树。所有这些生态系统 都有着自己的神奇之处, 但是红树林可能是最独特的。它们的树根与树冠为生命提供庇护, 红树林行使着 衔接海陆的重要桥梁的功能。而为了在这些世界里生存, 不同种类的红树林进化出了多种保护它们本身 和寄宿鲨鱼们的适应特性。在泥泞的海岸地区中 不稳定的大地上扎根是困难的, 因此红树幼苗缠在红树妈妈上发芽。在它们长大到能够独自生存时, 这些部分发育过的植物 开始随浪漂流。大多数在附近扎根, 而有些则漂流数月直到到达世界不同的角落。在它们安定下来后, 红树们长出高大, 细长的高跷根, 形似拐杖的支柱根, 或者弯曲的扶壁根, 以在不稳的地形中支撑它们自己。这些新长成的红树林 需要与额外两个问题斗争: 海水富含会导致脱水 甚至可能具有毒性的盐类, 且泥地含有过少或完全不含氧。这两个问题合在一起 对大多树木来讲会是致命的, 但是红树林充分利用 它们泥泞的环境。相比完全埋在地下, 红树根大部分位于地表之上。这允许这些树根上的 微小气孔在低潮时能吸入氧气并在涨潮前关闭以防止水分进入。很多红树还长有通气根, 它们能通过相同原理来吸入氧气, 抑或使用光合作用来直接产氧。为了阻止盐分进入它们的系统, 有些红树种类使用 它们根部中极细的过滤器。其它的则将盐浓缩到特殊的细胞室、树皮或将枯萎并掉落的树叶里。有些品种甚至能通过特别进化的盐腺排出多余的矿物质。所有这些过程把红树林变得咸咸的, 但这并不阻止海岸生物 在它们的角落和缝隙里生活。鸟儿们在红树枝间筑巢, 鱼儿们在它错综复杂的根系间产卵。共生海绵和海鸟贼保护它们的宿主树免受饥饿且爱钻木头的甲壳动物伤害。螃蟹、螺, 和虾 吃海藻、青口贝、藤壶还有咸咸的红树残渣。这些小动物则喂饱鱼类, 后者被在树根间游荡的 鲨鱼幼崽吞食——鲨鱼们有时还吃海草素食餐。但鲨鱼不是海中林的唯一受益者, 牠们也是保持红树林生态的 重要“粘合剂”之一。鲨鱼限制动物的数量, 否则太多的动物会过度消耗这些重要植物。就像海中林为脆弱的 猎食动物宝宝提供庇护所, 这些猎食者长大后 保护牠们的森林之家。不幸的是, 这精妙平衡的双方都正遭受威胁。过度捕鱼在世界范围 大幅减少了鲨鱼数量, 并且很多海中林正在 因为沿海开发而被砍伐和污染。这些破坏特别危险因为海中林对于减轻环境变化来说, 是最重要的生态系统。红树林和海草林在根系中困住碳, 而长得飞快的海带 将大量碳输出到深海区域。算在一起, 海中林每年 将大约 310 万吨碳隔绝起来, 捕获我们每年 全球碳排放的百分之三。所以, 就像栖息在它们中的鲨鱼, 人类需要极尽全力 来保护这些重要的生态系统。

P67 2021-06-15 A brief history of toilets - Francis de los Reyes

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=67>)

On sunny days, the Roman citizens of Ostia could be found on a long stone bench near the Forum. Friends and neighbors exchanged news and gossip while simultaneously attending to more... urgent business. These public latrines could sit up to 20 Romans at a time, draining waste in water conduits below. Today, most cultures consider trips to the restroom to be a more private occasion. But even when going alone, our shared sewage infrastructure is one of the most pivotal inventions in the history of humanity. While many ancient religious texts contain instructions for keeping waste away from drinking water and

campsites, waste management took a more familiar shape as early as 3000 BCE. Ancient Mesopotamian settlements often had clay structures made for squatting or sitting in the most private room of the house. These were connected to pipes which used running water to move waste into street canals and cesspits. Water infrastructure like this flourished in the Bronze Age, and in some parts of the Indus Valley, nearly every house had a toilet connected to a citywide sewage system. Ancient Cretan palaces even offered a manual flushing option. Researchers can't say for certain what inspired these early sewage systems, but we do know that waste management is essential for public health. Untreated sewage is a breeding ground for dangerous microorganisms, including those that cause cholera, dysentery, and typhoid. It would be several millennia before scientists fully understood the relationship between sewage and sickness. But the noxious odors of sewage have recorded associations with disease as early as 100 BCE. And by 100 AD, more complex sanitation solutions were emerging. The Roman Empire had continuously flowing aqueducts dedicated to carrying waste outside city walls. Chinese dynasties of the same period also had private and public toilets, except their waste was immediately recycled. Most household toilets fed into pig sties, and specialized excrement collectors gathered waste from public latrines to sell as fertilizer. In China, this tradition of waste management continued for centuries, but in Europe the fall of the Roman Empire brought public sanitation into the Dark Ages. Pit latrines called "gongs" became commonplace, and chamber pots were frequently dumped into the street. Castles ejected waste from tall windows into communal cesspits. At night, so-called gong farmers would load up the waste before traveling beyond city limits to dump their cargo. Europe's unsanitary approach persisted for centuries, but toilets themselves underwent some major changes. By the late Middle Ages, most wealthy families had commode stools— wooden boxes with seats and lids. And in the royal court of England, the commodes were controlled by the Groom of the Stool. In addition to monitoring the king's intestinal health, the Groom's... intimate relationship with the monarch made him a surprisingly influential figure. The next major leap in toilet technology came in 1596, when Sir John Harrington designed the first modern flush toilet for Queen Elizabeth. Its use of levers to release water and a valve to drain the bowl still inform modern designs. But Harrington's invention stank of sewage. Thankfully, in 1775, Scottish inventor Alexander Cumming added a bend in the drainpipe to retain water and limit odors. This so-called S-trap was later improved into the modern U-bend by Thomas Crapper— though the term "crap" predates the inventor by several centuries. By the turn of the 19th century, many cities had developed modern sewage infrastructure and wastewater treatment plants, and today, toilets have a wide range of features, from the luxurious to the sustainable. But roughly 2 billion people still don't have their own toilets at home. And another 2.2 billion don't have facilities that properly manage their waste, putting these communities at risk of numerous diseases. To solve this problem, we'll need to invent new sanitation technologies and address the behavioral, financial, and political issues that produce inequity throughout the sanitation pipeline.

P67 2021-06-15 A brief history of toilets - Francis de los Reyes

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=67>)

翻译人员: Yu Xie 校对人员: Jiasi Hao 晴天, 奥斯蒂亚的古罗马公民都会聚集在公共集会场所附近的 一张长条石凳上。朋友和邻居间交换新闻和八卦的同时也进行着一项更迫切的事。这些公共厕所 能通过下面的水管排掉代谢物, 一次可供 20 名罗马公民使用。如今, 大多数文化认为上洗手间 是一件更为私密的事情。但即便是一个人去洗手间, 公共的污水基础设施是人类历史上至关重要的发明之一。许多古代宗教文本中记载着将废水 与饮用水以及野营地隔离的方法。早在公元前 3000 年的废水管理 已具备了当代类似的形态。古老的美索不达米亚定居点 在房子最私密的位置通常有粘土结构, 用于蹲坐。它们与管道相连, 管道中的流动水将排泄废物排入街道的水渠和污水坑中。例如上述在青铜时代蓬勃发展的例子, 以及在印度河流域的某些地区, 近乎每个房子的厕所都会与 城市污水系统相连。古代克里特宫殿的厕所 甚至可以手动冲洗。研究人员并不确定 这些早期的污水设施是怎么被发明的, 但能够确定的是 污水管理是公共卫生的关键。未经处理的污水能滋养有害微生物, 从而导致霍乱, 痢疾以及伤寒等疾病。然而污水与疾病的关系 至少还需要几千年科学家们才能透彻了解。不过恶臭的污水气味 与疾病的关系早在公元前 100 年就有所记载。到了公元 100 年, 更复杂的卫生解决方案问世。罗马帝国采用持续流动的水道, 将废水引至城市外围。同时期的中国也有私人 and 公共厕所, 只是在中国, 这些排泄废物是被即时循环使用的。家用厕所的粪便大多会用于喂猪, 而公共厕所的代谢物会由 专门的人来收集并制成肥料卖出。中国的传统粪便废物处理方法 持续了好几个世纪, 但是在欧洲, 罗马帝国的衰落把公共卫生带入了黑暗时期。坑式蹲厕 (也被称作"Gong") 司空见惯, 夜壶常常直接往街道上倾倒。城堡的高窗向外面的公共粪池 抛弃排泄废物。到了晚上, 掏粪工 会把排

泄污物装满推车，将它们运出城外并丢弃。几个世纪以来，欧洲都没有对排泄污物进行卫生处理，但是厕所本身却经历了一些重大变革。到中世纪后期，大多数富裕人家都配备了坐便器——带有盖子和座椅的木箱子。在英格兰的皇室宫廷中，这些坐便器由专门的 管理排泄污物的侍从负责。另外，为了监测国王的肠道健康，这位侍从和国王无比亲密的关系使得这个职称变得极具影响力。厕所科技发展史中的下一个大跃进 出现在 1596 年：约翰·哈林顿爵士（John Harrington）为伊丽莎白女王设计了第一个现代抽水马桶。它利用杠杆放水 并用阀门抽干桶中的水，为现代马桶设计提供了参考。但是哈林顿的发明 没有解决污水臭味的问题。幸好到了 1775 年，苏格兰发明家 亚历山大·卡明（Alexander Cumming）在排水管道处加了一个弯曲的设计 进行保水限臭。这个 S 型设计经托马斯·克拉珀（Thomas Crapper）改进成现代的 U 型设计——尽管“废物”一词比发明者 出现早几个世纪。到了 19 世纪末，许多城市都已经有了 现代污水基础设施以及污水处理厂。如今，厕所也发展出了广泛的特征——从奢华到可持续性。然而仍有大约 20 亿的人 在家中没有于个人使用的厕所。还有另外 22 亿人没有适当管理废水的设施，使他们被暴露在无数疾病的威胁下。为了解决这个问题，我们需要发明新的卫生技术，并解决会造成卫生管道系统不公平的行为、经济以及政治方面的诸多问题。

P68 2021-06-17 What few people know about the program that 'saved' America - Meg Jac

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=68>)

In 1932, the Great Depression entered its third winter. One in four Americans was unemployed, marking the highest unemployment rate in the country's history. Tens of thousands had lost their homes and life savings, and there was very little confidence that Republican President Herbert Hoover could turn things around. So when the election came, voters flocked to his Democratic competitor. Franklin D. Roosevelt promised a New Deal for Americans— a comprehensive set of legislation to support struggling citizens and put the country back to work. The massive federal intervention Roosevelt proposed was a radical challenge to the individualist ideals that governed many Americans' lives. But due to the extreme circumstances, he began his presidency with public and political support. With the help of his advisers, Roosevelt's first hundred days in office were perhaps the most eventful of any US president. In just over three months, he pushed over 15 bills through Congress and created an "alphabet soup" of government agencies to help farmers, workers, and businesses. The New Deal's first priority was stabilizing the banks. Over the previous three years, many Americans had withdrawn their savings out of fear the bank would lose their money in bad investments. So to regain the public's confidence, FDR increased federal oversight of commercial banks, and created bank insurance to guarantee that any deposited funds would always be available. Next, he established the Federal Emergency Relief Administration. FERA cataloged each state's need for relief and provided funds to help citizens afford groceries, rent, clothing, coal, and other necessities. Meanwhile, the Agricultural Adjustment Administration subsidized farmers and educated them in improving planting techniques. These policies fed and housed thousands, but they didn't significantly address the New Deal's biggest promise: reducing unemployment. So the Civilian Conservation Corps was established to employ over 250,000 young men for projects like tree planting, irrigation, and fire prevention. The CCC offered onsite work camps that provided food, shelter, and education to those employed; mostly young, single men with families in need of relief. Subsequent programs like the Works Progress Administration and the Tennessee Valley Authority added projects building roads, bridges, and hydroelectric dams. The WPA also funded art, writing, and theater programs. These initiatives cut civilian unemployment in half. And they did so alongside labor acts that abolished child labor, granted unions the right to collective bargaining, and set the first national minimum wage. Benefits were also created to help those unable to work. The Social Security Act established an old-age pension system in addition to unemployment insurance, disability benefits, and welfare assistance. But despite these sweeping policies, the New Deal helped some groups more than others. Black Americans were hit hardest by the economic downturn, and the New Deal's impact on Black communities varied widely. In northern cities like Chicago, Black citizens received a large share of jobs, vocational training, and education, with New Deal programs teaching more than one million Black Americans to read. Northern Black communities also received an influx of public housing, though it was heavily segregated. In the South, results were less positive. Roosevelt relied heavily on the support of Southern Democrats, who welcomed economic development but fought to preserve white supremacy. They ensured that new labor laws excluded domestic servants and agricultural workers, occupations held by many Black Americans. These politicians and many others also undermined Eleanor Roosevelt's attempts to push her husband toward supporting a federal anti-lynching law. As a result, the New Deal has often been called a "raw deal" for Black communities. And many

modern inequities in housing, employment, and financial stability are partially due to New Deal programs prioritizing white Americans. In these ways and more, the New Deal didn't fully live up to its promises. Despite employing over 8 million Americans, unemployment never went lower than 14%. And the US economy wouldn't fully recover until the country's mobilization for World War II. But this bold campaign of progressive policies did empower unions to start their own revolution. In the coming decades, northern liberals, Black Americans, and other working minorities, united to fight discriminatory hiring. In the process, they reshaped the Democratic Party; challenging its racist leadership, and laying the groundwork for an emerging civil rights coalition.

P68 2021-06-17 What few people know about the program that 'saved' America - Meg Jac

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=68>)

翻译人员: Gia Hwang 校对人员: Carol Wang 1932 年, 大萧条进入了第三冬。四分之一的美国人失业, 创下了美国历史上最高的失业率。成千上万的人失去家园和毕生积蓄, 大家对共和党总统 赫伯特·胡佛扭转局面几乎没有信心, 开始大选时, 选民们纷纷 涌向了他的民主党竞争对手, 富兰克林·德拉诺·罗斯福 承诺为美国人制定新政——一套全面的立法 来支持陷入困境的公民, 并使国家重回正轨。对主导许多美国人生活的 个人主义理想而言, 罗斯福提议的大规模联邦干预 是一项根本性的挑战, 但由于所处的极端情况, 他在公众和政治支持下 开始了总统任期。在其顾问们的帮助下, 罗斯福上任的前一百天可能是所有美国总统中最关键的。在短短三个多月内, 他推动了超过 15 项法案通过国会, 并创造了推动新政的众多政府机构来帮助农民、工人和企业。新政的首要任务是稳定银行。在过去的三年里, 由于担心 银行在不良投资中亏本, 许多美国人已经取出银行存款。因此, 为了重拾公众信心, 罗斯福加强了对商业银行的联邦监督, 并创建了银行保险, 以保证任何存入资金将永远可取。接着, 他成立了联邦紧急救济署, 对每个州的救济需求建立目录, 并提供资金帮助市民支付食品杂货、房租、衣服、煤炭及其它必需品。同时, 农调局补贴农民, 并教他们改进种植技术。这些政策养活了数千人, 但并未解决新政最大的承诺: 减少失业。因此, 成立了平民保育团, 招募了逾 25 万名年轻人从事如植树、灌溉和防火项目。保育团提供现场工作营, 为就业者提供食物、住所和教育, 多数是年轻、有家庭、 需要救济的单身男性。随后的计划, 如公共事业振兴署和田纳西河谷管理局, 增加了修建道路、桥梁 和水电大坝的项目; 公共事业振兴署还资助 艺术、写作和戏剧项目, 这些举措将平民失业率减少了一半。同时, 还通过了 废除童工的劳工法案、授予工会集体谈判的权利, 并制定全国首个最低工资标准, 还为那些无法工作的人提供福利。社会保障法除建立失业保险、伤残津贴和福利援助外, 还建立了养老金制度。但尽管有这些大规模的政策, 新政对某些群体的帮助 大于其他群体。美国黑人受经济衰退打击最严重, 新政对黑人社区的影响千差万别。在芝加哥等北部城市, 黑人公民获得了大量工作、 职业培训和教育机会, 新政计划教会逾 100 万 美国黑人阅读。北部黑人社区的 公共住房也大量增加, 尽管被严格隔离开来。在南方, 结果不太乐观。罗斯福严重依赖 南方民主党人的支持, 他们欢迎经济发展, 但为维护白人至上而奋斗。他们确保新的劳动法不包括家庭佣工和农业工人, 这是许多美国黑人从事的职业; 这些政客和许多其他人也破坏了埃莉诺·罗斯福试图推动 她丈夫支持的联邦反私刑法。因此, 对黑人社区来说, 新政通常被称为“原始交易”。而住房、就业和金融稳定方面的 许多现代不平等的部分原因, 是新政计划优先考虑美国白人。从这些方面以及其它方面看, 新政并没有完全兑现其承诺。尽管雇佣了超过 800 万美国人, 失业率也从未低于 14%。直到美国为二战进行国家总动员, 美国经济才完全复苏。但这个大胆的进步政策运动确实授权工会开始他们自己的革命。在接下来的几十年里, 北方自由主义者、美国黑人和其他少数工作族裔, 团结起来抗争歧视性招聘。在这个过程中, 他们重塑了民主党, 挑战其种族主义领导, 并为新兴的民权联盟奠定基础。

P69 2021-06-22 Axolotls - The salamanders that snack on each other (but don't die) -

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=69>)

In 1864, French zoologist August Duméril was baffled while investigating the axolotl. Unlike many other amphibians, which transform into terrestrial adults, axolotls retain their juvenile characteristics and never leave the water. In an attempt to induce metamorphosis, Duméril spent months removing their gills. But in most instances, the axolotls simply... grew them back. Indeed, axolotls are masters of regeneration: they can flawlessly regenerate body parts ranging from amputated limbs and crushed spines to parts of their eyes and brains. So how do they do it? And what other secrets are they keeping? This extraordinary salamander is native to the wetlands in Mexico City. Ancient Aztec people considered it the incarnation of a

God named Xolotl— hence the axolotl's name, roughly meaning “water monster.” Axolotls reach sexual maturity with gills and a tadpole-like dorsal fin. Scientists think their forever-young condition, called “neoteny,” evolved because of their stable habitat. For salamanders that develop in waters that dry up, efficiently transitioning to land is essential. But the lakes axolotls evolved in were unchanging year-round and didn't host many aquatic predators. So, scientists think it was advantageous for axolotls to forgo the demands of metamorphosis. However, they haven't completely lost this ability. If exposed to certain substances, axolotls will turn into adults. But they'll often experience shorter lifespans and lose some of their self-healing abilities. These regenerative talents may seem like crazy superpowers to begin with, but axolotls have good use for them. As babies, they're in direct competition. So, they snack on each other. This is usually not a huge problem thanks to how quickly they can regenerate body parts. When an axolotl loses a limb, tissues stimulate growth in the area. Skin cells divide and cover the wound. Then, progenitor cells, which can develop into various bodily tissues, form a mass at the site of injury and nearby nerves secrete growth-promoting proteins. Over the next few weeks, a new limb emerges as cells proliferate and differentiate in coordination. This process could potentially lead to uncontrolled growth and tumor formation. But axolotls are remarkably resistant to cancer. They have a system in place that tightly controls cellular proliferation. To better understand the axolotl's baffling biology, scientists sequenced its genome. They found it to be more than ten times longer than a human's. Mutations can change the length of any animal's genome. For whatever reason, salamanders have much more DNA than other vertebrates because they lose parts of it less frequently. Investigating the axolotl's genome, scientists saw many repeated sequences, most of which don't code for proteins and have no known function. They also found genes that are key in regeneration. However, the biggest factor that sets axolotl regeneration apart may not be a set of unique genes, but how they regulate their genes. It's no wonder that axolotls are one of science's most studied animals. But their population in the wild has plummeted. Hundreds of years ago, axolotls thrived under the Aztec capital. Within the surrounding lakes, Aztec people built islands called chinampas for growing crops. This highly productive form of agriculture created a vast system of canals, expanding the lake system's shallow, sheltered habitat—the axolotls' ideal environment. But when Spanish invaders arrived, they began draining the lakes. And even more water has been diverted in recent years. Today, the entire population of wild axolotls is found in just one place, Lake Xochimilco, where it's threatened by pollution and invasive fishes. People are working to regenerate the ecosystem and strengthen the 2,000 year old chinampa farming tradition. If interest grows, farmers could recover abandoned chinampas and support the local community— along with the axolotl. Eventually, the benefits of saving this salamander might be even greater. Scientists hope that one day we'll be able to apply the axolotl's masterful tumor suppression and regenerative abilities to the human body. Perhaps its secrets are the real reason for the slimy god monster's smile.

P69 2021-06-22 Axolotls - The salamanders that snack on each other (but don't die) -

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=69>)

翻译人员: Carol Wang 校对人员: Helen Chang 1864 年, 法国动物学家 August Duméril 在研究蝾螈时感到困惑不解。与成年后变成陆地生活的 其它两栖类动物不同, 美西螈一直保持青少年特征, 而且从不离开水。为了诱导它们变形, Duméril 花了几个月的时间 切除它们的鳃。但多数情况下, 美西螈很快又长出了鳃。的确, 美西螈是再生大师: 它们能完美地长出身体部位, 从断肢、脊椎到部分眼睛和大脑。那它们如何做到的呢? 它们还有哪些秘密呢? 这种奇特的蝾螈的栖息地 是墨西哥城的湿地, 古代阿兹特克人认为 它是名为 Xolotl 的神的化身——名称美西螈 (Axolotl) 由此而来, 意思大致是“水怪”。长出鳃和蝌蚪状的背鳍后, 美西螈达到性成熟。科学家们认为, 这种“幼态化”的永远年轻状态, 是因为栖息地稳定的进化结果。对生活在会干涸水域的蝾螈来说, 有效转移到陆地生活至关重要。但美西螈演化所处的湖泊终年不变, 而且湖里没有太多的水生捕食者。因此, 科学家们认为放弃变形的需求有利于美西螈, 然而, 它们并非完全丧失变形能力。如果暴露在某些物质中, 美西螈会变为成年, 但经常寿命较短, 也丧失一些自我修复能力。这些再生才能可能一开始 看起来像超棒的超能力, 但美西螈善用了它们。在婴儿期, 它们就处于直接竞争中, 所以, 它们会吃对方。这通常不是一个大问题, 因为它们的身体器官 再生速度非常快。当美西螈失去肢体时, 组织会刺激该区域的生长。皮肤细胞分裂并覆盖住伤口, 接着, 祖细胞在受伤部位形成团块, 祖细胞能发展成各种身体组织, 且附近神经分泌出促生长蛋白质。接下来的几周里, 随着细胞的增殖和分化, 一个新的肢体出现了。这一过程可能导致 不可控生长和肿瘤的形成, 但美西螈对癌症有很强抵抗力, 它们有一个严格控制 细胞增殖的系统。为更了解美西螈 令人困惑的生物学特性, 科学家们对其基因组进行了测序, 发现比人类的长十倍以上。突变可改变任何动物基因组的长度。不管什么原因, 蝾螈 比其他脊椎动物拥有更多 DNA, 因

为它们不那么频繁地失去一部分。研究美西螈的基因组时，科学家发现了许多重复序列，其中大多数不编码蛋白质，也不知其功能是什么。他们还发现了再生的关键基因，但美西螈与众不同的再生最大因素可能不是一组独特的基因，而是它们如何调节自己的基因，难怪美西螈是科学界研究最多的动物之一。但它们在野外的数量急剧下降，几百年前，美西螈在阿兹特克首府繁荣起来，在周围的湖泊中，阿兹特克人建造了奇南帕浮田岛来种植庄稼。这种高产农业形式创造了巨大的运河系统，拓展了有庇护的湖泊浅水区栖息地——美西螈的理想栖息环境。但西班牙入侵者到达后，他们开始抽干湖水；近年来，更多的水被引走。今天，只发现一个地方有野生美西螈——索奇米尔科湖，在那里，它们受到污染和入侵鱼类的威胁。人们正努力恢复那里的生态系统，还强化有 2000 年历史的奇南帕浮田岛农业传统。如果收益增加，农民可以恢复被遗弃的奇南帕浮田岛，支持美西螈的同时，也支持了当地社区，最终，拯救美西螈的益处可能更大。科学家们希望，有一天我们能将美西螈高超的肿瘤抑制和再生能力应用到人体上。也许，其秘密正是这个黏糊糊神怪微笑的真正原因。

P72 2021-06-29 What you can do with an extra jaw - Darien Satterfield

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=72>)

After stalking an unsuspecting cuttlefish across the seafloor, this moray eel is finally ready to pounce. As the eel snags the mollusk in its long teeth, its prey struggles to escape. But before it can wriggle away, a second set of teeth lunge from the eel's throat, making short work of the captive cuttlefish. This adaptation is called a pharyngeal jaw. And while it might seem more fitting for an alien parasite than a fish, it's actually one of the most common adaptations under the sea. At some point millions of years ago, early fish evolved a jointed oral jaw from one of the bony arches that supported their frontal gills. This exterior, oral jaw was perfect for capturing or chewing prey, but these early fish had a problem. They had no limbs to manipulate food while eating, making it easy for their mobile prey to escape before they took the first bite. Essentially, it was impossible for fish to capture and chew their prey at the same time with just one set of jaws. So to hold their food and eat it too, an even deeper gill arch evolved into a secondary set of jaws. Unlike oral jaws connected by a bone joint, these pharyngeal jaws were suspended in muscle, offering them a wide range of motion to turn, tug, and tear on food. Some pharyngeal jaws actively chew, while others retract to pull chunks of food down the throat. Of course, the teeth a jaw has also factor in here. For example, an oral jaw with fangs is exceptional for catching and holding on to fast-moving prey. But depending on what that prey is, a fish might want sharp pharyngeal teeth to tear through tissue, flat pharyngeal molars to grind plant matter, or a powerful pharyngeal bite to crush shelled prey. Fortunately some fishes can change their secondary teeth to match a new diet over several years. This flexibility allows fish to adapt and find food in a huge variety of aquatic environments. Some pharyngeal jaws have formed to eat food too hard for most fishes. California Sheephead use pointed teeth from their oral jaws to pry urchins off rocks before crushing their spiny exteriors in strong pharyngeal jaws that have fused with the bones of their skulls. Other fish prioritize eating huge quantities of food. The pharyngeal jaws of grass carp have two bone components that move in unison to pull plant life into their stomachs, consuming over 18 kilograms of seaweed a day. Other pharyngeal jaws are adapted to suit incredibly specific circumstances. Consider this species of pearlfish that lives inside sea cucumbers and feeds on their guts. Fish are the most diverse group of vertebrates with over 30,000 unique species, and much of that diversity is due to the hundreds of unique jaws separating otherwise identical species. Perhaps the best example of this dental diversity can be seen in cichlids. This family of fish is primarily found in select African and South American lakes. Typically, large lakes like these would be occupied by a handful of distantly related species, each adapted to consume one of the lake's limited food sources. But here, almost every corner of the ecosystem is occupied by a different species of cichlid. There are over 1,700 cichlid species, many almost identical save for their uniquely adapted jaws which have evolved to eat crustaceans, mollusks, worms, algae, plankton, and even the scales of other fish. These oral adaptations are so essential for survival, that different species use their pharyngeal jaws to make unique mating sounds that allow female cichlids to identify males of their own species. This technique limits interspecies breeding, and ensures the parent fish will pass on their specialized jaws. Scientists are still discovering all the ways this incredible skeletal mechanism functions. But given what we know already, it's fair to say that for most fish, two jaws are better than one.

P72 2021-06-29 What you can do with an extra jaw - Darien Satterfield

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=72>)

翻译人员: David Shi 校对人员: Helen Chang 在海底跟踪了一条毫不知觉的 墨鱼一段时间后, 这条海鳗终于准备进攻了。当海鳗长长的牙齿咬住 这个软体动物后, 它的猎物拼命地试图挣脱。但在它能成功逃脱前, 海鳗喉咙里的第二套 牙齿咬了上来, 让猎物无法逃脱。这个进化被称为咽颌。虽然它更像来自外星的寄生虫, 而不是一条鱼, 而事实上它是海底 最常见的进化之一。在数百万年前的某个时间点, 早期鱼类从一个嘴弓进化出了 一个连接在一起的口腔颌骨, 它可以支撑它们前面的鱼鳃。这个外部的口腔颌骨非常适合 抓捕或咀嚼猎物, 但这些早期鱼类有一个难题。它们没有肢体来操弄食物, 在它们咬第一口之前, 它们灵活的食物会很容易逃脱。简而言之, 要鱼用 一套牙齿在同一时间既抓捕又咀嚼是不太可能的。所以为了既抓住又食用它们的食物, 一个更深的鳃弓 就进化成了第二套牙齿。和由骨关节连接的口腔牙齿不同, 这些咽颌长在肌肉上, 使得它们能够对食物进行扭转、拖拉和撕扯等一系列的动作。有的咽颌可以咀嚼食物, 而同时其它咽颌可以收缩 把食物块拖下喉咙。当然, 颌上所长的牙齿 也是一个重要因素。例如, 长着尖牙的口腔颌骨 非常容易捕获并抓牢快速游动的食物。但由于食物的不同, 有的鱼可能需要锋利的咽齿 以便撕扯软组织, 需要平的咽磨牙 以便研磨植物食物, 或一个有力的咽牙 来咬碎带壳的猎物。幸运的是, 有些鱼能够花几年时间 更换它们的第二套牙齿, 以适应不同的食物。这种灵活性使得它们能够适应非常广泛的海洋环境并获取食物。有的咽颌演化到可以吃 对大部分鱼都太硬的食物。加州羊头鱼使用嘴巴上的尖牙将海胆从岩石上撬开, 用强壮的已经和头骨融合的咽颌把海胆长满刺的身体压碎。有的鱼则偏重吃大量的食物。草鱼的咽颌有两个骨骼组件, 它们一致行动以便 把植物拖进它们的胃, 这样它们可以一天吃掉 超过 18 公斤的海藻。其它咽颌演化到能适应 令人难以置信的特定环境。比如这种珍珠鱼, 它们生活在海参身体里面并以它们的内脏为食。鱼类是最多样化的脊椎动物群体, 它们拥有超过 30,000 种独特的物种, 而大部分的多样性是 由于数百个独特的颌骨, 使得它们和其它相同 的物种不一样。也许慈鲷是多样性牙齿的最好例子。该鱼科主要分布于 非洲和南美的某些湖泊。通常像这样的大湖会被少数远亲物种占用, 而每种物种演化成食用 湖泊有限的食物中的一种。但在这里, 几乎生态系统的每个角落都被不同的慈鲷物种占据。有 1,700 多种的慈鲷, 许多都有独特的 几乎完全相同的下颌, 这些演化使得它们可以吃甲壳类动物、软体动物、蠕虫、藻类、浮游生物, 甚至其他鱼的鳞片。这些嘴的进化 对它们的繁衍至关重要, 使得不同的物种可以使用咽颌来发出独特的交配声音, 这样雌性慈鲷得以识别 属于自己物种的雄性。这个技能限制了 不同种类间的交配, 从而确保父母能遗传 它们独特的嘴巴。科学家们仍在不断发现这种令人难以置信的 骨骼机制的所有职能。但鉴于我们已经知道的, 可以公平地说, 对于大多数鱼来说, 两个嘴巴比一个好。

P73 2021-07-06 Could we build a wooden skyscraper - Stefan Al

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=73>)

Towering 85 meters above the Norwegian countryside, Mjøstårnet cuts a sleek shape in the rural skyline. Housing 18 stories of restaurants, apartments, and hotel rooms, this modern building might seem out of place. But a deeper look reveals it actually blends in quite well among the forested farmlands. This is likely because Mjøstårnet is the world's tallest wooden building, made almost entirely from the trees of neighboring forests. Until the end of the 20th century, engineers thought it was impossible to build a wooden building over six stories tall. Traditional boards of lumber were fairly strong against forces parallel to the wood's fiber growth. But they were vulnerable to forces applied perpendicular to this direction. As a result, wood lacked steel's tensile strength or concrete's compressive strength—each necessary to support tall buildings and battle the powerful winds found at high altitudes. But the early 1890s saw the invention of glue laminated timber, or glulam. And a century later, engineers developed cross-laminated timber, or CLT. These new wooden materials start out like all other lumber; a freshly cut log is sawed into smooth uniform boards of wood. Then, in the case of CLT, the boards are glued together in alternating orientations with each layer set at 90 degrees to its neighbors. The resulting material benefits from wood's structural rigidity in every direction, allowing it to mimic the compressive strength of concrete and bear loads up to 20 times heavier than traditional lumber. Glulam on the other hand, glues boards together in the same direction, forming massive beams with tensile strength comparable to steel. Glulam isn't as versatile as CLT, but its incredible strength along one direction makes it superior for load-bearing beams and columns. These engineered forms of wood could finally compete with traditional materials while also bringing their own unique set of advantages. At one-fifth the weight of concrete, building with CLT requires smaller cranes, smaller foundations, and fewer construction workers. While concrete has to undergo a time-intensive process of casting and curing in a mold, timber can be shaped quickly using computer directed cutting machines. And where

concrete requires certain weather and timing conditions to be poured on site, engineered wood can be prefabricated in a factory, creating standardized parts with clear instructions for assembly. Taken together, these materials allow for faster and quieter construction, with more biodegradable materials and less waste. Once constructed, CLT and glulam buildings are also more resilient to some natural disasters. An earthquake can crack concrete, permanently weakening an entire structure. But cracked wood panels can be easily replaced. The same is true for fire safety. As temperatures rise in a CLT building, the material's outer layer will char, insulating the inner layers for up to three hours. This is more than enough time to evacuate most buildings, and once the smoke has settled, charred panels can be swapped out— unlike melted steel beams. But perhaps the biggest benefits of CLT and glulam are outside the construction site. Building construction is responsible for 11% of annual global carbon emissions, and the production of steel, concrete, iron, and glass are major contributors to that figure. Timber, however, is a renewable resource that can be made carbon-neutral if trees are planted to replace those cut down. Wood also has low thermal conductivity, making it easier to heat and cool buildings with less energy waste. Despite these advantages, CLT requires vastly more lumber than traditional wooden construction. And when compared in similar quantities, neither CLT or glulam is as strong as steel or concrete. Even Mjøstårnet isn't made entirely of wood, as it contains concrete slabs to reinforce the upper floors. Taken together, it's unlikely that a purely wooden structure would be strong enough to support a 40-story building—the minimum height for a formal skyscraper. But even if only buildings under 30 stories were built from wood, it would reduce the carbon footprint of those structures by more than 25%. So no matter how tall these wooden buildings rise, each one contributes to the health of our concrete jungles.

P73 2021-07-06 Could we build a wooden skyscraper - Stefan Al

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=73>)

翻译人员: Sabrina Wang 校对人员: Helen Chang85 米高耸立于挪威乡间的 米约萨塔 (挪威语: Mjøstårnet)是乡村天际下一座 精致优美的建筑设计。这座有 18 层楼的餐厅、公寓 和酒店客房的此一现代建筑可能显得有点格格不入, 但深入了解后发现 它实际上相当好地融入了周边的森林与农田之中。这可能是因为米约萨塔 是世界上最高的木制建筑,几乎全由邻近森林的树木所制成。直到 20 世纪末,工程师们一直认为不可能 建造一座超过六层楼高的木制建筑。传统的木板能够坚守对抗与木材纤维生长方向平行的力量。但它们对于从垂直方向 所施加的压力很脆弱——所以木材缺乏钢铁的抗拉强度或混凝土的抗压强度,而这些都是支撑高层建筑和对抗高海拔地区强风所必需的。但在 1890 年代初 发明了胶合板, 又称胶合木。一个世纪后, 工程师开发了 交叉层压木材, 或称 CLT。这些新的木质材料 开始时和其他木材一样; 刚砍下的原木被锯成光滑均匀的木板。然后制成 CLT, 就是把木板 以纵横的方向交替粘在一起。每一层设置为 90 度与其相邻。由此产生的材料得益于木材在各个方向的结构刚度。使其能具有像混凝土那样的抗压强度, 并承受比传统木材重 20 倍的负荷。而胶合木则是将板材 沿同一方向粘合在一起形成巨大的横梁, 其抗拉强度可与钢铁相媲美。胶合板不像 CLT 那样用途广泛, 但沿着同一个方向时, 却具有令人难以置信的强度使它在承重梁和柱子方面更有优势。这些经过工程设计和改造过的木材, 最终可以与传统材料竞争, 同时也带来了它们 自己独特的一套竞争优势。CLT 的重量只有混凝土的五分之一, 使用 CLT 的建筑需要用的 起重机和地基比较小, 需要用的建筑工人比较少。混凝土必须经过一个时间密集的铸造和在模具中固化的过程, 而木材则可以使用计算机 直接操控的切割机, 快速成型。混凝土需要特定的天气和时间条件才能在现场浇筑, 而工程木料可以在工厂里预制, 形成标准化的部件, 有明确的组装说明。综上所述, 这些材料 可以使施工更快、更安静, 使用更多的可生物降解的材料, 产生更少的废料。一旦建成, 使用 CLT 和胶合板的建筑对一些自然灾害的抵御能力也会更强。地震会使混凝土裂开, 永久性地削弱整个结构。但是, 开裂的木板可以很容易被替换。消防安全方面也是如此。在 CLT 建筑中, 随着温度的升高, 这种材料的外层会烧焦, 从而产生对内层的隔热, 长达三个小时之久。这段时间对于疏散大多数 建筑物来说是绰绰有余的, 而且一旦烟雾消散, 烧焦的面板可以被换掉, 不像熔化的钢梁。但 CLT 和胶合板最大的好处也许在建筑工地之外。建筑施工占全球年度 碳排放量的 11%, 而钢铁、混凝土、铁和玻璃的生产是这一数字的主要贡献者。然而, 木材是一种可再生资源, 如果种植树木来取代被砍伐的树木, 就可以实现碳中和。木材还具有低导热性, 使其更容易为建筑物供暖和制冷, 减少能源浪费。尽管有这些优劣势, CLT 所需的木材要比传统的木制结构多得多。而在类似数量的比较中, CLT 或胶合木都没有 钢筋或混凝土那么坚固。即使是 Mjøstårnet 也不完全由木材制成, 因为它包含了混凝土板 来加固上部楼层。综上所述, 纯粹的木质结构不太可能有足够的强度来支撑 40 层的高楼 —这是正式摩天大楼的最低高度。但即使只有 30 层以下的建筑 是用木材建造的, 它也会使这些建筑的碳足迹 减少 25%以上。因此, 无论这些木制建筑有多高, 每一栋都能对我们所

处的 水泥森林的健康做出贡献。

P74 2021-07-08 History's deadliest king - by Georges Nzongola-Ntalaja

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=74>)

On December 12, 1904, Chief Lontulu laid 110 twigs in front of a foreign commission. Every twig represented a person in his village who died because of King Leopold's horrific regime in the Congo— all in the name of rubber. Chief Lontulu separated the twigs into four piles: tribal nobles, men, women, and children— then proceeded to name the dead of one-by-one. His testimony joined hundreds of others to help bring an end to one of the greatest atrocities in history. Beginning in the late 1800s, European countries participated in the so-called “Scramble for Africa.” They colonized 90% of the continent, exploiting African resources and enriching their countries. Belgium had recently become an independent kingdom. Its ruler, Leopold II, wanted to acquire what he called “a slice of this magnificent African cake.” Meanwhile, he read colonial explorer Henry Morton Stanley's reports about traveling through Africa. Stanley emphasized the Congo basin's majesty. So, in 1879, Leopold contracted him to return to the Congo. There, Stanley deceived leaders into signing some 450 treaties allowing for land use. Leopold persuaded the US and European powers to grant him ownership of the Congo, pledging to protect free trade in the region. And on May 29, 1885, a territory more than 80 times the size of Belgium and home to 20 million people was declared his own private colony— by no one it actually belonged to. Leopold lost no time consolidating power in what he called the Congo Free State. He claimed land, raised an army, and forced many Congolese men to complete unpaid labor. Things got even worse when, in 1887, a Scottish inventor redeveloped the pneumatic tire, creating a massive international market for rubber. The Congo had one of the world's largest supplies. Leopold seized the opportunity, requiring villages to meet ever-greater rubber quotas. Congolese men had to harvest the material from wild vines. As supplies drained, they walked for days to gather enough. Leopold's army entered villages and held women and children hostage until the impossible quota was met. Soldiers sexually violated women and deprived children of food and water. Congolese people rebelled— they refused to cooperate, fought Leopold's soldiers, hid in the forests, and destroyed rubber vines. Leopold's army responded to resistance or failure to meet quotas with unflinching torture and executions. Because guns and ammunition were expensive, officers ordered soldiers to prove they used their bullets in the line of duty by removing a hand from anyone they killed. However, many soldiers hunted using their guns. To avoid harsh penalties and account for lost bullets, they cut off living people's hands. They also used this practice as punishment. If rubber quotas weren't met, soldiers would sever people's hands and bring them to their commanders instead of rubber. The regime dramatically upended daily life and agriculture, causing widespread starvation and disease. Meanwhile, King Leopold built monuments and private estates with the wealth he extracted. Soon, people brought international attention to the horrific abuses of Leopold's Congo Free State. In 1890, American journalist George Washington Williams accused King Leopold of “deceit, fraud, robberies, arson, murder, slave-raiding, and [a] general policy of cruelty.” In 1903, Diplomat Roger Casement wrote a report that corroborated the nature and scale of the atrocities. It was published the following year. In response, Leopold appointed his own commission to investigate the accusations. They heard numerous witness statements in the Congo— Chief Lontulu's included. The report only confirmed the worst. Facing pressure, Leopold relinquished control of the Congo to the Belgian government in 1908. But this did not mean justice. The Belgian state awarded Leopold 50 million francs “in testimony for his great sacrifice in favor of the Congo.” He died the following year. Crowds booed his funeral procession. For more than 50 years following, the Congo remained a Belgian colony, until declaring independence in 1960. That year, the Congo elected its first prime minister, Patrice Lumumba. But months later, he was unseated in a US and Belgium backed coup. In early 1961, Lumumba was assassinated under Belgian supervision. The coup launched the country into a decades-long dictatorship. Around 10 million Congolese people are thought to have died during Leopold's occupation and looting of the Congo. Despite this devastation, calls for reparations have gone unanswered. To this day, throughout Belgium can be found the monuments King Leopold built on a foundation of inconceivable cruelty.

P74 2021-07-08 History's deadliest king - by Georges Nzongola-Ntalaja

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=74>)

翻译人员: 校对人员: Helen Chang 1904 年 12 月 12 日, 龙图鲁酋长 在一个外国调查团面前摆下了 110 根树枝。每根树枝都代表一个他所在村里死于利奥波德二世 在刚果的可怕统治时期的人, 他们罪名都是: 抢劫。龙图鲁酋长把树枝分为四堆: 部落贵族、男人、女人和孩子。然后一个个地说出他们的名字。他的证词以及数百人其他人的证词引致结束了历史上 最为残暴的暴行之一。从十九世纪末开始, 欧洲国家竞相加入 “瓜分非洲” 的活动中。他们殖民了 90% 的非洲大陆, 把掠夺而来的资源 变成自己国家的财富。那时, 比利时刚刚 成为一个独立的王国。他们的统治者利奥波德二世 想如他所说的“从非洲大蛋糕上分上一块”。此时, 他读到殖民地探险家 亨利·莫顿·史丹利所写的关于非洲的游记。史丹利在书中强调了 刚果盆地的雄伟壮观。于是, 1879 年, 利奥波德二世资助史丹利重回刚果。在刚果, 史丹利欺骗 领主们签署了大概 450 多个协议允许使用他们的土地。利奥波德二世说服美国和欧洲势力确保他对刚果的所有权, 承诺保护该地区的自由贸易。到了 1885 年 5 月 29 日, 一块面积超过比利时国土面积 80 倍、人口达到两千万人的土地 成为了他的私人殖民地。而实际上, 这块土地不属于任何人。利奥波德二世迅速地巩固了他在所谓的“刚果自由州”的权力。他宣誓主权, 建立了一支军队, 并且强迫许多刚果男人无偿劳动。1887 年, 情形变得更糟一个苏格兰发明家(注: 邓禄普) 设计出充气轮胎, 一下子为橡胶开创了巨大的国际市场。刚果是世界上最大的供应国之一。利奥波德二世抓住了这个机会, 强迫村民们完成不断上涨的橡胶任务。刚果男人们不得不 从野生橡胶树上收割原料。当原料枯竭时, 他们要走上数天才能搜集够。利奥波德二世的军队进入村庄, 把妇女和孩子当作人质, 直到不可能的任务被完成。士兵们性侵妇女, 剥夺孩子们的食物和水。刚果人民忍无可忍, 发动了起义。他们拒绝合作, 与利奥波德二世的士兵作战, 躲进森林, 破坏橡胶园。当遭遇抵抗或生产任务未能完成, 利奥波德二世的军队用冷酷的拷打和处决来回应。因为枪支弹药非常昂贵, 军官要求士兵们 砍下他们杀死的人的一只手, 来证明子弹是用于执行任务。然而, 很多士兵使用枪支来狩猎。为了避免严厉的惩罚 和丢失子弹的责任, 他们从活人的身上砍下手。他们还用这种方式作为惩罚的手段。如果橡胶任务没有完成, 士兵们会砍断人们的手, 把它们代替橡胶交给他们的指挥官。这种统治极大地改变了 日常生活和农业生产, 导致饥饿和疾病广泛传播。而与此同时, 利奥波德二世 却用他攫取的财富建立起纪念碑和私人庄园。很快, 利奥波德二世的 “刚果自由州” 的人民所遭受的非人虐待引起了国际关注。1890 年, 美国记者 乔治·华盛顿·威廉姆斯指控利奥波德二世 “欺骗、欺诈、抢劫、纵火、谋杀、抢劫奴隶, 和残忍的一贯政策。” 1903 年, 外交官罗杰·凯门特 撰写了一份报告, 证实了暴政的性质和规模。这份报告于次年出版。作为回应, 利奥波德二世派出了 自己的代表团调查这些指控。代表团听到了刚果无数目击者的证词, 这其中, 就包括龙图鲁酋长。最终的报告证明事实 比已出版的报告还严重。面对压力, 利奥波德二世 放弃了对刚果的控制, 于 1908 年, 把权力 移交给了比利时政府。但是, 这一切并不意味着正义来临。因为, 比利时政府授予 利奥波德二世 5000 万法郎作为“他为刚果所付出的 巨大牺牲的证明”。利奥波德二世于第二年 (1909 年) 去世。人群对他的送葬队伍发出嘘声。在接下来的超过 50 年的岁月里, 刚果始终是比利时的殖民地。直到 1960 年, 刚果宣布独立。当年, 刚果选举出第一个总理 ——帕特里斯·卢蒙巴。但是几个月后, 他就被 美国和比利时支持的政变赶下了台。1961 年初, 卢蒙巴在 比利时的“监护”下遇刺身亡。政变把刚果带入了 长达数十年的独裁统治。据信, 大概有一千万刚果人死于利奥波德二世占领、 抢劫刚果的时期。尽管遭受了巨大的破坏, 补偿刚果人民的呼声 犹如泥牛入海, 没有响应。时至今日, 在整个比利时 随处都可以看到利奥波德二世那些建立在 难以置信的残暴基石之上的纪念碑。

P75 2021-07-13 The most notorious scientific feud in history - Lukas Rieppel

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=75>)

After the California Gold Rush of 1848, white settlers streamed west to strike it rich. In addition to precious metals, they unearthed another treasure: dinosaur bones. Two wealthy scientists in particular—Othniel Charles Marsh and Edward Drinker Cope—competed to uncover these prehistoric monsters. Marsh and Cope were first to describe iconic creatures like Brontosaurus, Triceratops, and Stegosaurus. But they also showcased the destructive whirlwind of profiteering and ambition that fueled American science during the late 1800s. Their rivalry, one of the most notorious scientific feuds in history, became known as the Bone Wars. Marsh was ill-tempered and had a knack for debunking falsehoods. One woman said that getting to know him was “like running against a pitchfork.” Cope, on the other hand, was charismatic and given to bold theorizing. But he was also sarcastic and temperamental. By his own admission, he wasn’t “constructed for getting along comfortably with the general run of people.” When Marsh and Cope first met in 1864, they were friendly, and each named a new species in the other’s honor. But their relationship soon soured. In 1868, Cope took Marsh to a quarry near his home in New Jersey where one of the most complete dinosaur skeletons to date had recently been discovered. Sensing an opportunity, Marsh paid the

mine operators to send him the most interesting new finds. Outraged, Cope accused Marsh of bribery. That same year, Cope showed Marsh his reconstruction of a new marine reptile called Elasmosaurus. Marsh immediately noticed that something was wrong: Cope had mistaken the creature's long neck for its tail. When Cope's mentor sided with Marsh, Cope was mortified. He tried to buy and destroy every copy of the article containing his blunder, but to no avail. Their mutual resentment blossomed. After the transcontinental railroad was completed the following year, Cope and Marsh began scouring the American West for fossils. They found riches the likes of which neither had dreamed. Relying on the help of Native American guides, Marsh made some especially significant discoveries, like ancient birds with teeth that are still celebrated as a missing link between dinosaurs and modern birds. Cope made important discoveries, too, but Marsh successfully invalidated many of them, showing them to be redundant with other known species. Enraged, Cope tried to secure priority for new findings by announcing them via telegram. He even purchased a respected journal so future publications could be rushed into print. But Marsh used his personal fortune to gain the upper hand, hiring a small army of fossil hunters to out-compete his rival. In 1878, Marsh bought an especially promising quarry in Como Bluff, Wyoming, from two frontier collectors. It yielded tons of fossils, including the near-complete skeleton of a gigantic dinosaur that Marsh named Brontosaurus. Over the next 10 years, his men shipped him more than 480 boxes of dinosaur bones from Como alone. Marsh named dozens of new species. But his assistants could be ruthless in their quest to further Marsh's scientific ambitions. They sometimes destroyed fossils just to prevent them from falling into Cope's hands. Desperate to catch up with Marsh, Cope invested his dwindling fortune into silver mining. The gamble failed, and he was left nearly destitute. While Cope contemplated selling his precious collection, Marsh was named lead paleontologist for the US Geological Survey. This well-funded branch of the government often sponsored Westward expeditions, giving Marsh even more resources to vanquish his rival. The Bone Wars spilled into public view when Cope had a tabloid newspaper publish an article accusing Marsh of plagiarism, fraud, and corruption. Marsh fired back and the two further tarnished each other's reputations. Neither ever relented. When Cope died, he donated his skull to science, hoping to prove that his brain was larger than that of his enemy. Marsh never accepted the challenge. Although Marsh named more species than Cope, both men greatly expanded our understanding of evolution. But their egotistical one-upmanship reminds us that, in spite of its ideals, science is a personal enterprise conducted by individual—and at times deeply flawed—human beings.

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翻译人员: William Wu 校对人员: Helen Chang 在 1848 年加利福尼亚淘金潮后白人移民者涌向西方去淘金除了发现稀有金属之外 他们还挖掘了其他的宝藏恐龙化石两个特别富有的科学家奥斯尼尔 查尔斯 马什 和爱德华 德林克 科普互相竞争着去发掘这些史前怪兽马什和科普是第一个描述代表性生物像雷龙、三角恐龙和剑龙但与此同时他们也展现出了 毁灭性般谋取暴利的旋风和在十九世纪晚期 推动美国科学进程的野心他们的对抗是史上 特别臭名昭著的一次科学世仇被熟知为“化石战争”马什脾气很暴躁 并且对于击碎谎言很有一套有个女人说了解他就像 “和干草叉比赛跑”在另一方面 科普是很有魅力的 而且勇于大胆推论的但他同时又喜欢挖苦人且喜怒无常他自己承认他并不是为和大多数人好好相处而生马什和科普初次在 1864 年相遇时 彼此相当友好并都以对方的名字命名了新的物种但他们的关系很快就变质了在 1868 年 科普带着马什 去了他新泽西家附近的采石场是截至当时为止 最完整的恐龙头骨才刚被挖掘了出来马什嗅到了机会 付钱给了矿工取得了最有意思的新发现愤怒的科普指控马什贿赂同年科普向马什展示了 他重建的新海洋爬行动物叫做板龙马什很快注意到有些异样科普错把生物的长颈当作了它的尾巴当科普的导师赞同马什时 科普感觉很羞辱他试着买下并且毁掉 所有印有他错误的文章但并没什么用他们共同的怨恨生根发芽了在次年横贯大陆的铁路竣工后科普和马什开始擦亮美国西部的化石他们发现了从未幻想的重要结果依靠着美国土著向导的帮助马什有了些特别重大的发现一种有齿的古代鸟类至今仍被因为它是恐龙 与现代鸟的过度物种科普也发现了重要的化石但是马什成功地使其中的许多失效展示这些化石其实是已知物种愤怒之下 科普想通过电报赶紧发布他的新发现他甚至购买了一个有名气的期刊来快速的发布他未来的发现但是马什用他个人的财富招聘了一些私人化石猎手 从而胜过他的对手 1878 年 马什从两名收藏家那里 购买了一个有前景的位于怀俄明州的采石场结果有了数吨的化石, 包括一个大恐龙的几乎完整的化石这个恐龙被马什命名为“雷龙”接下来十年 他的手下 发现了 480 多箱化石仅仅来自怀俄明州的采石场马什命名了几十个新的物种但是他的助理为了 马什在科学领域的领先使用了无情的手段他们有时摧毁了化石 仅仅为了防止化石落入科普的手里为了赶上马什科普把他日益

减少的财富 投资到了银矿挖掘中他投资失败 陷入了贫困中在科普思考卖出自己珍贵的收藏品时马什被认为美国地质调查局 评价为顶尖古生物学家这个经费充足的政府机构 经常赞助向西的远征给了马什更多击败他对手的资源当科普在报纸上控诉 马什侵权、诈骗、腐败时公众才知道了这场化石战争马什也不甘示弱 两人都在互相诋毁对方的名誉并且都不肯让步科普去世后 他把自己的头骨捐献了出去来证明他的大脑比他的对手要大马什从未接受这个挑战尽管马什发现的新物种比科普多这两人都为人类对进化论的理解 做出了不可磨灭的贡献但是他们自大的自我提醒了我们： 尽管科学有理想科学是由人类个体进行的个人事业而人往往存在严重的缺陷

P76 2021-07-15 Why can't governments print an unlimited amount of money - Jonathan S

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=76>)

In March 2020, the COVID-19 pandemic rocked economies worldwide. Millions of people lost their jobs, and many businesses struggled to survive or shut down completely. Governments responded with some of the largest economic relief packages in history—the United States alone spent \$2.2 trillion on a first round of relief. So where did all this money come from? Most countries have a central bank that manages the money supply and is independent from the government to prevent political interference. The government can implement many types of economic policy, like decreasing people's taxes and creating jobs through public infrastructure projects, but it actually can't just increase the money supply. The central bank determines how much money is in circulation at a time. So why can't central banks authorize the printing of unlimited money to help an economy in crisis? They could, but that's a short-term solution that doesn't necessarily boost economic growth in the long-term, and can actually hurt the economy. Why? With more money in circulation, manufacturers of goods like food, clothing, and cars could respond to demand simply by raising prices, rather than manufacturing more of these goods and creating new jobs in the process. This would mean you could no longer buy as much with the same amount of money—a situation known as inflation. A little bit of inflation, about 2% a year, is considered a sign of economic health, but more can quickly derail an economy. In recent decades, central banks have tried an approach called quantitative easing to infuse the economy with cash while maintaining a low risk of severe inflation. In this approach, a central bank increases cash flow by purchasing another entity's bonds. Anyone can buy bonds from corporations or governments. When you buy a bond, you're essentially loaning money to the company—or government—with the promise that they'll pay it back later with interest. This is why buying bonds is sometimes referred to as buying debt. When an individual buys a bond, they're using money that's already in circulation. But when the central bank buys a bond, it essentially creates cash, supplying money that didn't exist before in exchange for bonds. Both during the 2008-2009 financial crisis and again in 2020, the United States' central bank, the Federal Reserve, bought bonds from the US government called treasury bonds. Historically, many people have purchased these bonds as a safe form of investment, knowing the US government will pay them back with interest. In early 2020, the Federal Reserve pledged to buy unlimited treasury bonds, loaning the U.S. government an unprecedented amount of money—cash that the government used to fund relief efforts like stimulus checks and unemployment benefits. This isn't equivalent to simply printing money, though it may sound similar. Because of the way bonds are priced, by buying so many, the Federal Reserve effectively lowered the return on them, which incentivizes other investors to lend to riskier entities—like small and midsize companies—in order to get a decent return. Encouraging lending this way should help companies of all sizes borrow money to funnel into projects and hires, boosting the economy over time in addition to helping the government supply people with urgently needed cash in the short term. The Federal Reserve's pledge to buy unlimited government debt has raised some questions—and eyebrows. In theory, this means the government could issue more bonds, which the central bank would purchase. The government could then use the money from the new bonds to pay off the old bonds, effectively meaning the government never pays back its debt to the central bank. Citing this and other theoretical scenarios, some economists have raised concerns that a central bank buying government debt is a subversion of a system designed to protect the economy. Others have insisted these measures are necessary, and have so far helped stabilize economies. Though quantitative easing has become a lot more common in recent years, it's still relatively new, and potential consequences are still unfolding.

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翻译人员: Frank Xu 校对人员: Helen Chang 在 2020 年三月, 新冠疫情 震荡了世界经济。数百万人失业, 而许多企业挣扎求生或完全倒闭。政府们通过一些历史上 最大的经济救助项目——单是美国就在其首次救助中 花费了 22 亿美金。那么这些钱都是从哪来的? 大多数国家有一间中央银行 来管理货币储备并且独立于政府来防止政治干预。政府可以施行多种经济政策, 比如减少税收和通过公共基建项目创造工作机会, 但是政府并不能直接地 增加货币储备。中央银行决定有多少资金在流通。那么为什么中央银行 不能授权印无限数量的钞票帮助危机中的经济呢? 它们可以, 但是这是一种短期手段, 它在长期并不真正帮助经济增长, 而且还可能损害经济。为什么? 流通的钱越多, 例如食品、衣物、和汽车制造商能够简单地针对需求抬高价格, 而不是制造更多产品并同时创造新工作。这意味着你再也不能 用同样多的钱买同样多的东西——这个状况叫做通货膨胀。一点点通货膨胀, 大该一年百分之二, 被认为是经济健康的表现, 但更多可以快速导致经济脱轨。在最近几十年, 中央银行尝试过一种叫做量化宽松的方式 来为经济注入资金同时保持较低的严重通货膨胀风险。在这个方法中, 一间央行通过购买 另一机构的债券来增加基金流动。任何人都能从公司 或政府那里购买债券。在你购买债券时, 你实际上是把钱借给公司——或政府——接受它们会在之后 把本金和利息一起归还的承诺。这是为什么购买债券 有时被称作是购买债务。当一个个体购买一份债券, 他们用的是已经在流通中的钱。但是当央行购买一份债券, 它本质上是在造钱, 提供出之前不存在的资金来换成债券。在 2008-2009 金融危机 以及 2020 年又一次, 美国的中央银行, 也就是美联储, 向美国政府购买 叫做长期国债的债券。历史上来说, 很多人购买国债 来作为一种安全的投资, 因为美国政府会连本带利一起付还。在 2020 早期, 美联储保证购买 不限量的长期国债借给美国政府空前大量的资金——给政府用来为救济募资, 比如经济刺激补助和失业补贴。这和简单地印钱并不相同, 即使它听起来相似。由于债券被定价的方式, 通过购买很多, 美联储有效地降低了它们的回利, 这促使其他投资者 向更有风险的选择放贷——比如中小企业——通过鼓励这种借贷方式 应该能帮助大小公司借款来投入到项目和雇佣, 从长期促进经济并帮助政府为有紧急需求的人们在短期提供资金。美联储对购买不限量长期国债的保证引发一些问题和怀疑。理论上, 这意味着政府 可以发放更多债券, 央行会购买这些债券。政府之后可以用新债券得到的钱来还清以前的债券, 这意味着政府 永远不会归还欠央行的钱。引用这个和其它理论上的情景, 一些经济学家担心央行购买国债是对经济保护系统的颠覆。其他人则坚持这些手段是必要的, 认为至目前为止 已经帮助稳定了经济。虽然量化宽松 在近年已变得更加普遍, 它依旧相对较新, 且可能产生的后果还有待观察。

P77 2021-07-20 The paradox at the heart of mathematics - Gödel's Incompleteness Theo

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=77>)

Consider the following sentence: "This statement is false." Is that true? If so, that would make this statement false. But if it's false, then the statement is true. By referring to itself directly, this statement creates an unresolvable paradox. So if it's not true and it's not false—what is it? This question might seem like a silly thought experiment. But in the early 20th century, it led Austrian logician Kurt Gödel to a discovery that would change mathematics forever. Gödel's discovery had to do with the limitations of mathematical proofs. A proof is a logical argument that demonstrates why a statement about numbers is true. The building blocks of these arguments are called axioms—undeniable statements about the numbers involved. Every system built on mathematics, from the most complex proof to basic arithmetic, is constructed from axioms. And if a statement about numbers is true, mathematicians should be able to confirm it with an axiomatic proof. Since ancient Greece, mathematicians used this system to prove or disprove mathematical claims with total certainty. But when Gödel entered the field, some newly uncovered logical paradoxes were threatening that certainty. Prominent mathematicians were eager to prove that mathematics had no contradictions. Gödel himself wasn't so sure. And he was even less confident that mathematics was the right tool to investigate this problem. While it's relatively easy to create a self-referential paradox with words, numbers don't typically talk about themselves. A mathematical statement is simply true or false. But Gödel had an idea. First, he translated mathematical statements and equations into code numbers so that a complex mathematical idea could be expressed in a single number. This meant that mathematical statements written with those numbers were also expressing something about the encoded statements of mathematics. In this way, the coding allowed mathematics to talk about itself. Through this method, he was able to write: "This statement cannot be proved" as an equation, creating the first self-referential mathematical statement. However, unlike the ambiguous sentence that inspired him, mathematical statements must be true or false. So which is it? If it's false, that means the statement does have a proof. But if a mathematical statement has a proof, then it must

be true. This contradiction means that Gödel's statement can't be false, and therefore it must be true that "this statement cannot be proved." Yet this result is even more surprising, because it means we now have a true equation of mathematics that asserts it cannot be proved. This revelation is at the heart of Gödel's Incompleteness Theorem, which introduces an entirely new class of mathematical statement. In Gödel's paradigm, statements still are either true or false, but true statements can either be provable or unprovable within a given set of axioms. Furthermore, Gödel argues these unprovable true statements exist in every axiomatic system. This makes it impossible to create a perfectly complete system using mathematics, because there will always be true statements we cannot prove. Even if you account for these unprovable statements by adding them as new axioms to an enlarged mathematical system, that very process introduces new unprovably true statements. No matter how many axioms you add, there will always be unprovably true statements in your system. It's Gödel's all the way down! This revelation rocked the foundations of the field, crushing those who dreamed that every mathematical claim would one day be proven or disproven. While most mathematicians accepted this new reality, some fervently debated it. Others still tried to ignore the newly uncovered a hole in the heart of their field. But as more classical problems were proven to be unprovably true, some began to worry their life's work would be impossible to complete. Still, Gödel's theorem opened as many doors as a closed. Knowledge of unprovably true statements inspired key innovations in early computers. And today, some mathematicians dedicate their careers to identifying provably unprovable statements. So while mathematicians may have lost some certainty, thanks to Gödel they can embrace the unknown at the heart of any quest for truth.

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[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=77>)

翻译人员: Xinyue Li 校对人员: Helen Chang 观察以下句子: “这句话是错误的。”这句话是正确的吗? 如果是的话, 那么这句话就是错误的。如果不是的话, 那么这句话就是正确的。通过引用本身, 这句话创造了一个无法解决的悖论。如果它不是正确的也不是错误的——那么它是什么呢? 这个问题看起来像一个愚蠢的思维实验但在 20 世纪早期, 它使得澳大利亚逻辑学家库尔特·哥德尔作出了一个永远改变数学界的发现。哥德尔的发现与数学证明的局限性有关。证明是一种逻辑论证, 被用来展示何以一句对于数字的表述成立。建立起这些论证的组成部分 被称为公理——有关这些提及到的数字 不证自明的论述。每一个建立在数学基础上的系统, 从最复杂的证明到基础运算, 都由公理推算而来。如果一个关于数字的论述是正确的, 数学家就应该能够用公理证明它。从古希腊起, 数学家用这个系统来充分证明或证伪数学陈述。但当哥德尔进入了这个领域后, 一些新发现的逻辑悖论 挑战了先前的充分性。杰出的数学家们迫切地想证明数学是没有矛盾性的。哥德尔自己却没有那么确定。而且他甚至对于数学是否是解决这个问题正确的工具更加没有信心。尽管用一个文字来形成一个 自我引用的悖论相对简单, 数字通常不会引用自身。一个数学论述就是对或错。但哥德尔有了一个想法。首先, 他把数学论述和等式 转化成了代码, 从而使得复杂的数学概念 可以用一数字进行表述。这意味着用这些数字写成的数学语句也表达了一些关于数学编码语句的内容。以这种方式, 代码能让数学表述自身。通过这种方式, 他能够将: “这个论述无法被证明” 写作一个等式, 创造了第一个自我引用的数学论述。然而, 并不像那些启发他的 模棱两可的句子, 数学论述必须是正确或者错误。因此它是哪个呢? 如果它是错误的, 那就意味着论述可以被证明。但如果一个数学论述可以被证明, 那它一定是正确的。这个矛盾意味着哥德尔的论述不能是错误的, 因此, “这个论述不能被证明” 是正确的。然而这个结论其实更加令人讶异, 因为它意味着存在一个正确的数学等式却无法被证明。这个出乎意料的事实 正是“哥德尔不完备定理”的核心, 开启了一个全新的数学论述的阶段。在哥德尔的范例中, 论述依旧是正确或者错误, 但正确的论述在给定的公理下可证或不可证。此外, 哥德尔提出 这些不可证的正确论述存在于每一个公理系统中。如此一来就无法用数学建立一个完美完满的系统, 因为永远会存在 无法被证明的正确论述。即使你可以将这些无法被证明的论述作为新的公理, 添加进已经很庞大的数学系统, 这个过程依旧会引入新的 无法被证明的正确论述。无论你添加多少新的公理, 你的系统中永远会存在 无法被证明的正确论述。哥德尔的理论永远成立! 这一发现震撼了数学领域的基础, 粉碎那些梦想总有一天 所有的数学论述都会被证明或证伪的人。尽管大部分数学家接受了这个全新的现实, 一些人满怀期待的想推翻它, 而剩下的则打心底里努力地去忽略 这个他们领域中全新的无法被填补的窟窿。不过当越来越多的经典问题被证明 它们是无法被证明的正确论述, 一些人开始担心 他们无法完成毕生的事业。即便如此, 哥德尔定理 打开的门和关闭的门一样多。有关无法被证明的正确论述的知识成为了早期电脑的关键创新启发。而如今, 一些数学家穷尽他们的职业生涯试图去证明那些无法被证明的论述。因此即使数学家可能丢失了一些必然性, 多亏了哥德尔, 他们得以以满心的期待去拥抱未知。

P78 2021-07-22 The rise and fall of the Kingdom of Man - Andrew McDonald

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=78>)

On a small island in the middle of the Irish Sea, fortresses preside over the rugged shores. This unlikely location was the birthplace of a medieval empire that lasted 200 years, ruled by a dynasty of sea kings. The first of these kings was Godred Crovan, a notorious warlord descended from Irish and Viking rulers. Starting in 1079, Godred consolidated power over the Isle of Man and the Hebrides, a collection of islands off the west coast of Scotland. He seized control of important sea routes between the British Isles, Scandinavia, and the North Atlantic. A turbulent period followed Godred's death, characterised by invasions from Norway and Ireland, and intense feuding between princes. But his descendants held on to power, building coastal fortresses, roving the seaways, throwing themselves into epic battles, and consolidating control over an impressive maritime kingdom. The inhabitants of this kingdom had both Gaelic and Norse roots, and many probably spoke both languages. Those on the Isle of Man were known as the Manx people, while those in the Hebrides were known as Islanders or People of the Isles. Though we still don't know for sure how many there were, we do know this relatively small group had an outsize impact on the region. Perched on cliffs with sweeping views and safe harbors, seaside fortresses helped the kings control shipping, commerce, and resources. The empire commanded vast fleets of Viking-style long ships, which they used for trading, raiding, and plundering the seas. Observing this prowess, many neighboring rulers sought their aid. The brothers Rognvald and Olaf each solved neighbors' maritime woes: King Rognvald supplied military assistance to the Scottish king, and King Olaf's forces served as a Coast Guard at the English King Henry III's request— for a hefty fee. The sea kings also sparred with their powerful neighbors, but they had a particularly bitter rivalry with another dynasty in their own isles: a line of rulers in the Hebrides. In the 1150s, a chieftain of this line, Somerled, defeated the Manx King, his brother-in-law, in a naval battle and formed a rival Kingdom of the Isles, fracturing the old kingdom. This began a century-long rivalry between Somerled's line, who ruled the southern and central Hebrides, and the Manx Kings, who ruled the Isle of Man and northern Hebrides, to control the seaways. Family feuds often blossomed into bitter civil wars. In 1223, King Rognvald sent a letter to his son commanding him to murder his uncle Olaf. When Olaf discovered the plot, he launched a vicious attack on his nephew, blinding and mutilating him. After Rognvald's death several years later, people realized the letter ordering the attack might have been forged. The Manx kings attempted to resolve disagreements at Tynwald, an open-air parliament centered on a mound, where assemblies ruled on matters of justice and other issues. Such sites were commonly used in the Viking world for resolving anything from local disputes to matters involving kings. These meetings didn't always go smoothly— sometimes violence erupted, and in 1237, two rival factions squabbled to the point of breaking up the assembly at Tynwald. The four-tiered mound at Tynwald survives to this day, and the modern Manx parliament still holds an annual meeting there. In 1248, King Harald of Man died in a shipwreck and was succeeded by his brother. Weeks into the new king's reign, a rebel knight assassinated him. His brother Magnus died in 1265 at Castle Rushen— without an heir. According to one scribe, his death marked the day that "kings ceased to reign in Man." Scotland annexed Man and the Isles the next year, in 1266. We know about the exploits of the sea kings primarily from a chronicle written by Christian scribes living on the Isle of Man, and from the praise poems composed to celebrate the kings' victories. Today, although the sea kings are long gone, their presence remains etched onto the landscape.

P78 2021-07-22 The rise and fall of the Kingdom of Man - Andrew McDonald

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=78>)

翻译人员: Shichang Zhang 校对人员: Helen Chang 在爱尔兰海中间的一个小岛上, 崎岖的海岸上矗立着堡垒。在这个意想不到的地方 有个中世纪帝国的发源地, 持续了 200 年, 由海王王朝统治。第一个国王是戈德雷·克罗万, 他是爱尔兰和维京统治者的后裔, 臭名昭著的军阀。从 1079 年开始, 戈德雷德巩固了对马恩岛和赫布里底群岛的权力, 赫布里底群岛 是苏格兰西海岸的一系列岛屿。他控制了不列颠群岛、 斯堪的纳维亚半岛和北大西洋之间的重要海上航线。戈德雷德死后一段动荡时期, 其特点是来自挪威和爱尔兰的入侵以及王子之间的激烈争斗。但他的后代继续掌权, 建造沿海堡垒, 在海上航行, 投身于史诗般的战斗, 并巩固了一个令人印象深刻的 海上王国的控制。这个王国的居民有盖尔和挪威两种血统, 许多人可能会说两种语言。马恩岛的人被称为曼克斯人, 而赫布里底群岛

的人被称为岛民或群岛人。虽然我们仍然不确定有多少人，但我们确实知道这个相对较小的群体 对该地区产生了巨大的影响。海滨堡垒栖息在视野开阔的悬崖上， 拥有安全的港口，帮助国王控制航运、商业和资源。帝国指挥着庞大的维京式长船舰队，用于贸易、掠夺和掠夺领海。看到这种威力，许多邻近的统治者 寻求他们的帮助。罗格瓦尔德和奥拉夫兄弟 各自解决了邻国的海上困境：罗格瓦尔德国王向苏格兰国王 提供军事援助，奥拉夫国王的部队担任了海岸警卫队应英国国王亨利三世的要求， 收取高额费用。海王们也与他们强大的邻居争吵，但他们与自己岛屿上的另一个王朝 有着特别激烈的竞争：赫布里底群岛的统治者。在 1150 年代， 这一血统的首长萨默雷德，在海战中击败了他的姐夫曼克斯国王，组建了一个敌对的群岛王国， 瓦解了旧王国。这开始了长达一个世纪的争夺在统治赫布里底群岛南部 和中部的萨默雷德家族，与统治马恩岛和赫布里底群岛北部的 曼克斯国王之间，以控制海道。家庭不和经常演变成激烈的内战。1223 年，罗格瓦尔德国王 给他的儿子写了一封信，命令他谋杀他的叔叔奥拉夫。奥拉夫发现这个阴谋后， 对他的侄子发动了恶毒的攻击，使他失明并致残。几年后罗格瓦尔德去世后，人们意识到下令发动袭击的信件 可能是伪造的。曼克斯国王试图解决 在廷瓦尔德的分歧，廷瓦尔德是一个 以土丘为中心的露天集会，议会就司法问题和其他问题进行裁决。这些站点在维京世界中通常用于从解决从地方争端到涉及国王的事务的任何事情。这些会议并不总是一帆风顺，有时会爆发暴力事件，1237 年，两个敌对派系争吵到瓦解廷瓦尔德集会的地步。Tynwald 的四层土丘一直保存至今，现代的 Manx 议会 仍然在那里举行年会。1248 年，人类国王哈拉尔死于海难，其弟继位。新国王在位数周后， 一名叛乱骑士暗杀了他。他的兄弟马格努斯于 1265 年 在鲁申城堡去世，没有继承人。据一位文士说，他的死的那一天标志着“君王不再统治人类”。苏格兰于次年，1266 年，吞并了马恩和群岛。我们主要从编年史居住在马恩岛的基督教文士所写的，以及为庆祝国王的胜利而创作的 赞美诗中了解海王的功绩。今天，虽然海王早已不复存在，但他们的存在仍然铭刻在风景上。

P79 2021-07-27 A year in the life of one of Earth's weirdest animals - Gilad Bino

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=79>)

Waddling along the parched Australian earth, this female platypus is searching for fresh water. Over the past year, a severe drought turned rivers and streams to mere trickles. She barely survived and was unable to reproduce. Could the next year bring a change in luck? It's autumn and fat raindrops finally come spilling from the sky. Within days, the platypus finds a river and begins to hunt. Her webbed feet propel her along and her waterproof coat traps heat close to her body. Underwater, she senses her surroundings with her duck-like bill, which is fitted with about 40,000 electroreceptors. This allows her to detect the minuscule electrical signals coming from a glass shrimp's nerves and muscles. She makes it a quick meal. And once she clambers back on land to construct a burrow, she waddles in a lizard-like posture, her limbs moving horizontally to her spine. The platypus has many quirks. As a monotreme, she's part of the most ancient lineage of mammals alive today. Consequently, she has a curious mix of mammalian, avian, and reptilian features, which is reflected in her genome. For instance, mammals usually have one pair of chromosomes that determine sex. But the platypus has five, which more closely resemble a bird's. Let's hope she gets to put them to use. She regains her strength and, as winter turns to spring, it's time to mate. However, she can't raise her young here. The surrounding land has begun to be deforested, causing the riverbank to erode. Instead, she journeys upstream and settles in a clear, deep pool sheltered by a river red gum tree. Suddenly, a rustle flushes birds from the undergrowth and a fox appears. These predators have threatened platypuses ever since they were introduced to Australia by white settlers in 1855. The fox doesn't see her this time, but the platypus will need to stay alert. Two males also occupy this area and, soon enough, they begin competing for her affections. Each has spurs on its hind legs containing a potent snake-like venom. One male fights the other off and courts the female over several weeks, swimming alongside her, and occasionally biting her tail. Eventually, she reciprocates, and they swim around in circles before doing the deed. The male platypus has a penis with eccentric features like two heads and spines that aid and fertilization. Over the following week, the female constructs an extensive burrow furnished with a cozy nest. She plugs up the tunnels leading in, making them appear as dead ends to potential predators. Then, much like a reptile or bird, she lays eggs from her cloaca, a single opening that's used for both reproduction and excretion. She incubates her eggs, and as the river red gum tree blooms, her offspring hatch. Like other mammals, she feeds them milk. But unlike other mammals, she has no nipples. Instead, her milk oozes from mammary glands onto her belly, where her babies slurp it up. This pooled milk invites bacteria, but the platypus also produces potent antibacterial proteins, ensuring her newborns are safe. She continues nursing them for four months— hunting, evading the fox, and repairing her burrow all the while. By the time her young are ready to make their debut, the summer is waning. One

evening, after the female platypus returns from hunting, she finds that one nestling has already struck off on its own. A few days later, the other also leaves the borough. Soon, her young are living completely independently. And eventually they'll leave this part of the river to make homes of their own.

P79 2021-07-27 A year in the life of one of Earth's weirdest animals - Gilad Bino

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=79>)

翻译人员: Bokeh Drops 校对人员: Helen Chang 在干枯的澳大利亚的土地上一只正在寻找淡水的 雌性鸭嘴兽正在爬行。过去几年极端的干燥使河流和溪水变成了仅有的涓涓细流。她勉强活了下来并且无法繁殖。明年会因为幸运而不同吗?现在是秋天, 饱满的雨滴终于从天而降。几天之内, 鸭嘴兽找到了 河流开始捕食。她的脚蹼推进着她沿河而上, 她的防水外套为她的身体保暖。在水底, 她用她鸭子一样的嘴 来感受她的周围环境, 嘴里配备了约 40,000 个感受器。这使她能够检测到微小的信号来自玻璃虾的神经和肌肉。那些玻璃虾被她做成一顿快餐。一旦她爬回来在陆地上建造洞穴, 她以蜥蜴般的姿势蹒跚而行, 她的四肢以平行于脊椎的方式移动。鸭嘴兽有很多怪癖。作为一个单项目动物, 她是 现存的最古老的哺乳动物谱系。因此, 她有一个哺乳动物、鸟类和爬行动物的奇怪混合特征, 这反映在她的基因组中。例如, 哺乳动物通常 有一对决定性别的染色体。但是鸭嘴兽有五对, 更像一只鸟。希望她用得着。随着冬天变成春天, 她恢复了力量, 是交配的时候了。然而, 她不能在这里抚养她的幼崽。周边土地开始被砍伐, 导致河岸被侵蚀。替代方案, 她逆流而上定居在被河边的红胶树 遮蔽的清澈的深水池中。突然, 一阵沙沙声有鸟儿 从灌木丛中冲了过来, 然后一只狐狸出现了。自从这些掠食者由白人移民于 1855 年带到澳大利亚 就威胁到鸭嘴兽。狐狸这次没有看见她, 但鸭嘴兽需要保持警惕。两只雄性也占据了 this 区域, 没多久就开始争夺她的感情。每只后腿上都有刺, 含有一种强效的蛇状毒液。一只雄性把另一只雄性斗败 并在几周内向雌性求爱, 和她一起游泳, 偶尔咬她的尾巴。最终, 她回报, 在交配之前它们围着圈子游来游去。雄性鸭嘴兽的阴茎有具有古怪特征, 像两个头和脊椎, 会辅助受精。在接下来的一周里, 雌性建造了一个广阔的洞穴配有一个舒适的小窝。她堵住了通往那里的隧道, 使潜在的掠食者认为是死胡同。然后就像爬行动物或鸟类一样, 她从用于繁殖和排泄两者的 单个开口泄殖腔下蛋。她孵化她的蛋, 然后 当河边红胶树开花的时候, 她的后代孵化。像其他哺乳动物一样, 她给它们喂奶。但是和其他哺乳动物不同, 她没有乳头, 而是奶从乳腺到腹部渗出, 她的孩子们在她的腹部啜饮它。这种混合奶会滋生细菌, 但鸭嘴兽也会产生有效的抗菌蛋白, 确保她的新生幼崽安全。她继续照顾他们四个月——捕食、躲避狐狸, 并一直在修复她的洞穴。当她的幼崽们准备好它们的初次狩猎, 夏天渐渐逝去。一天傍晚, 母鸭嘴兽捕食归来, 她发现一只幼崽已经离开。几天后, 另一只也离开了。很快, 她的幼崽可以完全独立生活。最终它们会离开这片河域 去建设自己的家园。

P80 2021-07-29 Iceland's secret power - Jean-Baptiste P. Koehl

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=80>)

While the weather in Iceland is often cold, wet, and windy, a nearly endless supply of heat bubbles away below the surface. In fact, almost every building in the country is heated by geothermal energy, in a process with virtually no carbon emissions. So how exactly does this renewable energy work? Between the Earth's core and its crust is a mixed layer of solid and partially molten rock called the mantle. Temperatures here range from 1,000 to 3,500 degrees Celsius. Some of this heat comes from the radioactive decay of metals. But much of it comes from Earth's core, which has been radiating energy since the planet formed over four billion years ago. While the mantle moves slowly, circulating roughly 40 kilometers below the Earth's crust, there are places where it surges closer to the surface. Here, the magma forms pockets and veins in the ground, heating underground rivers and pools to temperatures reaching 300 degrees. Controlling heated water is at the heart of harnessing geothermal energy, and there are two primary models for how to do it. One is to build a geothermal power plant which uses these hot, deep pools to produce electricity. First, engineers drill a well several kilometers into permeable rock like sandstone or basalt. As the hot, highly pressurized groundwater flows into the well, the rapid change in pressure and temperature produces huge amounts of steam. This steam then turns the blades of a turbine to generate electricity. Finally, the remaining cooled water and condensed steam are injected back into the ground to create an open loop that provides electricity without losing water. However, we don't have to drill this deep to take advantage of the planet's heat. Thanks to solar radiation, dirt just 1.5 meters deep can reach temperatures over 20 degrees Celsius. Geothermal heat pumps pipe water or antifreeze liquid

through this layer of earth to siphon its energy. These liquids are then pumped through local infrastructure, dispersing their heat before moving back through the ground to absorb more energy. While external electricity is needed to operate the pumps, the energy provided is far greater than the energy used, meaning this process is also a sustainable loop. In fact, geothermal heat pumps are both cheaper to operate and at least two times more energy efficient than fossil fuel equivalents. Whether geothermal energy is radiating just below our feet, or heating water several kilometers deep, the planet is constantly radiating heat. Averaged across one year, Earth gives off roughly three times more energy than humanity consumes. So why does geothermal only account for 0.2% of humanity's energy production? The answer has to do with heat, location, and cost. Since geothermal heat pumps rely on the consistent heat found in shallow earth, they can be implemented almost anywhere. But geothermal power plants require tapping into high-temperature geothermal fields; regions hotter than 180 degrees and typically several kilometres underground. These high temperature zones are hard to find, and drilling this deep for just one of the several wells a plant will need can cost up to \$20 million. There are regions with shallower geothermal fields. Iceland and Japan are near active volcanoes and tectonic plate boundaries, where magma rises up through the crust. But these same factors also make those regions prone to earthquakes, which can also be triggered by intensive drilling. Furthermore, while geothermal energy is clean and renewable, it's not entirely harmless. Drilling can release vapors containing pollutants like methane and hydrogen sulfide. And drilling tools that use pressurized water can contaminate groundwater. Fortunately, new technologies are emerging to meet these challenges. Emission control systems can capture pollutants, and electromagnetic monitoring can help detect seismic risks. We're also uncovering entirely new sources of geothermal energy, like pockets of magma in mid-ocean volcanoes. So if we can safely and responsibly tap into the heat sustaining our planet, we might be able to sustain humanity as well.

P80 2021-07-29 Iceland's secret power - Jean-Baptiste P. Koehl

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翻译人员: jasmine lau 校对人员: Helen Chang 虽然冰岛的天气 总是寒冷、潮湿又多风,但在地表之下,几乎 无穷无尽的热量在蒸发。事实上,这个国家几乎 所有建筑的供暖都来自于地热能,这个过程中几乎没有任何碳排放。那么,这种可再生能源 到底是怎么回事呢?在地核和地壳之间,是一个由固态和部分熔融的岩石 组成的混合层,称为地幔。这里的温度在 1000 到 3500 摄氏度之间。其中一些热量来自金属的放射性衰变。但很大一部分来自地核,自从地球在 40 多亿年前形成,地核就不断地在辐射能量。虽然地幔活动缓慢,在地壳约 40 公里之下循环,但在有些地方,它会涌向地表。在这里,岩浆在地面中形成囊和脉,将地下河流和水池加热到 300 摄氏度。控制这些热水是利用地热能的核心,而有两种主要方法能做到这一点。其中一种是建造地热发电厂,利用这些热的深水池发电。首先,工程师会在砂岩 或者玄武岩这样的可渗透岩石上钻一口数公里的井。随着高温高压的地下水流入井中,迅速变化的压力和温度产生大量的蒸汽。然后,这些蒸汽 将带动涡轮机的叶片发电。最后,剩余的冷却水 和冷凝蒸汽被注入地下,形成一个开环,在不失水的情况下提供电力。然而,我们不需要钻这么深的孔 来利用地球的热量。多亏了太阳辐射,仅有 1.5 米深的泥土 就可达到 20 摄氏度以上。地热热泵将水或者防冻液体通过管道在这层泥土里抽取能量。然后,这些液体被泵送到 当地的基础设施中,扩散它们的热量, 然后再次在地面中穿梭吸收更多的能量。尽管运作泵需要外部电力,但从中提供的能量远远超过消耗的,这代表这个过程 也是一个可持续的循环。事实上,地热泵不仅运行成本低,它的节能性是化石燃料的两倍。无论地热能是在我们脚下放射,还是在几公里之下加热水,地球都不断地辐射能量。平均一年,地球释放的能量 大约是人类消耗的三倍。那么,为何地热能只占 人类能源生产的 0.2%呢?答案和热量、地点和成本有关。由于地热热泵依赖 来自于浅地层的持续热量,它们几乎可以在任何地方使用。但是,地热发电厂需要利用高温地热田;温度超过 180 度的地区, 也通常在地下几公里。这些高温地区很难找到,而钻这么深仅仅为了一个工厂 需要的几口井中的其中一口,就需要花费 2000 万美元。有些地区的地热田较浅。冰岛和日本临近活火山 和地壳板块的边缘,在那里岩浆从地壳中上升。但这也导致这些地区容易发生地震,而密集的钻井也会引发地震。此外,尽管地热能是干净、可再生的,它并不是完全无害的。钻井会释放出含有污染物的蒸汽,例如甲烷和硫化氢。使用高压水的钻井工具 也会污染地下水。幸运的是,新技术的出现 能够战胜这些挑战。排放控制系统可以捕获污染物,电磁检测可以帮助检测地震风险。我们也在发现全新的地热能来源,比如海洋中火山的岩浆区。因此,如果我们能够安全、 负责任地利用地球的热量,我们或许能够维持人类的生存。

P81 2021-08-03 What causes seizures, and how can we treat them - Christopher E. Gaw

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=81>)

Nearly three millennia ago, a Babylonian tablet described a curious illness called miqtu. Said to cause symptoms ranging from facial twitching to full body convulsions, the Babylonians believed those afflicted were possessed by evil spirits, and the only treatment was divine intervention. Today, we know the symptoms of miqtu by another name, and modern medicine has developed numerous treatments for those experiencing seizures. But these ancient afflictions still hold a surprising number of secrets. Doctors define a seizure as any set of symptoms resulting from excess electrical activity in the brain. Outside this shared feature, there is a massive range of seizure symptoms, and researchers have identified a variety of different seizure types. But regardless of the underlying conditions that cause them, every seizure begins here. Hippocrates identified the brain as the source of seizures around 400 BCE. However, this insight didn't immediately lead to better treatments. Generally, ancient Greeks prescribed medicinal herbs and alterations in diet. If they believed the seizure was caused by bleeding in the skull, they sometimes employed a technique called trepanation. This early surgery involved drilling a hole in the skull to let blood escape and relieve pressure on the brain. Trepanation had... sizable risks. But it wasn't until the 19th century that scientists would make the next leap forward in seizure treatment. In 1870, two German researchers discovered that using electricity to stimulate specific areas of a dog's brain could move parts of its body. Around the same time, other scientists discovered the brain and nervous system were connected via a network of cells called neurons that transmitted electrical signals throughout the body. This established the brain as the control center for nerve impulses that determine our thoughts and movement. Better yet, this model made it clear that seizures were due to errors in that control center, such as misfiring neurons or excess electrical activity. Early experiments even suggested that different patterns of misfiring could account for different seizure types and symptoms. So if seizures were due to neurons misfiring, how could doctors stop this from happening? Physicians like Sir Charles Locock hypothesized that sedative drugs might calm overactive brain activity, a theory he confirmed by treating seizures with a medication called potassium bromide. Others like Sir Victor Horsley suspected that removing damaged parts of the brain might stop a patient's seizures. In 1886, he performed a craniotomy, temporarily removing part of a patient's skull to extract scarred brain tissue. Not only did his patient survive, but his seizures improved, launching further research in surgical treatments. Over the next two centuries, seizure treatments advanced rapidly. And today, there are dozens of available seizure medications that work with unprecedented specificity. Some newer medications are able to focus on specific proteins in the neuron to help manage electrical activity. And advanced brain imaging techniques can sometimes allow doctors to pinpoint exactly what parts of the brain are causing an individual's seizures. Surgeons then use this information to perform targeted surgeries. These various treatments help doctors manage the majority of seizure cases, allowing most people with seizures to live healthy and comfortable lives. But the underlying pathology of many seizures remains elusive. In cases without clear brain damage or certain types of pre-existing conditions, it's incredibly difficult to determine what causes neurons to misfire. It's also not always clear why some treatments are effective. And even more mysterious are cases where seizures are resistant to existing treatments that work on similar seizure types. Scientists are still working on these questions, but there are clear answers for what to do if you encounter someone experiencing a seizure. You should never hold a seizing person down, put objects in their mouth, or perform CPR. Instead, try to keep the person safe from falling or bumping their head, shift them onto their side to keep airways open, and stay with them until medical help arrives.

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翻译人员: Sammi Wang 校对人员: Helen Chang 接近三千年前,一座巴比伦的石碑描述了一种名为“miqtu”的疾病。那疾病据说会引起症状 包括面部抽搐到全身抽搐,巴比伦人认为那些受苦的人 是被恶魔附身,而唯一的治疗方法是神的介入。现在我们认识的是“miqué”疾病的 另一个名字,并且现代医学已经发明出 多种治疗方法给那些经历癫痫发作的人。但这些古老的痛苦 还包含着数量惊人的秘密。医生将癫痫定义为任何一组包括大脑过度电活动症状的疾病。除了这一共同特征之外, 还存在大范围的癫痫症状,并且研究人员已经确定了 各种不同的癫痫类型。但不管是什么潜在原因导致的,每一次癫痫发作都从这里开始。希波克拉底在公元前 400 年左右 确认大脑是癫痫发作的源头。然而这一发现并没有 立即带来更好的治疗。一般来说,古希腊人 会开药方和改变饮食。如果他们认为

癫痫 是因颅骨出血引起的，他们有时会运用一种 称为钻孔的技术。这个早期手术包括在颅骨上 钻一个洞让血液流出并减轻大脑的压力。钻孔技术有... 相当大的风险。但直到 19 世纪， 科学家才在癫痫治疗方面取得了新的飞跃。在 1870 年，两名德国 研究人员发现用电刺激狗的大脑的特定区域 可以使其身体的某些部位移动。大约在同一时间，其他科学家 发现大脑和神经系统是通过一个叫做神经元的细胞网络 连接起来的，这些细胞在全身传递电信号。这使大脑成为决定我们思想和运动的神经冲动的控制中心。更好的是，这个模型 清楚地表明癫痫发作是因为控制中心的差错，像神经元失效或过度电活动。早期试验甚至表明 不同神经元失效模式可以解释不同种类的癫痫和症状。所以如果癫痫发作是因为神经元失效，医生怎么可以阻止这种情况发生？像查尔斯·洛科克爵士这样的医生假设镇静药物可能会 平息过度的大脑活动，他用一种名为溴化钾的药物治疗癫痫证实了这一理论。其他像维克多·霍斯利爵士这样的人认为切除受损的大脑部分 可能会阻止病人的癫痫发作。在 1886 年，他主刀了一项开颅手术，暂时切除了一个病人的部分头骨，以去除伤痕累累的脑组织。他的患者不仅活了下来，而且癫痫发作也得到了改善，让他在外科治疗方面 展开了进一步的研究。在接下来的两个世纪里， 癫痫治疗有了迅速发展。现在，有数十种可用的治疗癫痫药物具有前所未有的独特性。一些较新的药物能专注于 神经元中的特定蛋白质以帮助管理电运动。而先进的脑成像技术有时可以让医生精确地指出大脑的哪些部分 是导致癫痫发作的原因。外科医生利用这些信息去进行更有针对性的手术。这些不同的治疗方法 帮助医生处理大部分的癫痫病例，让大多数癫痫患者 过上健康又舒适的生活。但许多癫痫发作的潜在原因 仍然让人难以捉摸。在没有明显脑损伤 或某些类型的先决条件的情况下，很难确定是什么导致神经元失效。同时也不清楚为什么某些治疗有效。更为神秘的是有些癫痫发作病例抗拒现有的对类似癫痫发作 有效的治疗方法。科学家们还在努力解答这些问题，但对于如果你遇到癫痫发作的人 该怎么做有明确的答案 。你不应该把人放躺在地上，不要把东西放进他们的嘴里， 也不要做心肺复苏术。而是尽量不要让这个 人 跌倒或撞到头，将身体侧身保持呼吸道畅通，并陪伴他们直到医疗帮助到达。

P82 2021-08-05 The method that can 'prove' almost anything - James A. Smith

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=82>)

In 2011, a group of researchers conducted a scientific study to find an impossible result: that listening to certain songs can make you younger. Their study involved real people, truthfully reported data, and commonplace statistical analyses. So how did they do it? The answer lies in a statistical method scientists often use to try to figure out whether their results mean something or if they're random noise. In fact, the whole point of the music study was to point out ways this method can be misused. A famous thought experiment explains the method: there are eight cups of tea, four with the milk added first, and four with the tea added first. A participant must determine which are which according to taste. There are 70 different ways the cups can be sorted into two groups of four, and only one is correct. So, can she taste the difference? That's our research question. To analyze her choices, we define what's called a null hypothesis: that she can't distinguish the teas. If she can't distinguish the teas, she'll still get the right answer 1 in 70 times by chance. 1 in 70 is roughly .014. That single number is called a p-value. In many fields, a p-value of .05 or below is considered statistically significant, meaning there's enough evidence to reject the null hypothesis. Based on a p-value of .014, they'd rule out the null hypothesis that she can't distinguish the teas. Though p-values are commonly used by both researchers and journals to evaluate scientific results, they're really confusing, even for many scientists. That's partly because all a p-value actually tells us is the probability of getting a certain result, assuming the null hypothesis is true. So if she correctly sorts the teas, the p-value is the probability of her doing so assuming she can't tell the difference. But the reverse isn't true: the p-value doesn't tell us the probability that she can taste the difference, which is what we're trying to find out. So if a p-value doesn't answer the research question, why does the scientific community use it? Well, because even though a p-value doesn't directly state the probability that the results are due to random chance, it usually gives a pretty reliable indication. At least, it does when used correctly. And that's where many researchers, and even whole fields, have run into trouble. Most real studies are more complex than the tea experiment. Scientists can test their research question in multiple ways, and some of these tests might produce a statistically significant result, while others don't. It might seem like a good idea to test every possibility. But it's not, because with each additional test, the chance of a false positive increases. Searching for a low p-value, and then presenting only that analysis, is often called p-hacking. It's like throwing darts until you hit a bullseye and then saying you only threw the dart that hit the bull's eye. This is exactly what the music researchers did. They played three groups of participants each a different song and collected lots of information about them. The analysis they published included only two out of the three groups. Of all the information they

collected, their analysis only used participants' fathers' age— to “control for variation in baseline age across participants.” They also paused their experiment after every ten participants, and continued if the p-value was above .05, but stopped when it dipped below .05. They found that participants who heard one song were 1.5 years younger than those who heard the other song, with a p-value of .04. Usually it's much tougher to spot p-hacking, because we don't know the results are impossible: the whole point of doing experiments is to learn something new. Fortunately, there's a simple way to make p-values more reliable: pre-registering a detailed plan for the experiment and analysis beforehand that others can check, so researchers can't keep trying different analyses until they find a significant result. And, in the true spirit of scientific inquiry, there's even a new field that's basically science doing science on itself: studying scientific practices in order to improve them.

P82 2021-08-05 The method that can 'prove' almost anything - James A. Smith

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翻译人员: Xiwen Zhu 校对人员: Yanyan Hong 2011 年, 一组研究人员 进行了一项不可能找到结论的科学研究: 听某些歌曲可以让你变得更年轻。这项研究邀请真人参与, 采用真实有效的数据, 以及常见的统计分析。那么, 他们是怎么做到的呢? 答案就在科学家们 常用的一种统计方法, 用来检测他们的数据 是有意义的还是随机的。事实上, 这项关于音乐的研究的就是为了指出这个统计方法 有哪些被滥用的途径。一个著名的思想实验可以 说明这个统计方法: 假如你有 8 杯茶, 其中 4 杯先加了牛奶, 另外 4 杯先加了茶。参与者们必须根据口味 将这 8 杯茶分成两组, 总共有 70 个不同的方式 可以将杯子分为两组, 每组 4 个, 而只有一个方式是正确的。那么, 她可以尝出差异吗? 这就是我们的研究问题。为了分析她的选择, 我们需要建立一个原假设: 她不能分辨出这 8 杯茶。假如她分辨不出这些茶, 她仍然可以在 70 次中做一次正确选择。70 分之 1 大概是 0.014 的概率。这个数字可以称之为 P 值。许多领域中, 当 P 值等于或小于 0.05 时, 可以认为在统计学上具有显著性, 这意味着有着足够的证据可以 拒绝我们的零假设。基于 0.014 的 P 值, 他们可以推翻她无法辨别 这 8 杯茶的原假设。虽然研究人员和期刊常使用 P 值来鉴定试验结果, 但是甚至对许多科学家来说, P 值非常难理解。这是因为在原假设是正确的前提下, P 值其实只能告诉我们得到某种结果的概率。所以假如她正确地分类出这 8 杯茶, P 值代表的是 在假设她无法辨别这些茶的情况下她能正确地分类的概率。但反过来就不成立了: P 值不能代表她能够尝出来不同味道的概率, 但这就是我们想要找出的。所以当 P 值不能解答 我们的研究问题时, 为什么科学界还在使用 P 值呢? 这是因为, 虽然 P 值不能直接说明实验结果是随机的, 但它是一个可靠的指示。至少, 当它在正确使用时, 确实如此。这就是许多研究人员, 甚至整个领域会出错的地方。大多数真正的研究 都比 8 杯茶实验更加复杂, 科学家可以使用许多不同的方法 来测试他们的研究问题, 其中有一些方法可能会产生 具有统计显著性的结果, 但有些方法就不会。似乎测试每一种可能性 是一个很好的主意。但是并不然, 因为每一个附加的测试都会带来增加误报的可能性。寻找低 P 值, 然后只展示这部分的分析, 通常称为 P 值操纵。这就好比一直扔飞镖, 直到有一个击中靶心, 然后宣称你只扔了那一个 正中靶心的飞镖。这正是这项音乐研究人员做的, 他们为三组不同的参与者 放了三个不同的歌曲, 然后收集了他们的大量信息。他们发表的分析报告 只包括了三组中的两组。在所有收集的信息中, 他们的分析只使用了 参与者父亲的年龄目的是为了 “控制参与者的年龄基线”, 他们还在每 10 个参与者后暂停实验, 然后如果 P 值大于 0.05, 他们会继续试验, 但假如 P 值开始下降到低于 0.05, 他们会停止实验。他们发现听到某一首歌的参与者 会比听到另一首歌的年轻 1.5 岁, P 值为 0.04。通常很难发现是否存在 P 值操控, 因为我们不知道哪些结论 是不可能的: 实验的目的就是探索新的知识。幸运的是, 有许多容易的方法 可以让 P 值更加地可靠: 预先记录实验及分析的详细计划, 以便他人能够核查, 来确保在研究员得到重要结果前, 不会尝试更改分析方式。本着真正的科学探究精神, 甚至还有一个新领域出现, 那就是用科学研究科学: 研究不同的科学实践, 以改进它们。

P83 2021-08-10 Can you solve the giant spider riddle - Dan Finkel

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=83>)

Once every century, the world's greatest spiders gather to compete in a series of grueling games. The winner will become the next arachnomonarch, able to command all the world's spiders to their will. That day is today, and for the first time, you're casting your name into the ring. From Anansi to Arachne to Aragog, all of the titans of the spider world are here, and at first, no one even notices it'sy-bitsy you. But after wowing the crowd with your web design and sticking it to the competition in the long-distance sling, you've qualified for the finals. Now all that remains is to face off against the reigning champion, Queen

Shelob, on the Whirled Wide Web, and win the title from her. The web stretches over a large chasm, with intersecting strands coming to a single point on the other side. Moving across each strand requires a careful dash, and you must keep going until you stop at the next hub where two strands cross. By ancient spider code, only one competitor may traverse the web at a time. You must take turns, moving from one intersection to an adjacent one. No one may spin new paths into existence or skip turns. You begin two spaces from Shelob, and to win, you must catch her by your tenth move. Can you attain the mantle of spider supremacy? Pause here to figure it out for yourself. Answer in 3 Answer in 2 Answer in 1 It's tempting to trap Shelob in a corner, but doing so is surprisingly tricky. The layout of the web is such that every move you make, Shelob can get to another intersection two away from you. So even if you were to drive her into a corner, she'd escape it easily. There are no dead ends, so there's never a situation where she'd be forced to move to your space. However, there is this point up here where all the strands converge. It's easy to see that it's important, but the challenge is figuring out exactly what to do with it. There's a clever way of re-visualizing the problem: try coloring every intersection one of two colors— say red and blue— where the same color never borders itself. What you get is a checkerboard pattern, then one space at the point which you can't make either color. At the beginning of the game, every time you move to red, Shelob will be on blue, and every time you move to blue, Shelob will be on red. In other words, unless something changes, you can never move onto the same intersection as her. And that's where the point comes in. As indicated by its unique color, it's the one place you can break the pattern and change the rhythm of moves. So you should waste no time in getting up there. Shelob could now be in any one of these red spaces, and you have at most 6 moves left to catch her. But thanks to the colors we've added, we can now focus on the one thing that matters the most: changing the color pattern. Shelob is on red, so you should move onto red on the second or fourth strand. Now, Shelob can never move to any of the spots neighboring you, giving you a kind of net to use to catch her. You may have luck choosing your moves through intuition at this point. But if you want to get algorithmic about it, you could track how far away she is horizontally and vertically, as two numbers. On your move, shrink the larger of the two, and no matter which direction she runs, she'll have to hit an edge. Eventually, you'll have backed her into one of the two corners and catch up to her at the last possible moment. You snatch the ceremonial sash from your opponent and wrap it around yourself. You are now the Spider Supreme, leader of all the world's eight-legged wonders. Just remember— with great spider power comes great spider responsibility.

P83 2021-08-10 Can you solve the giant spider riddle - Dan Finkel

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=83>)

翻译人员: Ivy Jin 校对人员: Helen Chang 每一百年, 世界上所有最厉害的蜘蛛们会聚集在一起, 参加一场 非常严格的比赛。赢家将会成为下一个蜘蛛王, 它具有根据自己的意愿 指挥世上所有的蜘蛛的权利。今天就是大赛的日子, 也是你第一次参赛的日子。从阿南西到阿拉克尼到阿拉戈格, 蜘蛛界所有的巨头都来了, 而一开始, 根本就没有蜘蛛 注意到你这个小透明。但在你织的网惊艳众蜘蛛, 然后在远距离抛掷项目中表现出色后, 你获得了进入决赛的资格。最后一步就是面对上一届冠军, 尸罗皇后, 在国际蜘蛛网上 将蜘蛛王的名号赢到手。这个网挂在一个巨大的深渊之上, 交叉的网在悬崖的另一边 会逐渐汇成一个点。在每一根网上行走都要格外小心, 而且中间不能停下, 直到你到达下一个交叉点。根据古老的蜘蛛法则, 每次只能有一只参赛者在网上行动。你们必须轮流行动, 从一个交叉点挪到下一个。参赛者不可以自己织新的网, 也不能在原地不动。开始时, 你距离尸罗两个交叉点, 想赢的话, 你必须在十轮以内抓到她。你能成为最至高无上的蜘蛛吗? 在这里暂停, 自己思考一下 解决方案, 倒计时: 三二一 你想把尸罗困在角落里, 但是比想象中要困难。蜘蛛网的布局使得你每走一步, 尸罗就可以走到 距离你两个交叉点的位置。所以即使你把她困在角落里, 她也能轻易逃跑。没有死角, 所以永远不会出现她必须 挪到你的位置上的情况。不过, 这边有一个所有蜘蛛丝 汇集在一起的点。很显然, 这个点很重要, 但要怎样利用这个点呢? 重新审视这个问题有一个巧妙的方法: 先把每一个交叉点都涂上 两种颜色中的一种, 比如红色和蓝色, 而颜色不能出现相邻的情况。你获得的是一个棋盘一样的图案, 还有一个点无法涂任何颜色。在游戏开始时, 每当你挪到红色的点, 尸罗会在蓝色的点上, 而每当你挪到蓝色的点上, 尸罗就会在红色的点上。简单地说, 不出意外的话, 你永远都不可能 和她到达同一个交叉点。而这个时候, 那个最重要的绿点 就要发挥它的作用了。这个点是你唯一的突破点, 也可以利用这个点来改变 参赛者挪动的规律。所以不要浪费时间, 直接去绿点。尸罗现在可能在任何一个红点上, 而你还有六轮时间来抓住她。因为我们先前 给每个交叉点上涂了颜色, 我们现在只需要专注一件事: 改变你们所落的点的颜色规律。尸罗在红点上, 那么你应该 挪到第二根或第四根的红点上。现在, 尸罗不能挪到 和你相邻的交

又点上了，这也给了你抓住她的路线。你现在可以试着凭借直觉 选择接下来要走哪步，但如果你想通过计算来解决问题的话，你可以现在数数她横向和纵向 分别离你有多远，获得两个数字。轮到你时，先把两个数字中 较大的那个数字缩小，无论她往哪个方向跑， 她都会碰到悬崖的一面。最终，你会将她困在其中一个角落里，在最后一轮的时候抓住她。你把冠军腰带从对手手中抢来，挂在了自己身上。你现在是蜘蛛中的王者，世上所有的蜘蛛都听命于你。你要谨记，得到无上的权利的同时， 也要肩负起相当大的责任。

P84 2021-08-12 The secret society of the Great Dismal Swamp - Dan Sayers

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=84>)

Straddling Virginia and North Carolina is an area that was once described as the “most repulsive of American possessions.” By 1728, it was known as the Great Dismal Swamp. But while many deemed it uninhabitable, recent findings suggest that a hidden society persisted in the Swamp until the mid-1800’s. So, who lived there? And what happened to them? People long suspected that communities had settled in the Swamp, but the historical record was spotty. It wasn’t until 2003 that the first systematic archaeological foray finally launched. But, despite having been extensively drained over the years, the wetland still presented many practical challenges. Researchers had to penetrate thorny thickets, wade through waters studded with sinkholes, and braved the threats of dangerous animals. After several months, they finally found islands in the Swamp’s interior. These formations quickly revealed traces of centuries-old secrets. Archeologists found buried markings that appear to have been left by raised log cabins, fire pits, and basins that may have collected drinking water. They identified what seems to have been a palisade wall and excavated more than 3,000 artifacts, including weaponry, stone tools, and fragments of ceramic pipes and vessels. These discoveries, combined with previous findings, helped tell a story that reaches far back in time. Indigenous American people began regularly inhabiting or visiting the area around 11,000 BCE, before it was even a swampland. A second era of occupation began much later. In the early 1600’s, more Indigenous people came seeking refuge from colonization. And later that century, it seems that Maroons— or people escaping from slavery— began entering the area. In fact, the team’s findings support the theory that the Great Dismal Swamp was home to the largest Maroon settlement in all of North America. Because their success and survival depended on staying hidden from the outside world, these Swamp communities were largely self-sufficient. Based on primary sources, historians believe that people cultivated grains and created homes, furniture, musical instruments, and more from the Swamp’s available resources. These organic materials had probably already decomposed by the time archaeologists came to investigate. But researchers were able to find more durable objects, like ceramic and stone items that were likely left by ancient Indigenous people then reused and modified by others later on. Around the turn of the 19th century, It seems the relationship between the Swamp’s community and the outside world changed. Lumber and manufacturing companies began encroaching on the Swamp’s interior. They brought thousands of free and enslaved workers to live in the Swamp and made them harvest wood, excavate canals, and drain fields. Certain findings suggest that the Swamp’s hidden communities might have switched to a more defensive mode during this period. But researchers also observed more mass-produced objects from this time, indicating that trading was taking place. Researchers think that the secret Swamp communities dispersed during or soon after the American Civil War, by the end of which slavery was abolished in the United States. Some people may have stayed in the Swamp until they passed away or left to settle elsewhere. Most of what we know about these hidden communities has come to light after archeologists excavated sections of a single island. However, there may have been hundreds of habitable islands dotting the Swamp’s interior at the time. Between 1600 and 1860, many people lived in these hidden settlements. Some probably lived their entire lives within the Swamp and never saw a white person or experienced racial persecution in broader American society. Generations of Black Maroons and Indigenous Americans resisted slavery and colonization by creating an independent society in the heart of the Great Dismal Swamp. They fostered a refuge in what might seem like the unlikeliest of places— but one that was more hospitable than what lay outside. Today, this area offers a partial record of that secret, self-reliant world, imagined and built for survival and the preservation of freedom.

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翻译人员: 思辰 李 校对人员: Helen Chang 横跨弗吉尼亚和北卡罗莱纳有个地方曾被称为“最令人嫌弃的美国领土”到了 1728 年, 这里被称为 迪斯默尔大沼泽 (大苍凉沼泽)。尽管许多人认为这里不适宜居住, 近期的调查结果表明这个沼泽中曾经有过 一个大隐隐于市的社会, 这个群落一直延续到 19 世纪中叶。那么谁曾经生活在那里? 发生了什么事? 许久以来, 人们怀疑沼泽里有人居住, 但鲜有任何有关的历史记录。直到 2003 年, 我们才开始了 第一次系统性的考古行动。但就算附近的湿地 在过去几年逐渐干涸, 探索这片湿地依旧是个不小的挑战。研究人员需要穿越荆榛满目的树丛, 跋涉充满沟壑的水潭, 斗胆直面凶险的野兽。几个月后, 他们终于找到了 沼泽内部的小岛。这些地形立马揭露了世纪秘密的踪迹。考古学家们发现了埋藏的痕迹, 看似是垫高的小木屋、火坑和饮用水蓄水池的遗迹。他们发现了类似栅栏的建筑, 出土了 3000 多件文物, 有武器、石器, 和陶管和容器的碎片。结合过去的发现, 这些新发现完述了 一个可以溯源过去的故事。美洲原住民在大约 在公元前 11,000 年时就定期去到和暂住该区域了, 那时候这里甚至还不是沼泽。然而, 过了很久才有第二批人居住。17 世纪初期, 这里成了 更多原住民逃离外来殖民的避难所。同一个世纪的后期 似乎又有一批人涌入了这地区, 他们是马龙人, 也就是黑人逃奴。考古队的发现正巧证明了一个理论: 迪斯默尔沼泽 是北美最大的逃奴居住地。因为只有藏于外界才能生存, 沼泽里的居民基本上自给自足。第一手资料表明, 历史学家认为这些人种植谷物, 建造房屋、家具、乐器等, 最大化利用了沼泽里一切可用的资源。不过在考古学家来访之前, 这些有机材料可能早就分解了。但是研究人员有幸找到了 更结实耐久的物品: 比如陶瓷和石器, 它们似乎被古代的原住民留下, 然后经由后人改造、重新使用。即将步入 19 世纪时, 沼泽居民和外界的关系似乎发生了变化。木材和制造业公司开始进军沼泽里。他们给沼泽带来了数以千计 奴隶和自由人的工人。要他们砍伐林木、开掘河道, 还排干了田地。一些调查结果表明, 隐秘的沼泽居民们在这个时候似乎已经开始有所防备。不过因为研究人员也发现此时 有了更多大规模炮制的产品, 显示双方可能也有贸易往来。研究人员认为隐秘的沼泽居民社区四散的时间是在在美国内战期间或结束不久后, 那时美国废奴了。或许有些人留在沼泽终其一生, 或许另外的人择地迁居。在考古学家发掘出 其中一个岛屿的躯块后, 这些隐秘居民的故事终于被曝光于大众。然而, 当时的沼泽里 可能有数百个可居住的岛屿。1600 年至 1860 年间, 有许多人曾栖身在这些隐世居所。有些人甚至一辈子都在沼泽里度过, 没有见过白人, 也没有经历过 美国社会的种族迫害。一代又一代的逃亡黑人和美洲原住民通过在大沼泽的中心 建立一个独立的社会来抵抗奴隶制和殖民化。他们把自己的避难所 建立在看似最荒凉的地方, 但这地方远比外面的世界 更友好、更怡人。如今, 这个地方不完全地记录了一个秘密, 自给自足的世界, 一个为生存和自由的存续 而创造的世界。

P85 2021-08-17 How the COVID-19 vaccines were created so quickly - Kaitlyn Sadler a

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=85>)

In the 20th century, most vaccines took well over a decade to research, test, and produce. But the vaccines for COVID-19 cleared the threshold for emergency use in less than 11 months. The secret behind this speed is a medical technology that's been developing for decades: the mRNA vaccine. This new treatment uses our body's existing cellular machinery to trigger an immune response, protecting us from viruses without ever experiencing an infection. And in the future, this approach might be able to treat new diseases almost as quickly as they emerge. So how do these revolutionary vaccines work? The key ingredient is in the name. mRNA, or messenger ribonucleic acid, is a naturally occurring molecule that encodes the instructions for producing proteins. When our cells process mRNA, a part of the cell called the ribosome translates and follows these instructions to build the encoded protein. The mRNA in these vaccines works in exactly the same way, but scientists use the molecule to safely introduce our body to a virus. First, researchers encode trillions of mRNA molecules with the instructions for a specific viral protein. This part of the virus is harmless by itself, but helpful for training our body's immune response. Then, they inject those molecules into a nanoparticle roughly 1,000 times smaller than the average cell. This nanoparticle is made of lipids, the same type of fatty material that forms the membrane around our cells. But these lipids have been specially engineered to protect the mRNA on its journey through the body and assist its entry into the cell. Lastly, the final ingredients are added: sugars and salt to help keep the nanoparticles intact until they reach their destination. Before use, the vaccine is kept at a temperature of -20 to -80 degrees Celsius to ensure none of the components break down. Once injected, the nanoparticles disperse and encounter cells. The lipid coating on each nanoparticle fuses with the lipid membrane of a cell and releases the mRNA to do its work. At this point, we should note that while the vaccine is delivering viral genetic material into our cells, it's impossible for this material to alter our DNA. mRNA is a short-lived molecule that would need additional enzymes and chemical signals to even access our DNA, let alone change it. And none of these DNA altering components are

present in mRNA vaccines. Once inside the cell, the ribosome translates the mRNA's instructions and begins assembling the viral protein. In COVID-19 vaccines, that protein is one of the spikes typically found on the virus's surface. Without the rest of the virus this lone spike is not infectious, but it does trigger our immune response. Activating the immune system can be taxing on the body, resulting in brief fatigue, fever, and muscle soreness in some people. But this doesn't mean the recipient is sick—it means the vaccine is working. The body is producing antibodies to fight that viral protein, that will then stick around to defend against future COVID-19 infections. And since this particular protein is likely to be found in most COVID variants, these antibodies should reduce the threat of catching new strains. This approach offers significant advantages over previous vaccines. Traditional vaccines contain weakened versions of live viruses or amputated sections of a virus, both of which required time intensive research to prepare and unique chemical treatments to safely inject. But mRNA vaccines don't actually contain any viral particles, so they don't have to be built from scratch to safely adjust each virus. In fact, every mRNA vaccine could have roughly the same list of ingredients. Imagine a reliable, robustly tested vaccine that can treat any disease by swapping out a single component. To treat a new illness, researchers would identify the right viral protein, encode it into mRNA, and then swap that mRNA into the existing vaccine platform. This could make it possible to develop new vaccines in weeks, giving humanity a flexible new tool in the never-ending fight against disease.

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翻译人员: Helen Ji 校对人员: Yanyan Hong 二十世纪时, 多数疫苗 需要用至少十年时间来完成科研、测试和生产。但新型冠状病毒 (COVID-19) 的疫苗 在不到 11 个月内通过了紧急使用的临界点。这速度背后的秘密是数十年医学技术发展的飞跃: mRNA 疫苗。这个新治疗方式 运用我们身体里现有的细胞机器来触发免疫反应, 让我们不感染生病就能抵抗病毒。而在未来, 这个方法或许 能以发现新疾病的同等速度找到治疗方法。这个变革性的疫苗是如何运作的呢? 它的主要成分就在写在疫苗的名字里。mRNA, 或信使核糖核酸, 是个自然生成的 合成蛋白质的模板分子。当我们的细胞处理 mRNA 时, 一个叫核糖体的细胞部分将转译且复制对应的蛋白。这些疫苗里的 mRNA 使用相同的工作原理, 但科学家们用这个分子 来安全地将病毒引入人体。首先, 科学家们 把特定的病毒蛋白质模版编写到万亿个 mRNA 分子里。病毒的单独这一部分无害, 但有助于训练体内的免疫反应。他们接下来将这些分子注射到纳米药物里, 大约比普通细胞小一千倍。这些纳米药物有间脂质构成, 和我们细胞外包薄膜的 细胞间脂质为相同材质。但在这些间脂质受过特殊加工, 用来保护 mRNA, 让它完成在体内行程且协助它进入细胞。到最后, 加入剩下的成分: 糖与盐, 用来保持纳米药物完好无缺, 直到它们地抵达目的地。在使用前, 疫苗需保存在 零下 20 到 80 摄氏度的环境下, 以防其中任何成分的失效。一旦注射至体内, 这些纳米粒子 会扩散并与细胞相遇。每一个纳米粒子的间脂质 将与细胞间脂质结合并通过释放 mRNA 来实现免疫。此刻值得一提: 虽然疫苗将病毒遗传物质输送进我们身体里, 这个物质不可能更改我们的基因。mRNA 分子寿命很短, 并需要其他的酶和化学信号 才能接触到我们的基因, 更别提更改它了。mRNA 疫苗里也不包括 任何一个修改基因的部分。一旦进入细胞, 核糖体将转译 mRNA 的指令并开始组装病毒蛋白质。新冠疫苗含有的蛋白是 病毒表面的刺突蛋白。少了剩下的病毒, 一个刺突蛋白没有感染力, 但是能触发我们的免疫反应。激活免疫系统会消耗体力, 给一些人带来短期疲劳、发烧, 和肌肉酸痛的反应。但这不代表接种者生病了——代表着疫苗生效了。身体生产着抵抗病毒蛋白的抗体, 能持续在身体里抵抗 未来的新冠感染。由于这个蛋白很可能 在多种变异株上出现, 这些抗体应当减少 感染变异株的威胁性。这个手段比起原先的疫苗 有明显的优势。传统疫苗含有削弱的活病毒或肢解病毒的一部分, 两个都需要耗时间的研究来生产及特殊的化学处理方式 才能安全接种。可 mRNA 疫苗本身 不含有任何病毒颗粒, 所以为了安全加工每个病毒, 它们不需要每次都从零开始。实际上, 每支 mRNA 疫苗 都有相似的成分表。想象一下, 即可信又稳健的疫苗, 只需要更改一种成分就能医治任何一种疾病。治疗新兴疾病时, 研究员们 要找到合适的病毒蛋白, 改写编辑到 mRNA 里, 再把那个 mRNA 替换到 现有的疫苗载体内。这样就使得数周内 研制出新的疫苗成为可能, 为人类在与疾病的无止境战斗中 提供灵活的新方法。

P86 2021-08-24 How we can detect pretty much anything - Hélène Morlon and Anna Papad

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=86>)

For years, scientists have been staking out this remote forest in Montana for an animal that's notoriously tricky to find. Camera

traps haven't offered definitive evidence, and even experts can't identify its tracks with certainty. But within the past decades, researchers have developed methods that can detect even the most elusive species. And so, in 2018, these scientists took a sample from some conspicuous snow tracks. Lab tests showed conclusive results: the Canada lynx was indeed present in the area. Without seeing the cat, scientists had proof it was there because of environmental DNA or eDNA. Using a technique called DNA metabarcoding, researchers can take a sample from the environment and learn which organisms are in it or have recently passed through it. The world is covered in DNA. It's all around us—on the ground, at the bottom of the ocean, and up in the clouds. Multicellular organisms are constantly shedding cells. But until recently, eDNA wasn't very useful to us. Traditional scientific techniques couldn't parse environmental samples containing mixed genetic material from multiple species. But DNA metabarcoding can. DNA begins to degrade once it's exposed to the environment. In the ocean, for example, it may only persist for a few days. So in many contexts, eDNA is useful for telling us about the recent past. The process of DNA metabarcoding starts with an environmental sample like a core of soil, a vial of water, some feces, an insect trap, or even the blood from leeches' stomachs. Researchers then sift out everything aside from DNA by blending the sample up and using enzymes that break down cellular proteins and release DNA, which they purify. The result is a "soup" of all the DNA in the sample. Scientists then apply the polymerase chain reaction or PCR, which uses artificial DNA strands called universal primers. These primers bind to DNA sequences that are similar across species, then amplify genetic barcodes that are species-specific. High-throughput sequencing then reads millions of these DNA fragments, simultaneously. And finally, researchers compare them to reference databases and identify how many and which species are present—or if they've found entirely new ones. This method has led to the discovery of tens of thousands of species over the past decade. While metabarcoding can detect elusive animals like the Canada lynx, it can also help scientists identify invasive species. In Yosemite, researchers used eDNA to track and remove invasive bullfrogs. Once no trace of these amphibians remained, they reintroduced a threatened native species, California red-legged frogs, which had disappeared from the area some 50 years prior. Likewise, DNA metabarcoding can be used to monitor biodiversity. For example, using traditional approaches, categorizing all of the insects in a hectare of rainforest can take decades. But DNA from insect traps could yield these results in just a few months. One study compared insects from adjacent forest and plantation sites within China's Yunnan province. It quickly found that not only were plantations less diverse, but deforestation affected insect groups unequally. Grasshoppers thrived in cleared areas while specialist forest beetles declined. Using eDNA, scientists are able to investigate complex ecosystem interactions. Tracking thousands of insects as they visit flowers is impossible. Instead, researchers can study the DNA left on flowers and insects to map pollination networks. Before these techniques were available, we didn't really know how much pollination was happening at night because we couldn't observe it. Now scientists understand that moths are important nocturnal pollinators. eDNA can even tell stories of long extinct species. Cold, dry, and low oxygen conditions are perfect for preserving genetic material. By digging deep into the Arctic permafrost, researchers found 50,000 year old DNA, which they matched to the nutrient-rich plants found in the stomachs of woolly mammoths. With eDNA, they also found that less nutritious grasses colonized the Arctic steppe during the last ice age, potentially contributing to the mammoth decline. As we face another period of climate change—this time due to human activities—understanding our planet's rapidly shifting biodiversity will be crucial to protecting it. Fortunately, eDNA and metabarcoding give us the tools to document rapid change in real time.

P86 2021-08-24 How we can detect pretty much anything - H       Morlon and Anna Papad

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=86>)

翻译人员: ye liu 校对人员: Helen Chang 多年以来,科学家们一直致力于在蒙大拿州的这片偏僻的森林里追踪一种难以寻觅的动物。红外相机的拍摄并不能提供确切的证据。甚至连相关专家也无法确定它的踪迹。然而在过去的几十年里,研究者们已经开发出了许多监测那些最为神出鬼没的物种的方法。因此在2018年,这些科学家们从那些显而易见的雪地足迹中提取了相关样本。检测的结果确切地表明:加拿大猞猁的确曾在这片区域内活动。在没有肉眼观测到其出现的情况下,科学家们仍能断定它的存在,归功于环境DNA,也就是eDNA。通过使用DNA复合条形码这技术,研究者们可以通过检测从环境中所收集到的样本,进而得知该样本中包含哪些物种或是近期哪些物种经过此地。世界上遍布着DNA。到处都是,在陆地上,深海里,还是云霄之上,都存在。多细胞生物的细胞不断地脱落。但是环境DNA直到最近方为我们所用。传统的技术无法解析环境的样本,如果样本混合了多种生物的遗传物质。幸运的是,“DNA复合条形码”可以帮我们解决这个难题。一旦暴露在环境中,DNA会自行开始降

解。例如，在海洋中，只需几天时间就降解了。因此，在多数情况下，环境 DNA 对我们了解近期活动起到十分重要的作用。在使用 DNA 复合条形码之前，我们需要收集相关环境样本。像是一份核心土壤，一小瓶水，一些排泄物，一个捕虫器，甚至是来自水蛭胃里的血液 都能作为很好的样本。研究者接着混合样本，排除里头不是 DNA 的物质。用酶分解细胞中的蛋白质释出 DNA，将其纯化。最终得到一份包含所有 DNA 样本的“汤”。接着科学家们应用聚合酶链式反应，简称 PCR，使用一种被称为通用引物的人工合成 DNA 链。这些引物会结合不同物种间相似的 DNA 序列，然后扩增出具有物种特异性的基因条形码。高通量测序随即读取 数以百万计 DNA 片段的信息，并行运作。最后，研究者们会将这些信息 与参考数据库中的数据进行比较，辨识出有多少已知的存在物种，抑或发现了全新的物种。这个方法已帮助我们发现了数以万计的物种，在过去的十几年中。DNA 复合条形码不仅可以帮助科学家 监测像加拿大猞猁这样行踪不定的动物，也帮助科学家识别那些入侵的物种。在优胜美地国家公园，研究者用环境 DNA 来追踪和清除入侵的牛蛙物种。一旦这些两栖动物的踪迹不复存在，他们重新引入一种已濒临绝种的 本地物种，加州红腿蛙。该物种在大约 50 年前从该地区消失了。同样地，DNA 复合条形码 还能用于监测生物多样性。例如，若是使用传统的方法来对一公顷左右雨林中的所有物种分类， 可能会需要耗费长达数十年的时间。但是用来自昆虫诱捕器的 DNA 仅需几个月就可以收获结果。目前，已有一项研究比较邻近森林 和种植园内昆虫物种的不同，地点在中国云南省内。研究很快发现，不仅种植园内的多样性较差，而且毁林对不同的昆虫种群有着不同的影响。蚱蜢可以在清理过的区域内茁壮成长， 而森林甲虫的数量却在逐渐下降。通过使用环境 DNA，科学家们能够调查复杂的生态系统之间的相互作用。想要追踪数以千计接近花朵的昆虫几乎不可能。取而代之，研究者可以通过检测 留在花和昆虫身上的 DNA，进而绘制它们授粉的网络图。未有这些技术之前，我们并不清楚 有多少夜间授粉活动，因为我们无法直接观察。如今科学家已能确定飞蛾种群 是十分重要的夜间传粉者。环境 DNA 甚至可以告诉我们 关于那些早已灭绝的物种的故事。寒冷，干燥和低氧的环境 是保存遗传物质的完美条件。通过深入挖掘北极的永久冻土层，研究人员发现了大约 5 万年前的 DNA 物质，发现其与具有极高营养价值的植物匹配，是在长毛象胃中发现的（植物）。通过环境 DNA，研究者还发现那些缺乏营养价值的草在最后一个冰河时期内于北极草原上肆意生长，极可能加速了长毛象种群数量的减少。鉴于我们正处于另一个气候变化的阶段，而这一次却是由于人类活动所造成，了解我们地球生物多样性正快速改变将会是后续保护它的关键。值得庆幸的是，环境 DNA 和 DNA 复合条形码赋予了我们实时记录变幻莫测的生物多样性的能力。

P87 2021-08-26 Is this the most successful animal ever - Nigel Hughes

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=87>)

A procession of segmented creatures moves across the sea floor. Up ahead, hundreds have begun shedding their exoskeletons and piling on top of one another in what appears to be... a massive orgy. But this is not some alien world. It's Earth about 500 million years ago, when these creatures, called trilobites, prospered. Prevailing for around 270 million years and encompassing more than 20,000 distinct species, trilobites are some of the most successful lifeforms in Earth's history. When they sprung into existence, they were among the most diverse and sophisticated organisms Earth had yet seen. And, as the earliest known animals with complex eyes, trilobites had a unique perspective on the ancient world. For almost all of Earth's history before the rise of the trilobites, life had mostly consisted of microscopic marine organisms. But then, scientists think an increase in oxygen allowed multicellular lifeforms to extract more energy from their food and perform more complex functions. This then enabled the rise of carnivores, which in turn spurred a productive arms race, resulting in what's known as the Cambrian explosion. Within about 20 million years, life had branched out to include most of the animal groups we know today. Trilobites were an important part of this surge. All trilobites had three lengthwise lobes, but building off the same basic components, they varied greatly. Species ranged in length from a few millimeters to almost one meter and some were equipped with intriguing ornaments. As a result, they filled many distinct niches over the ages. Many trilobites plowed or burrowed into the sea floor while others swam freely. Certain species had spines, horns, and even protruding tridents. And their social behavior was complex: they came together to search for food, find safety in numbers, migrate and mate. In fact, their fossilized conga lines represent some of the first evidence of animal group behaviour. Like modern arthropods, trilobites had compound eyes composed of many tiny lenses. But theirs were made of the mineral calcite, which also constituted their exoskeletons. These lenses allowed trilobites to form sharp images and quickly sense changes in light. Some had long eye stalks that helped them peep above the muddy sea floor as they burrowed beneath. Others had large dragonfly-like eyes that they probably used to scour the ocean bottom as they swam upside-down in dim waters. And some trilobites had pillar-like eyes that may have

offered 360 degree views, along with structures that provided shade from overhead light. Yet despite their dominance of the seas, trilobites were vulnerable to environmental changes and predators. About 444 million years ago, Earth cooled and sea levels dropped, radically changing some of their habitats. This was the beginning of what would prove to be the trilobite's long demise. Some 20 million years later, fish with jaws began sweeping the sea. Trilobites developed spiky ornamentation and neat ways of locking their joints shut. Many species could curl themselves into balls, entirely sealing their soft parts inside their hard exoskeletons. Then, another extinction event shook the world. Trilobite diversity dwindled, and come about 360 million years ago, only one of the 10 former trilobite orders remained. Finally, rapid climate change spurred the greatest known mass extinction event in Earth's history. This catastrophic period finished the trilobites off— along with approximately 96% of all marine species. But trilobites left a remarkable record behind. Their calcite exoskeletons made for hardy fossils that would remain intact for hundreds of millions of years to come. We've found trilobite fossils on every single continent— many in unlikely environments that were once part of the ocean floor. Trilobites have no direct descendants, but their evolutionary cousins are alive and well. And since arthropods make up over 80% of current animal species, we might say that, although Earth may no longer be the planet of the trilobites, their distant relatives still reign supreme.

P87 2021-08-26 Is this the most successful animal ever - Nigel Hughes

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翻译人员: Yue Zhang 校对人员: Yanyan Hong 一队节肢动物正在海底爬行, 前方, 上百个节肢动物 已经开始蜕去它们的外骨骼, 堆在彼此身上, 就像是—— 一场大型狂欢会。但这可不是外星世界, 而是 5 亿年前的地球。那时, 这些叫三叶虫的动物处于繁盛期。三叶虫在地球上 存在了大概 2.7 亿年, 包含 2 万多个不同的物种, 是地球史上最成功的生物之一。自它们诞生起, 它们是地球上迄今为止所见过的最多样、最复杂的生物之一。同时, 作为已知最早的有复眼的动物, 三叶虫看古世界有着独特的视角。三叶虫兴起之前, 地球历史上绝大部分生命体由海洋微生物构成。但之后, 科学家认为 氧气的增加使多细胞生物从食物中吸取更多的能量, 并执行更复杂的功能。这使食肉动物得以兴起, 反过来又刺激了一场生产性的军备竞赛, 造成了人们所称的寒武纪生命大爆发 (Cambrian Explosion)。约在 2000 万年内, 生命进行扩展, 已囊括 我们如今所知的大多数动物群体。在这次激增中, 三叶虫十分重要。所有的三叶虫都有三块纵向叶片, 但建立在相同的基本组件上, 三叶虫的种类大相径庭。不同种的长度区间为几毫米到近一米, 有的身上还带有有趣的装饰。所以它们在那些年代里 填充了许多不同的生态龛。许多三叶虫犁入或钻进海底, 其他三叶虫则自由游动。某些品种有刺、角, 甚至突出的三叉戟。它们的社交行为也很复杂: 大量聚集在一起觅食、 寻找安全的地方、迁移并繁衍。实际上, 三叶虫的化石康加线 (conga lines) 体现了动物存在集体行为的最早证据。像现代的节肢动物一样, 三叶虫的复眼 由许多小型的晶状体组成。但它们的复眼是由矿物方解石制构成的, 同时构成三叶虫外骨骼的物质。通过晶状体, 三叶虫得以看到清晰的图像, 迅速感知到光的变化。有些三叶虫有长长的眼柄 帮助它们在钻进泥泞海底的时候探视海床上方。另一些则有蜻蜓般的大眼睛, 这样在昏暗的水域中倒立游动时, 它们或许能用眼睛来搜索海底。有的三叶虫眼睛则呈柱状, 能提供 360 度的视野, 它们还具有遮挡头顶光线的结构。但即便在海洋中占主导地位, 三叶虫容易受环境变化影响, 且易被捕食者捕获。约 4.44 亿年前, 地球降温, 海平面下降, 三叶虫的栖息地遭到急剧变化。这也被证实是三叶虫长期消亡的起点。大概 2000 万年后, 海里开始充满长有下颚的鱼类。三叶虫的装饰部位长出尖刺, 用妙招让鱼的下颚紧闭。许多种类可以将自己卷成球状, 外骨骼完全封住柔软部位。接下来, 另一灭绝事件震惊了世界。三叶虫的多样性逐渐减少, 先前三叶虫等级有十个, 而在约 3.6 亿年前, 仅剩一个。最终, 快速的气候变化刺激了地球史上已知的最大规模灭绝事件。这个灾难性时期导致了三叶虫——以及约 96% 海洋物种的灭亡。但三叶虫留下了非凡的记录。它们的方解石外骨骼变成坚硬的化石, 在未来数亿年内可完好无损地保存。我们在每片大陆上都发现了三叶虫化石, 曾经属于海底但不太可能 存在化石的环境中也找到了许多。三叶虫没有直系后代, 但它们进化的表亲生存得很好。既然在目前动物物种中, 节肢动物的占比高于 80%, 我们可以说, 尽管地球或许不再是三叶虫的星球, 但它们的远亲仍享有至高的地位。

P88 2021-08-31 The infamous overpopulation bet - Simon vs. Ehrlich - Soraya Field Fi

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=88>)

In 1980, two American professors bet \$1,000 on a question with stakes that couldn't be higher: would the earth run out of

resources to sustain a growing human population? One of them was Stanford biologist Paul Ehrlich, who wrote the bestselling 1968 book, “The Population Bomb.” The global population had grown rapidly since World War II, and Ehrlich predicted that millions would starve to death as the population increased faster than the food supply. He drew from the ideas of 18th century economist Thomas Malthus and related work from the 20th century. Malthus had posited that population growth, if unchecked over time, would always outpace food supply. Through the 1970s, it seemed like Ehrlich was right: famines, pollution, and political unrest had many concerned that humanity was on the brink of such a crisis, and some governments considered and even implemented policies to limit population growth. Betting against Ehrlich was Julian Simon, a professor of business and economics. He analyzed historic data from around the world, and found no correlation between a growing population and a decrease in standards of living—in fact, he found the opposite. He argued that Ehrlich’s work, and that of Malthus before him, was based on theoretical calculations, while the real-world data told a different story. But then, he departed from the data himself, claiming human ingenuity would always find alternatives to compensate for diminishing resources. If that seems overly optimistic to you, well, you’re not alone. Ehrlich and other experts found Simon’s claims preposterous. In June 1980, Simon wrote a scathing article for Science Magazine that incited a heated debate of published articles between the two men. Simon said he should have placed a wager against Ehrlich years before, when Ehrlich ventured that, “England would not exist in the year 2000.” Later that year, Simon called Ehrlich a false prophet and challenged him to a bet. Their feud also touched on the debate about whether to prioritize environmental protections or economic growth, a key issue in the American presidential race between Jimmy Carter and Ronald Reagan. After some debate, they set the final terms: \$200 on the price of each of five metals. If the price of the metal decreased or held steady over the next decade, Simon won. If the price increased, Ehrlich won. Wait, what? Weren’t we talking about overpopulation and famine? What could the price of metals possibly have to do with that? Well, the reality is that the price of metals may not have been the best choice—many factors impact these prices that have nothing to do with overpopulation. But their reasoning was as follows: metals are finite natural resources used in all sorts of manufacturing. Ehrlich believed a growing population would consume such finite resources, and scarcity would drive the prices up. Simon thought humanity would find substitutes for the metals, and the prices would stay stable or even decrease. So, what happened? The world population continued to increase over the next 10 years, but the price of all five metals decreased, making Simon the clear winner of a bet that may not have been a great proxy for the question they were debating, anyway. As for the question itself, today, their focus on overpopulation represent a snapshot of history. Our understanding of what causes starvation and famine has progressed: we have the resources to support a growing human population, but we’re currently failing to distribute those resources equitably, and changing that should be our priority. And we no longer see population size as a primary cause of environmental degradation and climate change, or limiting population growth as a viable solution to these problems. Rather, experts largely agree that our focus should be on replacing unsustainable technologies and practices with sustainable ones, and that economic growth and environmental protections don’t have to be at odds. In October 1990, Julian Simon received a check from Paul Ehrlich. There was no note.

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翻译人员: Shuhui Huang 校对人员: Helen Chang 1980 年, 两个美国教授 打了个 1000 美元的赌而赌约事关重大赌的是地球会不会 因为人口过剩而耗尽资源其中一位教授是斯坦福的 生态学家保罗·埃利希他撰写了 1968 年的 畅销书《人口爆炸》自从二战结束 全球人口一直在快速增长埃利希预测, 数百万人 将会因为粮食供给跟不上人口增长速度而饿死他的想法来自于十八世纪的 经济学家托马斯·马尔萨斯和一些二十世纪的相关著作马尔萨斯认为如果不加以控制人口增速总是会比粮食产量快在 70 年代看似埃利希正确饥荒、污染、政治斗争都让人感到危机即将爆发有些政府衡量甚至执行了限制人口的政策和埃利希打赌的是朱利安·西蒙一位商业经济学教授他分析了各个国家的历史数据得出人口增长和生活质量下降是没有必然联系的事实上, 他的结论是相反的他反驳埃利希以及之前的马尔萨斯基于理论计算而真实数据的结果是不一样的然而, 他后来的理论也脱离了数据认为人类的智慧总是会找到办法以弥补资源的减少不只是你觉得这过于乐观埃利希和其他专家 都觉得西蒙的观点很荒唐 1980 年 6 月, 西蒙投稿科学杂志写了一篇很尖刻的文章两个人随之开始激烈地 发表文章驳斥对方西蒙说他早该在几年前 就与埃利希打赌那时埃利希大言不惭地说“英格兰到 21 世纪将不复存在”那一年稍后, 西蒙公开宣称 埃利希是一个假预言家并挑战他打一个赌他们的争执也恰好与当时是环境还是经济为先的讨论不谋而合这是当时竞选总统的 吉米·卡特和罗纳

德·里根辩论的重要话题经过一番辩论，两人最终商定：赌五种金属的价格，各两百美元如果金属的价格十年后下降或不变则西蒙赢如果价格上升，则埃利希赢啥？我们不是再说人口过剩和饥荒吗？和金属价格有什么关系？其实，金属的价格 可能的确不是最好的选择因为金属价格会受很多 与人口无关的因素影响但他们的理由如下：金属是有限的自然资源而且是各种工业生产的必需品埃利希相信人口增长会导致资源稀缺并使价格上涨而西蒙认为人类会找到 金属的替代资源所以价格不仅不涨，甚至还会跌所以，结果是什么呢？之后的十年，世界人口持续增加但这五种金属矿物的价格却都下跌了所以西蒙完胜虽然金属价格对他们辩题来说可能并不是一个好的衡量标准再回到人口过剩的问题他们的论点其实展现了我们过去的认知我们对导致饥荒原因的理解有所进展：虽然我们拥有足够的粮食但我们的问题在于没有公平分配这是我们要优先解决我们也不再认为环境恶化、 气候变化的主要原因是人口数量了也不再觉得限制人口是解决办法业界专家已达成共识，我们应该注重开发可以持续的新能源 来替代旧的不可再生能源经济发展和环境保护也并不一定对立 1990 年 10 月朱利安·西蒙 收到了一张来自保罗·埃利希的支票没有附言

P89 2021-09-02 What is MSG, and is it actually bad for you - Sarah E. Tracy

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In 1968, Dr. Robert Ho Man Kwok felt ill after dinner at a Chinese restaurant. He wrote a letter detailing his symptoms to a prestigious medical journal, pondering whether his illness had resulted from eating monosodium glutamate— also known as MSG. Kwok's connection between his headache and this common seasoning in American Chinese cuisine was just a hunch. But his letter would dramatically change the world's relationship with MSG, inspiring international panic, biased science, and sensationalist journalism for the next 40 years. So what is this mysterious seasoning? Where does it come from, and is it actually bad for you? MSG is a mixture of two common substances. Sodium, which is well-established as an essential part of our diet, and glutamate, a very common amino acid found in numerous plant and animal proteins. Glutamate plays a key role in our digestion, muscle function, and immune system. Around the time of Dr. Kwok's letter, it had been identified as an important part of our brain chemistry. Our body produces enough glutamate for all these processes, but the molecule is also present in our diet. You can taste its signature savory flavor in foods like mushrooms, cheese, tomatoes, and broth. Chasing this rich flavor is what led to MSG's invention in 1908. A Japanese chemist named Dr. Ikeda Kikunae was trying to isolate the molecule responsible for a unique flavor he called "umami," meaning "a pleasant, savory taste." Today, umami is recognized as one of the five basic tastes in food science. Each basic taste is produced by unique molecular mechanisms that can't be replicated by combining other known tastes. In the case of umami, those mechanisms arise when we cook or ferment certain foods, breaking down their proteins and releasing amino acids like glutamate. But Ikeda found a savory shortcut to producing this chemical reaction. By isolating high quantities of glutamate from a bowl of noodle broth and combining them with another flavor enhancer like sodium, he created a seasoning that instantly increased the umami of any dish. The result was a major success. By the 1930s, MSG was a kitchen staple across most of Asia; and by the mid-20th century, it could be found in commercial food production worldwide. So when Dr. Kwok's letter was published, the outrage was immediate. Researchers and citizens demanded a scientific enquiry into the popular additive. On one hand, this wasn't unreasonable. The substance hadn't been tested for toxicity, and its health impacts were largely unknown. However, it's likely many people weren't responding to a lack of food safety regulation, but rather the letter's title: "Chinese Restaurant Syndrome." While MSG was commonly used in numerous cuisines, many Americans had longstanding prejudices against Asian eating customs, labeling them as exotic or dangerous. These stigmas fueled racially biased journalism, and spread fear that eating at Chinese restaurants could make you sick. This prejudiced reporting extended to numerous studies about MSG and umami, the results of which were much less conclusive than the headlines suggested. For example, when a 1969 study found that injecting mice with MSG caused severe damage to their retina and brain, some news outlets jumped to proclaim that eating MSG could cause brain damage. Similarly, while some studies reported that excess glutamate could lead to problems like Alzheimer's, these conditions were later found to be caused by internal glutamate imbalances, unrelated to the MSG we eat. These headlines weren't just a product of prejudiced reporters. Throughout the late 60s and early 70s, many doctors also considered "Chinese Restaurant Syndrome" to be a legitimate ailment. Fortunately, today's MSG researchers no longer see the additive in this discriminatory way. Recent studies have established the vital role glutamate plays in our metabolism, and some researchers even think MSG is a healthier alternative to added fat and sodium. Others are investigating whether regular consumption of

MSG could be linked to obesity, and it is possible that binging MSG produces headaches, chest pains, or heart palpitations for some people. But for most diners, a moderate amount of this savory seasoning seems like a safe way to make life a little tastier.

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翻译人员: Xiaowen Wang 校对人员: Helen Chang 1968 年, 郭浩民医生在中国餐厅 吃过晚餐之后感到不适。他写信给一份很有名望的 医学期刊详述他的症状, 怀疑他的不适是不是因为 吃了麸胺酸钠, 又名味精。郭医生把他的头痛和这种 美式中餐中常见的调味料联系起来只是一种直觉。但他写的这封信却极大程度上 改变了全世界对味精的看法, 引发了国际恐慌 和有失偏颇的科学研究以及耸人听闻的新闻报道, 长达 40 年之久。这种神奇的调味料究竟是什么? 它从哪儿来, 对人体 又是否真的有害呢? 味精是由两种简单分子构成的混合物。一种是钠, 它被公认为我们饮食中不可或缺的一部分, 另一种则是谷氨酸, 一种非常常见的氨基酸存在于多种动植物蛋白质中。谷氨酸对人体消化和肌肉功能以及免疫系统都至关重要在郭医生发表信件的时代, 谷氨酸被认为是 大脑化学的重要组成部分。谷氨酸作为机能必需, 除了会被人体产生以外, 还存在于我们的日常饮食中。你可以在食物中尝出 它标志性的可口味道, 比如蘑菇, 芝士, 西红柿和肉汤里。正是为了追求这种浓郁的口感, 在 1908 年人们发明了味精。一位名为池田菊苗的日本化学家尝试分离这种具有独特风味的分子, 他称之为“umami”, 意为“一种美妙的鲜味”现在, 鲜味已被认定为 食品科学五大基本味觉之一。每一种基本味觉都是由独一无二的分子机制产生的无法通过结合其他已知味觉来复制。对于鲜味来说这些分子机制产生于 我们烹饪或发酵某些食物时食物中的蛋白质被破坏, 从而产生了谷氨酸等氨基酸。但是池田找到了一条 诱发这种化学反应的捷径。通过从一碗面汤中分离出大量谷氨酸并将其和另一种 风味增强剂结合, 例如钠, 池田发明了一种调味品, 能瞬间从任何一盘菜里调出鲜味来。这一发明取得了重大成功。到 20 世纪 30 年代, 味精成为了 亚洲大部分地区的厨房必备品; 而到了 20 世纪中期, 在全世界的商业食品生产中 都能找到味精。所以当时郭医生的信立刻引燃了众怒。研究学者和普通百姓 都要求进行一次科学调查矛头直指这种流行的添加剂。一方面, 这种诉求并不无理。此前味精并未经过毒性测试, 而它对于健康的影响也基本未知, 然而, 大部分人可能并非是在针对食品安全监管的匮乏, 而是那封信的标题: “中餐馆综合征”。尽管味精在许多菜系中普遍使用, 许多美国人长期以来 对亚洲的饮食习惯持有偏见, 认为它们是外来的, 是危险的。这些污名助长了 带有种族偏见的新闻报道, 并营造了一种在中餐馆就餐 会使人生病的恐惧。这种怀有成见的报道延伸到 许多关于味精和鲜味的研究, 这些研究的结果远没有 新闻头条所说的那么有说服力。例如, 一项 1969 年的研究显示 将味精注入小鼠体内会对它们的视网膜和大脑 构成严重伤害, 一些新闻媒体便贸然断定 食用味精会造成脑损伤。同样, 虽然一些研究发现过量的谷氨酸可能会引发阿兹海默症等疾病, 但后来发现这些症状是由 体内谷氨酸盐不平衡所导致的, 与我们食用的味精没有关系。这些新闻头条不仅只是 有偏见的记者们的作品。从 60 年代末一直到 70 年代初, 许多医生也认为“中餐馆综合征”确实是一种疾病。幸运的是, 现在的味精研究学者们 不再用有色眼镜看待这种添加剂。最新研究明确了谷氨酸 在人体新陈代谢中所起的关键作用, 一些学者甚至认为味精是一种更健康的选择而不是添加脂肪和钠。另一些学者在研究适量食用味精是否会导致肥胖, 对一些人而言, 大量食用味精可能会造成头痛胸痛、心悸等症状。但对大部分食客来说, 适量使用这种调味品似乎是一种能使生活 更有滋有味的安全方式。

P90 2021-09-07 The rise and fall of the Lakota Empire - Pekka Hämmäläinen

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=90>)

In 1776, a powerful empire was born in North America. The Lakotas had reached the Black Hills, the most sacred place and most coveted buffalo hunting grounds in the western plains. Located in what is now South Dakota, control of the Black Hills, or Paha Sapa, marked the Lakotas as the dominant power in the American West. Just a few decades before, they were vying for power in the eastern woodlands— and losing. One of seven nations, or seven council fires, that made up the Sioux Alliance, the Lakotas had lived in the forests and wetlands between the Great Lakes and the Missouri Valley for centuries. In the 1600s, European colonizers destabilized this region. While some tribes profited by trading furs with new France, the Lakotas lived just out of range of the best trade opportunities. So in the early 1700s, they turned their attention west. The western plains were much less fertile and abundant than the Lakotas' homelands. The only easy access to food and water was immediately

alongside the rivers—land Arikaras had already claimed. To compete, the Lakotas became skilled buffalo hunters and warriors on horseback. They conquered the farming Arikaras, forcing them to pay tributes of maize and squash. When the Spanish arrived expecting to find lucrative trading grounds, they had to pay tolls to the Lakotas instead. In 1804, a new spectacle came floating up the Missouri River: Merriwether Lewis and William Clark. Lakota chief Black Buffalo refused to let them pass until they paid a hefty tribute. In spite of this rocky start, the expedition marked the beginning of a close trade alliance between the Lakotas and the United States. Lakota men hunted buffalo, while women processed the hides into robes for trade. The US government supplied guns, ammunition, and other goods, even providing Lakotas with smallpox vaccines that protected them from the deadly epidemics that ravaged other Native American nations. On paper, the United States had acquired the Lakotas' lands from France in the Louisiana Purchase. But the Lakotas would not cede their lands because of an agreement between two foreign powers. Though there were 15,000 Lakotas and 23 million Americans, the bulk of US population and military might was concentrated on the east coast. Just getting an army to Lakota territory presented a huge expense, and once there they would face formidable warriors with deep local knowledge and alliances. To avoid a war it couldn't afford and wouldn't win, the US government attempted to appease the Lakotas, paying steep tributes of ammunition and rations demanded by Lakota leaders. So while almost all the Native Americans in North America were being forced off their lands and onto reservations, the Lakota Empire was still expanding. By 1850, they controlled some 500,000 square kilometers. They were spread thinly across this vast area, moving their villages in pursuit of Buffalo. Though there was no central authority, the leaders of bands, or oyates, came together at annual Sun Dances to strategize and coordinate complex diplomatic operations. Lasting a few weeks each summer, Sun Dances were spiritual ceremonies that reaffirmed communal ties, appeased Wakan Tanka, the Great Spirit, and kept the world in balance. Starting in 1849, the California gold rush brought hordes of white settlers west, encroaching on Lakota territory and disturbing the buffalo herds. Lakota leaders correctly interpreted this migration as a signal that the US no longer intended to respect their claim to the land. In retaliation, they attacked wagon trains and government offices. As the conflict grew, Chief Red Cloud negotiated in Washington DC. While back in Lakota territory, chiefs Sitting Bull, Crazy Horse, and others prepared for battle. They mobilized their Cheyenne and Arapaho allies and almost all the other Sioux nations against the US. In 1876, exactly 100 years after the Lakotas' arrival, gold prospectors occupied the sacred Black Hills. For many Lakotas, this was the final straw. Following a vision by Sitting Bull, Crazy Horse led Lakota forces to decisively defeat the Americans in the Battle of the Little Bighorn. After this victory, the Lakotas faced an even graver threat: wagon travel and railroad construction had decimated buffalo populations, and they faced starvation. To survive, they moved on to reservations, where US officials murdered Sitting Bull and Crazy Horse and attempted to dismantle their culture, prohibiting the Sun Dance on reservations. The Lakotas started a protest movement called the Ghost Dance. Alarmed by this resistance, in 1890, the US Army massacred hundreds of Lakotas, many of them women and children, at Wounded Knee Creek. Today, Lakotas continue to fight for their culture and their land. In 2016, they drew supporters worldwide to protest construction of the Dakota Access Pipeline through their reservation, continuing a long history of resistance to a government known for breaking its promises.

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翻译人员:jasmine lau 校对人员:Helen Chang1776 年, 一个强大的帝国 在北美洲诞生。拉科塔人已经到达了布拉克山, 这是西部平原上最神圣的地方, 也是令人垂涎的水牛猎场。坐落在如今的南达科他州, 控制着布拉克山, 即帕哈萨帕, 标志着拉科塔人成为 美国西部的主导力量。就在几十年前, 他们还在东部林地争夺权力--而且正在输着。作为组成苏族联盟的七个民族之一, 拉科塔人几个世纪以来一直生活在 五大湖和密苏里河谷之间的森林和湿地中。在 17 世纪中, 来自欧洲的殖民者 打破了这个地区的稳定当一些部落从与新法国的 毛皮贸易中获利时, 拉科塔人生活在最佳贸易范围之外。所以在 18 世纪早期, 他们将注意力转向了西边。西部平原远不及拉科塔人的家乡 来得肥沃和富饶。唯一容易获得食物 和水的地方就是河岸--一片已经被阿里卡拉人占领的土地。为了竞争, 拉科塔人成为了技巧纯熟的水牛猎手和马背上的战士。他们打败了农耕的阿里卡拉人, 强迫他们进贡玉米和南瓜。当西班牙人来到这里, 期望着找到有利可图的贸易场所时, 他们不得不向拉科塔人支付过路费。在 1804 年, 密苏里河上游出现了一个新的奇观:梅里韦瑟·刘易斯和威廉·克拉克。拉科塔酋长黑水牛拒绝让他们通过, 除非缴纳大量的贡品。尽管这是一个坎坷的开始, 但这次远征标志着 拉科塔人与美国之间紧密贸易联盟关系的开始。拉科塔男人捕猎水

牛，而妇女则将水牛皮 加工成长袍用于交易。美国政府提供枪支、弹药和其他物品。甚至为拉科塔人提供了天花疫苗，保护他们不受肆虐其他 美洲原住民民族的致命流行病的影响。理论上，美国通过 购买路易斯安那州从法国获得了拉科塔族人的土地。但是拉科塔人不会因为 两个外国势力之间的协议而放弃他们的土地。虽然有 1.5 万拉科塔人 和 2300 万美国人，但美国的大部分人口和军事力量 都集中在东海岸。仅仅是把军队派到拉科塔的领地 就需要巨大的花费，而且一旦到达那里，他们将面对对当地有深刻了解 并有联盟的可怕战士。为了避免一场它负担不起也赢不了的战争，美国政府试图安抚拉科塔人，按照拉科塔人领导人的要求， 向他们提供了大量的弹药和口粮。因此，当几乎所有北美印第安人被迫离开自己的土地，搬到保留地时，拉科塔帝国仍在扩张。到 1850 年，他们控制了大约 50 万平方公里。他们分散在这片广阔的土地上，为了追赶水牛而迁移他们的村庄。尽管他们没有中央权威机构，但部落的领导们，或称为奥亚茨， 在每年的太阳舞会上聚集在一起，制定战略并协调复杂的外交行动。每年夏天都要持续几周的太阳舞会是一种精神仪式，它重申了社区关系，安抚了瓦坎坦卡，也就是伟大的灵魂， 并使世界保持和平。从 1849 年开始，加州的淘金热潮 将大批白人移民带到西部，侵占了拉科塔的领土， 扰乱了野牛群。拉科塔领导人正确地将这次迁移理解为美国不再打算尊重他们 对土地的要求的信号。为了报复，他们袭击了马车队和政府办公室。随着冲突的加剧， 红云酋长在华盛顿进行了谈判。与此同时，在拉科塔地区里， 坐牛酋长、疯马酋长和其他人准备战斗。他们动员夏安族和阿拉帕霍族盟友以及几乎所有苏族联盟对抗美国。1876 年，也就是拉科塔人到来 整整 100 年后，淘金者占领了神圣的布拉克山。对许多拉科塔人来说， 这是压垮他们的最后一根稻草。在坐牛酋长的愿景下， 疯马酋长带领拉科塔部队在大小角战役中果断击败了美国人。这场胜利之后，拉科塔人 面临着更严重的威胁：货车行驶和铁路建设 使水牛的数量减少，他们面临着饥饿。为了生存，他们搬到了保留地，在那里，美国官员谋杀了坐牛和疯马，并试图摧毁他们的文化， 禁止太阳舞会在保留地举行。拉科塔人发起了一场名为“幽灵之舞”的抗议运动。这次抵抗引起了美国军队的警觉，于 1890 年，美军在伤膝河屠杀了数百名拉科塔人，其中很多是妇女和儿童。今天，拉科塔人继续为 他们的文化和土地而战。2016 年，他们吸引了 世界各地的支持者，抗议修建会穿过他们保留地的 达科他输油管道，延续了他们对一个 以违背承诺而闻名的政府长期以来的抵抗历史。

P91 2021-09-09 What makes a language... a language - Martin Hilpert

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=91>)

The distinct forms of speech heard around Bremen, Germany and Interlaken, Switzerland are considered regional dialects of the German language. And yet, when someone from Bremen is visiting the Swiss Alps, the conversations they hear between locals will likely be incomprehensible to them. Similarly, outside of China, Mandarin and Cantonese are often referred to as Chinese dialects. But they're even more dissimilar than Spanish and Italian. On the other hand, speakers of Danish, Norwegian, and Swedish, which are recognized as three distinct languages, can usually communicate in their native tongues with little difficulty. And Turkish language soap operas, broadcast without dubbing or subtitles, are some of the most popular shows in Azeri-speaking Azerbaijan. So, when is a form of speech considered a dialect versus a language? It seems reasonable that the degree of mutual intelligibility would determine whether two ways of speaking are classified as separate languages or as dialects of the same language. But as we've seen, there are many occasions where this is not the case. Perhaps surprisingly, the distinction between a language and a dialect usually has nothing to do with pronunciation, vocabulary, or any other linguistic features. However, it's not coincidental, either. It's a matter of politics. The basis for what's officially deemed a language was shaped by the emergence of a European nation states beginning around the 1500s. In order to establish and maintain centralized governments, clear territorial boundaries, and state-sponsored education systems, many nation states promoted a standardized language. Which form of speech was chosen to be the standard language was usually based on what people spoke in the capital. And while other forms of speech persisted, they were often treated as inferior. This tradition extended across the globe with European colonization and into modern times. Italy, for example, has at least 15 of what might be called regional dialects. One of them, the Florentine dialect, became known as Standard Italian when the country politically unified in 1861. It was selected because legendary authors like Dante and Machiavelli used it in their original works, And it came to represent an image of Italian national identity that some found particularly desirable. Later on, in his attempt to establish a unified, fascist state, Italian dictator Benito Mussolini saw language standardization as an important objective. His government promoted standard Italian while prohibiting other forms of speech from the public sphere, framing them as backward and unsophisticated. In everything from job applications to court testimonies, standard languages act as gatekeepers around the world. For instance, one 1999 study showed that landlords responded to apartment inquiries based on what form

of speech their prospective tenants used. When callers spoke African-American Vernacular English, or AAVE, landlords were more likely to reject their inquiries. When they spoke so-called Standard American English, which is often associated with whiteness, landlords responded more positively. Both of these forms of speech are considered English dialects. In the United States, some people have cast AAVE as an incorrect or simplified version of mainstream US English. But AAVE follows consistent grammatical rules every bit as sophisticated as other forms of English. Linguists tend to avoid the term dialect altogether. Instead, many opt to call different forms of speech “varieties.” This way, languages are seen as groups of varieties. So the English language is made up of varieties including Standard British and American English, AAVE, Nigerian English, Malaysian English, and many others. Each has its own unique history and characteristic pronunciation, vocabulary, and grammatical structures. But the dividing line between varieties is murky. Human language, in all its cross-pollinating, ever-evolving glory, naturally resists the impulse to sort it into neat buckets. Oftentimes, forms of speech exist on a kind of linguistic continuum where they overlap with others, and the differences between them are gradual— not clear cut. And that’s the confounding beauty of the dynamic, diverse, and dazzling universe of human communication.

P91 2021-09-09 What makes a language... a language - Martin Hilpert

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翻译人员: Chuner Chen 校对人员: Helen Chang 我们听到的不同的语音在德国的不来梅以及瑞士的因特拉肯被认为是德语的地区方言。然而，当来自不来梅的游客 游览瑞士的阿尔卑斯山时，当地人的交流，他们可能完全无法理解。同样的，在中国之外，普通话和粤语常被作为中文的方言，但他们之间的差别 比西班牙语和意大利语的差别还大。同时，说丹麦语、挪威语和瑞典语的人尽管这些是被认为三种截然不同的语言，却可以毫不费力的用母语交流。若干土耳其语的肥皂剧， 在播放时没有配音或字幕，竟然是阿塞拜疆语观众最喜爱的节目。那么，我们是怎么将一种语音 判定为语言或方言呢？以能够互相理解的程度 来定义看起来比较合理，用这种标准，可以 将两个不同的语音定义为语言，或是将其定义为同一语言下的方言。但正如我们所见，往往并非如此。也许，令人惊讶的是， 语言和方言的区分通常和发音、词汇毫无关联，和其他语言学特征也没有关系。然而，这也并非巧合。这是一个政治问题。正式认定一种语言的依据始于 1500 年代，是随着欧洲 各个民族国家出现而形成的。为了建立并维持中央集权的政府，明确领土边界， 以及建立国有教育系统，各个国家开始推行单一标准语言。选择哪种语音作为标准语言，通常取决于该国首都人们所说的话。尽管其他形式的语音依然存在， 它们常常被视为低等语言。这一传统随着欧洲的 殖民进程遍布全球，并一直持续到现在。例如，在意大利至少有所谓的 15 种地方方言。其中之一，佛罗伦萨方言，在 1861 年统一意大利全境时， 曾作为标准意大利语。它入选是因为传奇作家， 如但丁、马基雅维利创作手稿时，使用这一语言。进而把它作为意大利民族形象的代表，也让一些人觉得非常合适。后来为了建立一个统一的法西斯国家，意大利独裁者贝尼托墨索里尼 将语言标准化作为一个重要的目标。墨索里尼政府推行标准意大利语， 同时严令禁止其他意大利的语音，特别是在公共领域，将这些语音形式 塑造为愚昧落后的代表。生活中的一切， 从工作申请到法庭证词，标准语言在世界各地 扮演者守门员的角色。例如，1999 年的一项研究表明， 房东对于租客的选择取决于准租客所使用的语音。当准租客说非洲英语、土话英语 或者非洲裔土话英语（AAVE）时，房东倾向于拒绝他们的租房申请。当准租客使用所谓的标准美式英语时，通常被认为是白人，房东的反应则通常会比较积极。以上这些语音都被认作是英语的方言。在美国，有些人会将非洲裔土话英语（AAVE）认为是主流美式英语的 简化或错误的版本。但是，非洲裔土话英语（AAVE） 遵循相同的语法规则，样样与其他形式的英语一样复杂。语言学家倾向于避免使用方言一词。取而代之，很多人选择称其为 不同“变异”的语音形式。这样一来，语言被看作是 不同组别的变异。所以，英语由以下变异组成，包括英式英语、美式英语， 非洲裔土话英语（AAVE）、尼日利亚英语、马来西亚英语等...各有自己独特的历史、特色的发音、词汇以及语法结构。但不同变异间的界限是模糊的。人类语言的美妙之处 就在于相互交融、自我进化，自然拒绝将其标准化并整齐排列。多数情况下，语言形式 存在于语言的连续体中，并在其中相互交叠嵌套，使得他们之间的区别逐渐模糊，不是一切两半。这就是语言的精妙之处： 动感，多元并闪耀在人类交流的宇宙之中。

P92 2021-09-14 Earth's mysterious red glow, explained - Zoe Pierrat

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=92>)

In 2009, a satellite circled Earth, methodically scanning and sorting the wavelengths reflecting off the planet’s surface.

Researchers were looking for the spectral signature of carbon dioxide when they noticed something baffling: an unexpected wavelength of unknown origin. They tried looking at Earth with only this wavelength, and saw the planet covered in a red hue of varying intensity. This couldn't have been reflected sunlight because it was a wavelength that never escapes the Sun's outer atmosphere. And it didn't correspond with densely populated areas, suggesting it wasn't human-made either. In fact, it was emanating from places with lots of plants: the Amazon basin, northern evergreen forests, and croplands of the Midwestern US were all ablaze. So, what was going on? Plants and other organisms use light to grow by way of photosynthesis. But that's just one of three ways that light entering a photosynthetic organism is used. And this is the key to solving the mystery. To understand the others, we need to begin with photosynthesis. During this process, sunlight hits structures within a plant's cells called chloroplasts, which are packed with chlorophyll pigments. When chlorophyll molecules absorb light, some of their electrons become excited. They go through a series of reactions, which transform light energy into chemical energy. This powers the conversion of carbon dioxide and water into glucose, the simple sugar plants need to grow. And of course, this reaction generates an important byproduct. Photosynthesis—which is constantly being carried out by plants, algae, and bacteria—produces all of Earth's oxygen. But plants regularly absorb more light than they're able to consume. For instance, over winter, the frozen leaves of evergreen trees can't photosynthesize at their usual rate, but they're still exposed to a lot of sunlight. If not dealt with, the excess light can damage their photosynthetic machinery. So, the second way plants use light is by transforming it into heat and dissipating it out of their leaves. The third way plants interact with incoming light is by radiating it back out at a different wavelength, producing what's called chlorophyll fluorescence. During photosynthesis, the chlorophyll's excited electrons move through that series of chemical reactions. But as some of the excited electrons fall back to their ground states, they emit energy as light. Overall, about 1% of the light absorbed is re-emitted as wavelengths at the red end of the spectrum. It's such a small amount that you can't see it with the naked eye. But plants the world over are fluorescing as they photosynthesize. And this is what's caused the Earth's baffling red glow, as observed by satellite. It was an accidental discovery, but a huge breakthrough. Tracking chlorophyll fluorescence from space allows us to watch the planet breathe in real time—and monitor the health of ecosystems worldwide. Previously, researchers used levels of greenness as the main estimate for plant health. Because plants generally change colors or lose foliage when they're stressed, higher levels of green typically indicate healthier plants. But this measure can be unreliable. In contrast, chlorophyll fluorescence is a direct measure of photosynthetic activity. It can help us infer how much oxygen is being released and how much carbon is being absorbed in a given system. Drops in chlorophyll fluorescence may also occur before visible signs of plant stress, making it a timely measure. Scientists have already used chlorophyll fluorescence to monitor harmful phytoplankton blooms, and track the effects of drought in the Amazon and Great Plains. Going forward, we'll be investigating photosynthesis from space, and gauging how best to support our silent friends, who already do so much for us.

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翻译人员: Zifeng Zhang 校对人员: Helen Chang 2009 年, 一颗环绕地球的人造卫星有条不紊地扫描并分类从地球表面反射的波长。在研究人员正在寻找二氧化碳的光谱特征时, 他们发现了一个令人疑惑的东西: 一道来历不明, 令人意外的波长。研究人员试着只用这道波长观察地球, 结果他们看见地球被不同程度的红色所覆盖。但这肯定不是被反射的太阳光, 因为这种波长从来逃不出太阳的外部大气层, 而且这种颜色也与人口密集的区域对应不起来, 因此也暗示了它也不是人造的。事实上, 这道波长是从植物众多的地方显示出来的, 亚马逊盆地, 北部长青森林, 还有美国中西部的农田都闪耀着红色的光芒。那么, 这到底是怎么回事呢? 植物以及其他生物利用光进行光合作用来生长, 但是这仅仅只是光进入光合生物体内被使用的三种方式的其中一种。而这就是解决这个谜团的关键。为了看懂其他两种方式, 我们先要看懂光合作用。在光合作用中, 太阳光照射在植物细胞里一些叫做叶绿体的结构上, 而这些叶绿体中含有大量的叶绿素色素。当叶绿素分子吸收阳光时, 一部分电子被激发起来。这些电子经过一系列的反应, 把光能转化成化能。这个过程也使二氧化碳和水转化成了葡萄糖。而葡萄糖就是植物生长不可或缺的简单糖类。此外, 这个反应当然还产生了一个重要的附带产物。光合作用, 这个一直由植物、藻类和细菌在进行的反应, 制造了地球上所有的氧气。但是通常植物吸收的光线比他们能够消耗的光线要多一些。举个例子, 在冬天, 被冻住的常青树叶进行光合作用的效率不敌往常, 尽管这些叶子依然暴露在许多太阳光之下。如果不解决这个问题, 过量的光线会毁坏植物中运行光合作用的机制。因此, 第二种植物利用光的方法就是把光转化成

热量，并且把热量通过它们的叶子疏散出去。而植物利用光的第三种方式就是让光以一种 与之前不同的波长发射回去，而这会产生一种叫叶绿素荧光的物质。在光合作用的过程中，叶绿素中的被激发的电子会经过一系列的化学反应，不过当一部分的激发电子 回到它们的基态的时候，它们会释放出能量，即光。大体上，被吸收的光中大约有 1% 被植物以位于光谱的红色尾端波长的形式 重新反射出去。因为反射的光量太小了，我们甚至不能用肉眼看见。但是当全世界的植物在进行光合作用时 它们都在发荧光。这就是导致人造卫星观测到地球散发令人疑惑的耀眼红光的原因。这是一个意外却重大的突破性发现。在太空中追踪叶绿素荧光能让我们观看到地球的“呼吸”实况并且监管世界各地生态系统的健康情况。以前，研究人员把植物的绿色等级作为估量植物健康的主要手段，因为当植物压力过大时 通常会变颜色或是掉叶子，因此更高级的绿色 通常表明植物更加地健康。但是这种方法也可能不可靠。相比之下，叶绿素荧光能直接地测量光合作用活动。叶绿素荧光能帮助我们推断 光合作用中释放的氧气量以及在给定系统中碳被吸收的量。此外，叶绿素荧光的下降可能会发生在有植物承压的明显迹象表现出来之前，因此用叶绿素荧光测量会比较及时。科学家们已经在用叶绿素荧光来监控有害的浮游植物的野蛮生长，并且还用它来追踪 干旱对亚马逊和大平原的负面影响。在未来，我们将会太空中研究光合作用，并且测量计算如何最好地帮助并支持已经为我们人类做了这么多贡献的 无声的植物朋友。

P93 2021-09-16 You could have a secret twin (but not the way you think) - Kayla Mand

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=93>)

While searching for a kidney donor, a Boston woman named Karen Keegan stumbled upon a mystery. When her three adult sons underwent genetic testing to determine whether they were a match for kidney donation, the test showed that two of them weren't actually her sons. Keegan knew she was her sons' mother— she had conceived and given birth to them. Figuring there must have been an error, her doctors pursued further testing, only to uncover something even more confusing: she was her children's biological aunt. It turned out that Keegan had a second genome in some tissues and organs. In other words, some of her cells had a completely different set of genes from the others. This second set of genes belonged to her twin sister— who had never been born. This condition, where an individual has two genomes present in the tissues of their body, is called chimerism. The name comes from Greek mythology, where chimera is an amalgam of three different animals. Individuals with chimerism might have two-toned skin or hair, or two different colored eyes, but most are believed to have no visible signs of the condition. Chimerism can come from a twin in utero, from a tissue or organ transplant, or happen between a fetus and a pregnant woman. So how exactly does it happen? In one of the most common forms, a mother and fetus swap cells in the flow of nutrients across the placenta. The mother can inherit fetal stem cells, undifferentiated cells that are able to develop into any specialized cell. The fetal cells initially go undetected because the mother's immune system is suppressed during pregnancy. But in some cases, cells with the fetus's DNA persist in the mother's body for years or even decades without being destroyed by her immune system. In one case, a mother's liver was failing, but suddenly started to regenerate itself. Her doctors biopsied her liver, and found DNA in the regenerated tissue from a pregnancy almost 20 years earlier. The fetal stem cells had lodged in her liver and specialized as liver cells. Karen Keegan, meanwhile, acquired her second genome before she was born. Very early in her own mother's pregnancy with her, Keegan had a fraternal twin. Keegan's embryo absorbed some fetal stem cells from her twin's embryo, which did not develop to term. By the time Keegan's fetus developed an immune system, it had many cells with each genome, and the immune system recognized both genomes as her body's own— so it didn't attack or destroy the cells with the second genome. We don't know how much of her body was composed of cells with this second genome— that can vary from one organ to another, and even between tissues within an organ: some might have no cells at all with the second genome, while others might have many. At least some of the egg-producing tissue in her ovaries must have carried the second genome. Each time she conceived there would be no way to predict which genome would be involved— which is how two of her children ended up with the genes of a woman who had never been born. This can also happen to fathers. In 2014, when ancestry testing determined that a father was actually his baby's biological uncle, researchers discovered that 10% of the father's sperm carried a second genome from an embryonic twin. Cases like this challenge our perception of genetics. Though there are very few documented cases of chimerism from an embryonic twin, we're all amalgams to some extent, carrying around the different genetic codes of our gut bacteria and even our mitochondria. And given that 1 in 8 individual births started out as twin pregnancies, there could be many more people with two genomes— and many more lessons to learn about the genes that make us who we are.

P93 2021-09-16 You could have a secret twin (but not the way you think) - Kayla Mand

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翻译人员: Zizhuo Liang 校对人员: Helen Chang 当寻求肾器官捐献者时, 一位名叫凯伦·基冈的波士顿妇女 偶然发现了一个谜团。当她的三个成年儿子 接受了基因测试以确定他们的肾脏捐献 是否匹配, 测试显示其中两个 实际上不是她儿子。基冈知道她是她儿子的母亲-她怀孕并生下了他们。想到一定有什么错误, 她的医生进行了进一步的测试, 但却发现了一些 更加令人困惑的事情: 她是她的孩子们生物学上的姨妈。结果是基冈在一些组织和器官中拥有第二个基因组。换句话说, 她的一些细胞具有 一组完全不同的基因相较于别的细胞。这第二组基因属于 属于她的双胞胎姐妹-她从未出生过。这种情况, 一个人有两个基因组存在于他们身体的组织中, 被称为嵌合体。这个名字来自于希腊神话, 其中嵌合体是一种 三种不同动物的混合体。患有嵌合体的人可能有 双色调的皮肤或头发, 或两只不同颜色的眼睛, 但大多数人被认为没有明显的 可视的迹象。嵌合体可以来自子宫内的双胞胎, 来自组织或器官移植, 或发生在胎儿和孕妇之间。那么它究竟是如何发生的呢? 其中最常见的形式之一, 在营养物质跨越胎盘的流动中母亲和胎儿互换细胞。母亲可以继承胎儿干细胞, 未分化的细胞能够 发展成任何专门的细胞。胎儿细胞最初未被发现因为母亲的免疫系统 在怀孕期间受到抑制。但在某些情况下 带有胎儿 DNA 的细胞持续存在于母亲的身体里 几年甚至几十年而不被她的免疫系统摧毁。在一个案例中, 一位母亲的肝脏正在衰竭, 但突然开始自我再生。她的医生对她的肝脏进行了活检, 并在再生的组织中发现了 DNA 来自近 20 年前的一次怀孕。胎儿的干细胞在她的肝脏中着床, 特化为肝脏细胞。与此同时, 凯伦·基冈在出生前 就获得了她的第二个基因组。在她的母亲怀着她的早期, 基冈有一个异卵双胞胎。基冈的胚胎吸收了一些 她的双胞胎胚胎中的胎儿干细胞, 那个胚胎没有发育到足月。当基冈的胎儿形成了免疫系统, 它的每个基因组都有很多细胞, 而免疫系统则确认 这两个基因组都是她身体自己的, 所以它没有攻击或破坏 具有第二基因组的细胞。我们不知道她身体的组成 有多少是带有第二基因组的细胞, 不同器官之间会有差异, 甚至同一器官的不同组织间也有: 有些可能根本没有 第二个基因组的细胞, 而另一些可能有很多。在她的卵巢中至少有一些产卵组织肯定携带了第二个基因组。每次她受孕时, 都会无从预测哪些基因组会被涉及, 这就是为什么她两个孩子 最终得到的基因来自于一个从未出生的女人。这种情况也可能发生在父亲身上。2014 年, 当血统测试确定一个父亲实际上是他孩子的生物学上的叔叔, 研究人员发现, 10% 的父亲的精子携带来自胚胎期的双胞胎的 第二个基因组。这样的案例挑战我们 对遗传学的认知。尽管胚胎双胞胎嵌合体的 案例记录极少, 我们在某种程度上都是嵌合体, 携带着肠道细菌的不同的遗传密码, 甚至我们线粒体的。鉴于每 8 个新生儿中就有一个 开始时是双胞胎怀孕, 可能有更多拥有两个基因组的人, 以及关于造就我们的基因 更多需要学习的课程。

P94 2021-09-21 The secrets of the world's most famous symphony - Hanako Sawada

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=94>)

These eight ferocious notes open one of the most explosive pieces of music ever composed. Ludwig van Beethoven's Symphony Number Five premiered in 1808, on a blisteringly cold Vienna night. The piece was just one small part of a lengthy program, and the orchestra had been hastily assembled and under-rehearsed. But despite this inauspicious premiere, the symphony quickly won acclaim. One critic likened the piece to "glowing beams of light, piercing through the darkness." This intensity persists throughout the composition, and its dramatic musicality continues to move listeners today. So what exactly makes Beethoven's Fifth so captivating? When the symphony premiered, Beethoven already had a formidable reputation. While his peers produced music exclusively for religious functions or private events held by their wealthy patrons, Beethoven was one of the first freelance composers. He made his living composing and selling his music to publishers in multiple countries and showcasing his compositions to an adoring public. This career choice gave him the flexibility to compose for self-expression and Beethoven was always pursuing new ways to translate his powerful emotions into music. At the time, most composers worked within the Classical style, which offered limited options for a piece's overarching structure and instrumentation. Beethoven composed most of his earlier pieces in this tradition, following in the footsteps of role models like Mozart and Haydn. But with his Fifth Symphony, he experimented with elements of Romanticism. This blossoming mode of composition was known for its expressive melodies, extended forms and surprising instrumentations. The first movement of Beethoven's Fifth uses a Classical sonata form, in which a central musical idea is explored, developed, and repeated in an

altered manner. Within these parameters, he explores a simple idea with incredible depth. A single rhythmic motif serves as the building block for most of the movement: three short notes, followed by a lingering fourth. One of Beethoven's biographers would later call this pattern the "fate motif," because it suggests the figure of fate knocking at the door. While it's not clear if Beethoven composed the motif with fate in mind, these notes certainly create a gripping hook. The rhythmic pattern creates forward movement, while the prolonged fourth note signals doom. This motif haunts the symphony, including its accompanying parts and rhythmic flourishes. Beethoven experiments with dozens of variations, playing out across different instruments and pitches. Throughout the piece, this motif is passed around the orchestra like a whisper, gradually reaching more and more instruments until it becomes a roar. The motif's inventive repetition is a large part of what makes this piece so memorable, but it's not the only innovation on display. This was the first major orchestral composition to use trombones, and Beethoven also employs a high-pitched piccolo and a low-pitched contrabassoon to give the orchestra a wider range than most classical compositions. Exaggerated musical dynamics further heighten the drama. And harmonically, the piece has a clear emotional arc—beginning in a somber C minor and ending in a triumphant C major. This progression, from ominous unease to majestic resolution, is a testament to Beethoven's ability to inject raw emotionality into his music. He wrote this symphony while battling with hearing loss, and his anguish can be heard in the composition's thunderous and repeating musical phrases. Beethoven continued to compose even after he became completely deaf, producing innovative music until his death in 1827. And the Fifth Symphony's central motif has continued to resound through the ages. Outside of concert halls, the piece has become a symbol for suspense, revelation, and triumph. The fate motif sounds out the letter V in Morse code, and during World War II, the Fifth Symphony became a code for victory amongst the Allies. The iconic composition can be found in film scores, and it's even been explored through musical reinterpretations and visual art. But whatever the context, Beethoven's Fifth takes its listeners through a dark world, then guides them into the light.

P94 2021-09-21 The secrets of the world's most famous symphony - Hanako Sawada

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=94>)

翻译人员: S Wang 校对人员: Helen Chang 这八个激烈的音符开启了音乐史上最具爆炸性的曲子路德维希·范·贝多芬创作的《第五交响曲》首演于 1808 年维也纳的一个寒风刺骨的夜晚这首曲子仅仅是一个大项目中的一小部分乐团也是匆忙组建的, 排练得也不够充分但尽管首演并不理想 这首交响曲很快获得了赞誉一位评论家将这部作品比作像“一束束光从黑暗中穿透而来”这种紧张感贯穿整部作品戏剧化的音乐直至今天仍在感染着听众那么贝多芬的《第五交响曲》究竟为何如此迷人呢? 这部交响曲首演之际 贝多芬已经十分出名在他的同行还只写宗教音乐 或者为他们富有的赞助人举办的私人活动作曲时贝多芬已经成为了史上第一位 自由职业作曲家他靠作曲谋生 把曲子卖给多个国家的出版商向崇拜他的观众表演他的作品这一职业选择为他提供了自我表达的空间而且贝多芬也总在探索新的方法来用音乐传达他强烈的情感当时大部分作曲家以“古典主义”风格作曲一首曲子可选的整体结构和使用的乐器比较有限贝多芬大部分早期的作品延续了这种传统跟随着莫扎特和海顿这些榜样的步伐但在他的《第五交响曲》中 他尝试加入了一些浪漫主义元素这种逐渐成熟的作曲方法 以其极具感染性的旋律更加广泛的形式和令人惊喜的配器著称贝多芬《第五交响曲》第一乐章 使用了古典主义音乐的奏鸣曲式针对一个中心的音乐主题使用不同的方式发掘、发展和反复在这些已设定的范围内贝多芬异常深入地 探索一个简简单单乐想单独的一个动机非常有节奏感 作为该乐章大部分片段的基本组成要素即三个短音接着一个延绵的长音后来, 一位贝多芬的传记作家称 其为“命运动机”因为它体现出了命运叩门般的画面尽管我们并不清楚贝多芬本人 是否在谱曲时想到了命运这几个音符的确染具有强大的吸引力富有节奏感的片段创造出一种向前的趋势而拉长的第四个音则象征着毁灭这一动机笼罩着整首交响曲包括伴奏部分和鲜明的节奏贝多芬尝试了十余种变体用不同的乐器和音高展示这一动机贯穿全曲 像耳语一样在乐团中传递传递到越来越多的乐器 直至变为一声怒吼这一动机具有独创性的反复很大程度上是这首曲子 能够如此印象深刻的原因但它不是这首曲子唯一的 具有独创性的地方这是第一首在乐团中 使用长号的大型交响乐曲而且贝多芬还使用了一个高音短笛和一个倍低音巴松使乐团的音域比大部分古典主义作品更广夸张化的音乐强弱对比更加增强了戏剧性在和声方面, 这首曲子 也有着清晰的情感走向开始是阴郁的 c 小调 最终以辉煌的 C 大调结尾这种音乐进行, 从不详的 不适感发展到辉煌的尾声是贝多芬有能力向他的音乐 注入丰富情感的强有力证明贝多芬写这部交响曲时正在经历听力衰退而从他的作品中就能听出他的痛苦在滚滚雷声般不断重复的乐句中可见一斑贝多芬在他完全失聪之后仍坚持作曲不断产出富有创造性的音乐 直至 1827 年去世而他《第五交响曲》中的中心动机 则在岁月中持续地回响这部交响曲走出了音乐厅成为悬疑、启示和胜利的象征命运动机在摩

斯电码中代表字母“V”在二战期间《第五交响曲》成为盟军之间胜利的暗号这部极具象征意义的作品 出现在很多电影原声音乐中人们甚至也在音乐的重新阐释 和视觉艺术中继续探索这首曲子但无论以什么形式贝多芬的《第五交响曲》 都把人们带到一个黑暗的世界然后带领他们走向光明

P95 2021-09-23 Can you solve the rogue submarine riddle - Alex Rosenthal

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=95>)

Smuggling yourself aboard the rogue submarine was the easy part. Hacking into the nuclear missile launch override—a little harder. But now you’ve got a problem: you don’t have the override code. You know you need the same two numbers that the agents of chaos just used to authorize the launch. But one wrong answer will lock you out. From your hiding spot, you’ve been able to learn the following: The big boss didn’t trust any minion with the full information to launch nuclear missiles on their own. So he gave one launch code to Minion A, the other to minion B, and forbade them to share the numbers with each other. When the order came, each entered their own number and activated the countdown. That was 50 minutes ago, and there’s only 10 minutes left before the missiles launch. Suddenly, the boss says, “Funny story— your launch codes were actually related. I chose a set of distinct positive integers with at least two elements, each less than 7, and told their sum to you, A, and their product to you, B.” After a moment of awkward silence, A says to B, “I don’t know whether you know my number.” B thinks this over, then responds, “I know your number, and now I know you know my number too.” That’s all you’ve got. What numbers do you enter to override the launch? Pause now to figure it out for yourself. Answer in 3 Answer in 2 Answer in 1 Ignorance-based puzzles like this are notoriously difficult to work through. The trick is to put yourself in the heads of both characters and narrow down the possibilities based on what they know or don’t know. So let’s start with A’s first statement. It means that B could conceivably have something with the potential to reveal A’s number, but isn’t guaranteed to. That doesn’t sound very definitive, but it can lead us to a major insight. The only scenarios where B could know A’s number are when there’s exactly one valid way to factor B’s number. Try factoring a few and you’ll find the pattern— It could be prime— where the product must be of 1 and itself— or it could be the product of 1 and the square of a prime, such as 4. In both cases, there is exactly one sum. For a number like 8, factoring it into 2 and 4, or 1, 2, and 4, creates too many options. Because the boss’s numbers must be less than 7, A’s list of B’s possibilities only has these 4 numbers. Here’s where we can conclude a major clue. To think B could have these numbers, A’s number must be a sum of their factors— so 3, 4, 5, or 6. We can eliminate 3 and 4, because if the sum was either, the product could only be 2 or 3, in which case A would know that B already knows A’s number, contradicting A’s statement. 5 and 6, however, are in play, because they can become sums in multiple ways. The need to consider this is one of the most difficult parts of this puzzle. The crucial thing to remember is that there’s no guarantee that B’s number is on A’s list— those are just the possibilities from A’s perspective that would allow B to deduce A’s number. That ambiguity forces us to go through unintuitive multi-step processes like: consider a product, see what sums can result from its factors, then break those apart and see what products can result. We’ll soon have to do something similar going from sums to products and back to sums. But now we know— when A made his first statement, he must have been holding either 5 or 6. B has access to the same information we do, so he knows this too. Let’s review what’s in each brain at this point: everyone knows a lot about the sum, but only B knows the product. Now let’s look at the first part of B’s statement. What if A’s number was 5? That could be from 1+4 or 2+3, in which case B would have either 4 or 6. 4 would tell B what A had, like he said, because there’s only one option to make the product: 4 times 1. 6, on the other hand, could be broken down three ways, which sum like so. 7 isn’t on B’s list of possible sums, but 5 and 6 both are. Meaning that B wouldn’t know whether A’s number was 5 or 6, and we can eliminate this option because it contradicts his statement. So this is great— 5 and 4 could be the override code, but how do we know it’s the only one? Let’s consider if A’s number was 6— which would be 1+5, 2+4, or 1+2+3, giving B 5, 8, or 6, respectively. If B had 5, he’d know that A had 6. And if he had 8, the possibilities for A would be 2+4 and 1+2+4. Only 6 is on the list of possible sums, so B would again know that A had 6. To summarize, if A had 6, he still wouldn’t know whether B had 5 or 8. That contradicts the second half of what B said, and 5 and 4 must be the correct codes. With seconds to spare you override the missile launch, shoot yourself out of the torpedo bay, and send the sub to the bottom of the ocean.

P95 2021-09-23 Can you solve the rogue submarine riddle - Alex Rosenthal[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=95>)

翻译人员: Ashley Wu 校对人员: Helen Chang 偷溜上离群的潜水艇是最容易的一步。黑进核导弹发射超控就有些难度了。但是有个问题: 你不知道 用来阻止发射的密码。你知道需要输入 混乱之敌特刚用来开启发射的两个数字。可是答错一次, 超控就会上锁。你从隐藏的地方获得了以下的信息: 老大不够信任他的走狗们, 所以没把用来开启发射的全部信息 交给任何一个走狗。于是他把开启密码的其中一个 交给走狗 A, 另外的交给走狗 B, 并且禁止他们两互相分享密码。老大命令下来后, 他们各自输入了自己的密码, 启动了倒计时。那已经是 50 分钟前的事了。距离导弹发射只剩下 10 分钟。老大突然道, “跟你们说件好笑的事情。 你们的开启密码其实是相关的。”我选择了一组至少有两个元素的不同正整数, 各自小于 7, 把总和告诉了 A, 把乘积告诉了 B。尴尬的一瞬间后, A 对 B 说: “不知道你知道我的数字是多少。”B 想了想, 回答道: “我知道你的数字是多少, 现在也知道你也知道我的数字。”你获得的信息就这么多。输入什么数字才能阻止发射? 想自己解答就请暂停视频。3 秒后公布答案 2 秒后公布答案 1 秒后公布答案像这样一个建立在无知的基础的谜题 是出了名的难解。解题的窍门是通过两人的角度想, 然后根据他们知道和不知道的事 缩小可能性的范围。先从 A 说的第一句话开始吧。那代表 B 可能知道一件有可能能透漏 A 的数字是多少的事, 但是不一定。这听起来并不能确定, 却能使达到极重要的见解。仅当 B 的数字只有一种 因数分解方式的时候 B 才会知道 A 的数字的大小。你通过尝试整除几个数就会发现规律。可能会是素数——也就是说, 它的因式必须是一和那个数字。或者可能是一个有一和一个素数的二次方的因式, 如四, 的数字。在这两种情况下, 正好有一个和数。把一个像八一样的数字整除成二和四或一, 二, 和四的话, 就有太多可能性了。因为老大的数字都小于七, A 能列为有可能是 B 的数字 只包括这四个数字。我们从此能判断出一个重要的线索。A 的数字必定是 B 数字的因式的和, B 才能是这些数字之一。也就是说是三, 四, 五, 或六。可以排除三和四, 因为和数 如果是其中的一个数的话, 那乘积就只能是二或三。在那种情况下, A 就已经知道 B 知道 A 的数字了, 和 A 说的话恰恰相反。但是五和六都有可能, 因为这两个数字可以 以许多方式成为和。考虑这个的需要就是 这个谜题最难的部分之一。要记得的关键就是 B 的数字不一定在 A 列的数字里。这些只是 A 觉得有可能的数字, B 也就能借此推断出 A 的数字是多少。这种模糊性迫使我们通过不直观、多步骤的过程来考虑, 如: 考量一个乘积, 看看乘积的因式 加起来是什么和数, 然后把那些和数分解成因式, 再找出因式的乘积。我们马上就要做一件相似的事, 从和找到乘积, 再回到和。但我们现在知道 A 说出第一句话时, 他的数字一定是五或六。B 知道的信息和我们一样, 所以这他也不知道。我们回顾一下大家现在都知道些什么: 大家都知道很多关系和数的信息, 但只有 B 知道乘积是多少。现在看看 B 说的话的第一部分。A 的数字要是五呢? 那可能是一加四或二加三的结果。在这种情况下, B 的数字不是四就是六。如果是四的话, B 就知道 A 的数字是什么了, 因为那样只有一种乘法, 四乘以一。六反而能以三种方法分解, 因式的和数如以上。B 觉得有可能的和数不包括七, 但包括五和六。那代表 B 就不知道 A 的数字是五还是六了, 所以我们就能排除这个可能性, 因为和他说的话自相矛盾。那好, 五和四可能就是密码, 但我们怎么才能确定是唯一一个? 假设 A 的数字是六, 也就是一加五, 二加四, 或者一加二加三, B 的数字分别就是五, 八, 或六。B 的数字如果是五, 他就会知道 A 的数字是六。他的数字如果是八的话, A 的数字的可能性就是 二加四和 一加二加四。只有六是有可能的和数之一, 所以 B 就又知道 A 的数字是六了。总结一下, A 的数字如果是六, 他也不知道 B 的数字是五还是八。这就与 B 说的话的后半段自相矛盾了, 所以五和四一定就是正确的密码。以几秒之差, 你阻止了导弹发射, 从鱼雷舱里射出去, 还有让潜艇沉没到了海底。

P97 2021-09-30 Ancient Greece's greatest popstar - Diane J. Rayor[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=97>)

More than 2,500 years ago, one of ancient Greece's most celebrated popstars and erotic poets enraptured listeners. In one legend, a prominent Athenian heard his nephew singing one of their songs and enjoyed it so much that he asked the boy to teach it to him— “So that I may learn it and die,” he said. So, who was this revered figure? Her name was Sappho. She lived on the Greek island of Lesbos around 600 BCE. Like other singer-songwriters of the time, she sang while playing the lyre, a stringed instrument from which the term “lyrics” is derived. But Sappho lyrics offered a uniquely intimate perspective on love, passion, and longing. She's the first on record to combine the words “bitter” and “sweet,” for instance, to describe at once the thrills and devastations of romance. Sappho was an aristocrat thought to have married a man, though none of her surviving work mentions him. It does reference other family as well as festivals, colorful clothing, and growing old. But Sappho is best known for her lyrics about homoerotic desire for women. In one song, as her female companion departs

tearfully, Sappho says, “let me remind you / ... the lovely times we shared.” She describes flower garlands, perfumes, “and,” she says, “on soft beds / ... you quenched your desire.” In another, she describes a friend in a distant city, “Pacing far away, her gentle heart devoured by powerful desire, she remembers slender Atthis.” The word “Lesbian” means someone from Lesbos, but, because of Sappho, it now also describes a woman who’s gay. In ancient Greece, the norm was for everyone to marry and have children. While men were usually permitted to have homosexual relationships based on their status, women weren’t. But it appears that, on Lesbos at this time, aristocratic women generally had more freedom. Yet the details of Sappho’s life remain mysterious, partially because only fragments of her poetry survive. In ancient times, however, so much of it persisted that it seemed it would last forever. Admirers performed Sappho cover songs and committed her poetry to papyrus, parchment, and pottery. Three centuries after Sappho’s death, a Greek author declared that her words would endure “as long as ships sail from the Nile.” Another century later, the Library of Alexandria housed nine scrolls of her work, numbering over 10,000 lines. But natural forces eroded the collection. And monks, tasked with preserving ancient writing, likely neglected or destroyed her work. One 2nd century Christian leader called Sappho “a whore who sang about her own licentiousness.” Later, a Pope and Archbishop ordered her poetry burned. Almost all of it had vanished by the Middle Ages. Then, about a century ago, people began rediscovering Sappho’s poetry—in locations like an ancient Egyptian garbage dump. Now, we have around 700 lines, representing less than 10% of Sappho’s total known work. We only have one complete poem of hers. About a dozen others are substantial, but most are mere fragments. New pieces of Sappho’s songs probably will be found. Some may already be sitting in museum archives, to be revealed when technology allows scholars to read through scrolls too fragile to unroll. What we are currently left with is an incomplete record—and many historical rumors. Ovid insisted that Sappho fell in love with a ferryman and, upon being rejected, leapt from a cliff to her death. Another tale asserts that she ran a girls’ school and those mentioned in her poems were merely students for whom she felt platonic affection. Current consensus is that these stories, which ridicule Sappho or deny her work’s homoeroticism, are probably all untrue artifacts of misogyny and homophobia. Despite the distortions of the intervening millennia, Sappho’s words reach across time and resonate today. More than 2,000 years ago, she wrote: “I say someone in another time will remember us” And, thankfully, we do.

P97 2021-09-30 Ancient Greece's greatest popstar - Diane J. Rayor

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=97>)

翻译人员: Shiqing Liang 校对人员: Helen Chang 在距今 2500 多年前一位希腊最出名的流行歌星和情色诗人使听众心醉神迷有则传说提到,一位雅典名人 听见其侄子唱着其中一首歌他非常陶醉,便问侄子 能不能教他唱这首歌他说:“我学了这首歌便能死而无憾了。”那么,这位备受尊敬的大人物是谁呢?她便是萨福公元前 600 年左右 她生活在希腊莱斯波斯岛她如同那个时代其他创作歌手一样她边唱边弹着竖琴歌词(lyrics)一词就来自竖琴(lyre)但萨福的歌词带给人 与众不同的亲密视角她歌颂爱、热情和渴望例如,她是记载里首个 把“苦”和“甜”合成一个词来描绘在浪漫关系中 同时存在的震颤与毁灭的人萨福是一个贵族 后世认为她嫁了一个男人尽管她现存的所有作品中从未提到过她她的作品里提到过其他家人、节日多彩的服饰,以及衰老但萨福最著名的是 歌词里对女性的同性欲望在一首歌里,与她的女性爱人 挥泪而别时,她说道“就让我来提醒你... 我们消磨过的美好光阴。”她描绘花环、香水,还说“在柔软的床上...你释出欲望。”在另一首诗里,她这样描写 一位千里之外的朋友“踱步远行,她温柔的心 被强烈的欲望吞噬,”“她无法忘记身段苗条的阿特斯。”“蕾丝边(Lesbian)”一词原指 来自莱斯波斯岛(Lesbos)的人但因为萨福,现在这个词 也被用来形容女同性恋者古希腊的社会规范是 每个人都得结婚生子尽管男性通常会被允许有同性恋关系根据他们的地位而定,女性却不能但好像在那时的莱斯波斯岛上贵族女性通常拥有更多的自由但萨福的生活细节仍不为人知一部分是因为她的现存诗歌仅剩片段但古时萨福有非常多的诗歌就像这些诗歌会永远流传仰慕者表演萨福的诗歌 并把她的诗歌留存在莎草纸、羊皮纸和陶器上萨福去世三个世纪后一位希腊作家声称她的作品会恒久流传“只要船只还会从尼罗河上扬帆起航。”又过去一个世纪之后亚历山大图书馆里 存放了九大卷轴她的作品总共有超过五万行但这些收藏遭到了自然力量的侵蚀而负责保护古代著作的僧侣则很可能无视或摧毁了她的作品公元 2 世纪,一位基督教领袖称萨福是“歌颂自身放荡的妓女。”之后,有位教皇和大主教 下令烧掉她的诗歌她的作品在中世纪前几乎全被销毁了此后,大约在一个世纪前人们在一个像古埃及垃圾场的地方 重新发现了萨福的诗歌现在我们还有大概 700 行她的诗歌仅是萨福所有已知作品的不到 10%我们仅有一首完整的萨福的诗歌大约十几首诗歌有较为完整 但绝大多数都仅有片段我们可能还会找到 萨福诗歌的一些新片段有些片段可能已在博物馆档案室里一旦科技能让学者翻动 过于脆弱的卷轴阅读,就能被揭晓我们现在仅有的是不完整的记录以及

许多历史上的传闻奥维德坚称萨福曾与一名船夫相爱但遭到了拒绝后，坠崖而亡另一则传闻则说她办了一所女子学校那些她诗中提到的人 只不过是让她有着柏拉图式喜爱的学生目前的共识则是，这些奚落萨福或否认其同性恋的故事可能都是出于厌女症 和恐同症而捏造的谣言尽管几千年中遭遇了各种扭曲萨福的词句仍穿越时间 使今天的人产生共鸣在两千多年前，她写道：“我相信其他时代的某人会记得我们”幸好，我们现在记得

P98 2021-10-05 The genes you don't get from your parents (but can't live without) -

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Inside our cells, each of us has a second set of genes completely separate from the 23 pairs of chromosomes we inherit from our parents. And this isn't just the case for humans— it's true of every animal, plant, and fungus, and nearly every multicellular organism on Earth. This second genome belongs to our mitochondria, an organelle inside our cells. They're not fully a part of us, but they're not separate either— so why are they so different from anything else in our bodies? Approximately 1.5 billion years ago, scientists think a single-celled organism engulfed the mitochondria's ancestor, creating the predecessor of all multicellular organisms. Mitochondria play an essential role: they convert energy from the food we eat and oxygen we breathe into a form of energy our cells can use, which is a molecule called ATP. Without this energy, our cells start to die. Humans have over 200 types of cells, and all except mature red blood cells have mitochondria. That's because a red blood cell's job is to transport oxygen, which mitochondria would use up before it could reach its destination. So all mitochondria use oxygen and metabolites to create energy and have their own DNA, but mitochondrial DNA varies more across species than other DNA. In mammals, mitochondria usually have 37 genes. In some plants, like cucumbers, mitochondria have up to 65 genes, and some fungal mitochondria have only 1. A few microbes that live in oxygen-poor environments seem to be on the way to losing their mitochondria entirely, and one group, oxymonad monocercomonoides, already has. This variety exists because mitochondria are still evolving, both in tandem with the organisms that contain them, and separately, on their own timeline. To understand how that's possible, it helps to take a closer look at what the mitochondria inside us are doing, starting from the moment we're conceived. In almost all species, mitochondrial DNA is passed down from only one parent. In humans and most animals, that parent is the mother. Sperm contain approximately 50 to 75 mitochondria in the tail, to help them swim. These dissolve with the tail after conception. Meanwhile, an egg contains thousands of mitochondria, each containing multiple copies of the mitochondrial DNA. This translates to over 150,000 copies of mitochondrial DNA that we inherit from our mothers, each of which is independent and could vary slightly from the others. As a fertilized egg grows and divides, those thousands of mitochondria are divvied up into the cells of the developing embryo. By the time we have differentiated tissues and organs, variations in the mitochondrial DNA are scattered at random throughout our bodies. To make matters even more complex, mitochondria have a separate replication process from our cells. So as our cells replicate by dividing, mitochondria end up in new cells, and all the while they're fusing and dividing themselves, on their own timeline. As mitochondria combine and separate, they sequester faulty DNA or mitochondria that aren't working properly for removal. All this means that the random selection of your mother's mitochondrial DNA you inherit at birth can change throughout your life and throughout your body. So mitochondria are dynamic and, to a degree, independent, but they're also shaped by their environments: us. We think that long ago, some of their genes were transferred to their host's genomes. So today, although mitochondria have their own genome and replicate separately from the cells that contain them, they can't do this without instruction from our DNA. And though mitochondrial DNA is inherited from one parent, the genes involved in building and regulating the mitochondria come from both. Mitochondria continue to defy tidy classification. Their story is still unfolding inside of each of our cells, simultaneously separate and inseparable from our own. Learning more about them can both give us tools to protect human health in the future, and teach us more about our history.

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翻译人员: Wang Pray 校对人员: Yanyan Hong 在我们的细胞内，我们每个人都有第二套基因与我们从父母那里继承的 23 对染色体完全分开。而且这不仅仅是人类的情况——每种动物、植物和真菌，以及几乎所有地球上 每个多细胞的生物体都是如此。这第二个基因组属于我们的线粒体，是我们细胞内的一个细胞器。他们并不完全是我们的一

部分，但它们也不是独立的——那么，为什么它们与我们身体里的其他东西如此不同？大约 15 亿年前，科学家认为一个单细胞生物体吞噬了线粒体的祖先，进而创造了所有多细胞生物的前身。线粒体起着至关重要的作用：它们从我们吃的食物和呼吸的氧气中的能量转化为我们细胞可以使用的能量形式，这就是一种叫做 ATP 的分子。没有这种能量，我们的细胞就会开始死亡。人类有超过 200 种类型的细胞，而除了成熟的红细胞外，都有线粒体。这是因为红细胞的工作是运输氧气，而线粒体在它到达目的地之前就会耗尽。因此，所有线粒体都使用氧气和代谢物来产生能量，并有自己的 DNA。与其他 DNA 相比，线粒体 DNA 在不同物种间的差异更大。在哺乳动物中，线粒体通常有 37 个基因。在一些植物中，如黄瓜，线粒体有多达 65 个基因，而一些真菌的线粒体只有 1 个。一些生活在贫氧环境中的微生物似乎正在走向完全失去他们的线粒体的路上，而类单鞭滴虫属的这些生物已经开始没有线粒体了。这种多样性的存在是因为线粒体仍在进化中，与含有它们的生物体，分别在自己的时间线上同步进行。要了解这一点是如何实现的，仔细看看我们体内的线粒体在做什么会有所帮助，从我们受孕的那一刻开始。在几乎所有物种中，线粒体 DNA 只从父母一方传下来。在人类和大多数动物中，该受体是母亲。精子的尾部大约含有 50 至 75 个线粒体，来帮助他们游动。这些东西在受孕后与尾巴一起解体。同时，一个卵含有成千上万的线粒体，每个都含有多组线粒体 DNA。这意味着我们体内超过 15 万份的线粒体 DNA 是从母亲那里继承的。每一个都是独立的，且彼此之间可能略有不同。随着受精卵的生长和分裂，这些数以千计的线粒体被分配到发育中的胚胎细胞中。当我们有了分化的组织和器官，线粒体 DNA 的变异是随机地散布在我们的身体里。使之更复杂的是，线粒体有一个与我们细胞不同的独立复制。因此，当我们的细胞通过分裂进行复制时，线粒体最终出现在新细胞中，而它们在自己的时间轴上融合和分裂。随着线粒体的结合和分离，它们封存了有问题的 DNA 或对不正常工作的线粒体进行清除。所有这一切意味着，你在出生时从母亲那随机继承的线粒体 DNA 会在你的一生中在你身上发生改变。所以线粒体是动态的，而且，在某种程度上是独立的，但它们也被他们环境所塑造：我们。我们认为，很久以前，它们的一些基因被转移到宿主的基因组中。所以今天，虽然线粒体有自己的基因组，并与包含它们的细胞分别进行复制，如果没有我们的 DNA 指示，它们就不能这样做。而尽管线粒体 DNA 是由父母一方遗传的，参与建立和调节线粒体的基因来自父母双方。线粒体继续藐视着井井有条的分类。它们的故事仍在我们每个人的细胞里展开，同时独立且与我们自己不可分割。更多地了解它们，既可以给我们提供在未来保护人类健康的办法，还能让我们更多地了解我们的历史。

P99 2021-10-07 What happened to the lost Kingdom of Kush - Geoff Emberling

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=99>)

Along the Nile River, in what is now northern Sudan, lay the ancient civilization of Kush. Though they were once conquered by a powerful neighbor, the kings and queens of Kush would go on to successfully challenge two of the most dominant empires in history. From 1500 to 1100 BCE, Egypt controlled Kush, introducing many Egyptian cultural and religious practices. The civilization of Kush was more than a thousand years old at that time. Its early capital city at Kerma had impressive temples, palaces, and houses, including a massive mudbrick temple structure that had a chapel deep inside, reached by a long staircase at the center. Rich gold mines helped the Kushites build a flourishing commercial network, making bronze weapons and tools and trading materials like incense, animal skins, ivory, and ebony wood from sub-Saharan Africa. The tide started to change for Kush as Egypt descended into civil war. By 750 BCE, Egypt was divided into local kingdoms with fluctuating alliances. The Kushite king Piankhy saw an opportunity. He led his navy, flanked by horsemen and archers, up the Nile to the gateway city of Khemenu. As Piankhy's army constructed siege ramps and battle towers, the city's ruler sent his wives and daughters to negotiate—not with Piankhy, but with the women of his royal household, later known as kandake, who were extremely influential in military affairs and political succession. At the end of a long siege, Piankhy entered the conquered city and bitterly criticized the conditions in its stables. From there, Piankhy and the Kushite forces conquered the Egyptian capital of Memphis. Piankhy installed his sister, Amunirdis, as priestess of the great god Amun, in the Egyptian city of Thebes, and left other Kushite officials there before returning to live in Kush. His successors extended control all the way to the Nile Delta. This was a high point for the Empire of Kush: trade thrived, and they built magnificent temples, palaces, and pyramid tombs all along the Nile. But the Assyrian army was approaching Egypt in its annual campaigns. When the Assyrians began to encroach on trade routes near Jerusalem, the Kushite king Taharqa moved to stop them. The Assyrians defeated him with the help of some rebelling Egyptian princes, and drove him out of Egypt in the 7th century BCE. The Kushites continued to rule in their homeland for nearly 1,000 years that were prosperous and innovative. They moved their

capital farther south to the city of Meroe, where they built temples to a new god called Apedemak. They built new cities in the savannah south of the Sahara Desert, some of which contained huge reservoirs for water. When the Roman Empire conquered Egypt in 31 BCE, Kushite armies again traveled north, led by Queen Amanirenas. She led them to success in battle against the Romans, capturing the bronze head of a statue of the Roman emperor Augustus, and bringing it back to Kush. They buried it under the doorway of a temple in the capital, so that worshippers would step on it as they crossed the threshold. After brokering peace with the Romans, Kush continued to prosper. Over time, however, groups of people called the Noba raided from the west, and trade routes were disrupted by the rising kingdom of Aksum. Around 350 CE, the Aksumite king sacked Meroe, effectively bringing Kushite rule to an end. Since then, some have argued that Kush's history has been overlooked by generations of European and American scholars who promoted the idea that Egypt was part of the origin of Western civilization, while Kush, as an African culture, was excluded. Today, there's still much to learn about Kush—including a writing system we haven't deciphered fully.

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翻译人员: Yuwei Wu 校对人员: Helen Chang 沿着尼罗河, 现在的苏丹北部, 蕴含着古库什文明。即使曾经他们被强大的邻居征服, 古库什的国王和女王也会挑战在历史中最具统治力的两个帝国。公元前 1500 年到 1100 年, 埃及控制着古库什, 带来了许多埃及文化的宗教习俗。那时的古库什文明 已经超过了一千年。早期的首都科马有着 威风的寺庙、宫殿和房屋, 其中包含一座巨大的泥砖寺庙, 寺庙深处有一个小教堂, 可以通过中心的楼梯到达。丰富的金矿帮助库什人 建立了繁荣的商业网络, 制造青铜武器与工具, 还交易熏香、兽皮、象牙乌木等, 来自撒哈拉以南的材料。随着埃及陷入内战, 库什的情况开始发生变化。到公元前 750 年, 埃及被划分为 具有波动联盟的地方皇室。库什特王 Piankhy 看到了机会。他让他的海军, 两侧是骑手和弓箭手, 沿着尼罗河到达门户城市赫梅努。当 Piankhy 的军队 建造攻城坡道和战塔时, 这座城市的统治者 派他的妻子和女儿去谈判——不是和 Piankhy, 而是和他王室的女人谈判, 她们后来被称为坎达克, 在军事事务和政治继承上极具影响力。在一场漫长的围城战结束后, Piankhy 进入了这座被征服的城市, 并严厉批评了马厩的条件。从那里, Piankhy 和 Kushite 军队占领了埃及首都孟菲斯。Piankhy 将他的妹妹 Amunirdis 安置在埃及城市底比斯 担任大神 Amun 的女祭司, 并在返回库什之前 将其他库什派官员留在那里。他的继任者将控制 一直延伸到尼罗河三角洲。这是库什帝国的鼎盛时期:贸易繁荣, 他们沿着尼罗河 建造了宏伟的庙宇、宫殿和金字塔坟墓。但亚述人的军队 在每年一次的战役中逼近埃及。当亚述人开始侵占耶路撒冷 附近的贸易通道时, 库施王塔哈尔卡采取行动阻止他们。亚述人在一些反叛的 埃及王子的帮助下打败了他, 并在公元前 7 世纪将他驱逐出埃及。库施人继续在他们的家乡 统治了近 1000 年, 那里繁荣而富有创新精神。他们将首都迁往更南方的梅罗伊城, 在那里建造了一座神庙, 供奉一位名叫阿佩德马克的新神。他们在撒哈拉沙漠南部的大草原上建造了新的城市, 其中一些城市有巨大的蓄水池。当罗马帝国在公元前 31 年征服埃及时, 库施人的军队再次北上, 由女王阿马尼亚娜斯率领。她带领他们在与罗马人的 战斗中取得了胜利, 夺取了罗马皇帝奥古斯都的青铜头像, 并将它带回了库什。把它埋在首都一座寺庙的门洞下面, 以便朝拜者跨过门槛时可以踩上它。在与罗马人达成和平协议后, 库什继续繁荣。然而, 随着时间的推移, 一群叫做 Noba 的人从西部发动袭击, 贸易路线被崛起的阿克苏姆王国中断。大约在公元 350 年, 阿克苏姆国王洗劫了梅罗, 有效地结束了库施的统治。从那以后, 一些人认为库什的历史被几代欧洲和美国学者忽视了, 他们宣扬埃及是 西方文明起源的一部分, 而库什这非洲文化被排除在外。至今, 关于库什 还有很多东西需要了解——包括我们还没有完全破译的书写系统。

P100 2021-10-12 Where will you be able to live in 20 years - Carol Farbotko and Ingri

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=100>)

Mohammadpur has always had a unique relationship with the weather. Located at the mouth of the Bay of Bengal, this coastal village was built on top of the Meghna River delta. Deltas are a kind of landmass formed when sediment carried by rivers is deposited where that river meets a larger body of water. River deltas are incredibly fertile ecosystems capable of supporting abundant agriculture and marine life. However, their borders gradually change as rivers bring more sediment in and storms wash sediment away. The residents of Mohammadpur are well accustomed to managing the ebbs and flows of this ever-shifting landscape. But lately, an abundance of intense cyclones have caused frequent flooding that impedes farming and

fishing. These floods also erode the coastline, allowing later storms to wipe away land altogether. Since 2000, the Meghna River has overtaken the coastline by 2.5 kilometers, forcing many villagers to move inland or to nearby cities. Mohammadpur isn't the only place where erratic weather is impacting people's mobility. Repeated typhoons in the Philippines have displaced thousands from their homes. In Fiji, the government is already moving many coastal villages inland to get ahead of predicted land loss. And in the United States, melting permafrost is causing chunks of the Alaskan coastline to erode. In some ways, this is nothing new. Humanity has always adapted to changing weather and moved to regions that best support cultural lifestyles and livelihoods. However, scientists agree that this rise in extreme weather is a by-product of Earth's rapidly changing climate. Global warming increases the frequency and intensity of storms, flooding and drought, while also melting polar ice caps and raising sea levels. These factors are changing the environment much faster than they have in the past. Even for communities with the resources to take action, the variable pace and nature of these changes makes them difficult to adapt to. And the vulnerable populations most impacted by climate change are often those least responsible. Many facing climate mobility live in farming and fishing communities in countries that generate dramatically fewer emissions than their larger counterparts. Bangladesh is one such country. The nation has a unique combination of low-lying geography and heavily populated coastal regions. Most of these vulnerable coastal families, like those in Mohammadpur, don't want to abandon their homes and livelihoods. And for others, leaving Bangladesh isn't financially practical. So to stay with their communities, many have moved a few meters inland and built more resilient homes on higher ground or elevated stilts. Others have tried to buy land on newly emerging islands in the delta, while some have sent family members to find work in nearby cities. A handful of individuals might even cross international borders, if they have family, friends, or work connections on the other side. But many of the residents who've left are eager to return home. Unfortunately, it's unclear when weather extremes will die down, and the government has repeatedly delayed projects to build concrete embankments that would prevent further erosion. In other parts of the world, people couldn't move inland even if they wanted to. The low-lying Pacific Island nations of Kiribati and Tuvalu are only 811 square kilometers and 26 square kilometers, respectively; so migration would mean moving to a different country altogether. Instead, their governments and citizens have united in physically, legally, and politically fortifying their countries. Island residents are planting coastal mangrove forests, and building up low-lying areas of land with dredged sand to shield themselves against storms and rising sea levels. And the islands' governments have repeatedly lobbied on the global stage for countries with the highest emissions to reduce pollution and take responsibility for climate change. The challenges facing each coastal community are unique, and the diversity of the people's experiences can make climate mobility a difficult phenomenon to measure and define. But as new communities are endangered by extreme weather, it's more important than ever to listen to those on the front lines of this crisis.

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翻译人员: Meiqi Jia 校对人员: Helen Chang 穆罕默德布尔与天气 总是有一种特别的关系。坐落在孟加拉湾的河口, 这个沿海小镇建于 梅克纳河三角洲之上。三角洲是河流流入海洋时, 因所携带泥沙大量沉积, 逐渐发展成的冲积平原。河流三角洲有着非常富饶的生态系统, 足以支持大量的农作物与海洋生物。但是由于河流携带更多的沉积物, 同时风暴冲刷走沉积物, 导致边界的变化。穆罕默德布尔的居民已经适应了与这个不停变化的景观并存。但是最近大量的强旋风 导致了频繁的洪水, 阻碍了农业与捕鱼。这些洪水腐蚀了海岸线, 让后续的风暴冲刷走整块地。自 2000 年起, 梅克纳 已经超过海岸线 2.5 千米, 大量村民被迫搬到内陆或临近的城市。穆罕默德布尔并不是唯一一个因为受恶劣天气 而影响人们迁徙能力的地方。菲律宾反复的台风 导致数千人无家可归。在斐济, 政府已经在准备 将海滨村庄迁移内陆, 避免未来的土地流失。在美国, 融化的永冻层导致了 阿拉斯加海岸线的腐蚀。某种程度上, 这不是新鲜事。人类总是可以适应多变的天气, 并且迁移到可以最好的支持 文化习性和生机的地方。即便如此, 科学家们认为地球快速的天气变化导致了更多的极端天气。全球变暖加剧了风暴, 洪水和干旱的频率与强度, 还导致了融化极地冰川 和升高海平线。相较过去, 这些因素在更快地改变环境。即便对于那些有资源去行动的群体, 这些改变多变的速度与本质 使他们很难去适应。那些最被气候变化所影响的弱势群体往往责任是最小的。很多被气候多变所影响的人居住 在农业和捕鱼的群体, 这些国家相较于同行生产显著低的排放量。孟加拉国就是这样的国家。这个国家由独特的低洼地理和 人口密集沿海区域的组成。大多数弱势沿海家庭, 和穆罕默德布尔一样, 不希望抛弃他们的家与生计。对于其他人来说, 离开孟加拉国在经济上是不现实的。为了可以和他们的群体在一起,

很多需要向内陆迁移，并在更高的地方建造结实的房屋。其他人尝试在新起的三角洲内陆购买陆地，与此同时很多人将家庭成员 送到邻近的城市寻找工作，很多人甚至跨越了国际边界，如果在另一边有他们的家庭，朋友，或者工作联系。但是很多离开的居民都迫切的想要回家。不幸的是，还不确定 极端天气什么时候会停止，并且政府一直拖延了修建 可以防止腐蚀的河坝的项目。在世界的其他地方，即便人们想向内陆迁移也不可行。低洼的太平洋岛国基里巴斯和图瓦卢分别占地面积 只有 811 平方千米和 26 平方千米。所以迁移将代表 搬到了一个完全不同的国家。取而代之，这些政府和公民在行动上，法律上和政治上 团结一致去保卫他们的国家。岛民们在种植沿海红树林，并且用疏浚砂建造低洼地区，以防风暴和海平面上升。这些岛屿政府反复地在全球游说那些造成高排放量的国家， 让他们减少污染，并且为气候变化负责。这些沿海群体所面临的挑战是特殊的，并且人们多样的经历 会让气候多变难以衡量与定义。但是当更多的群体被极端天气所危害，我们比任何时候都应该听从 那些站在危机前线的人。

P101 2021-10-14 Can love and independence coexist - Tanya Boucicaut

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=101>)

Baritone thunder. Snarling winds. Consuming downpours. Okeechobee, the disastrous hurricane of 1928, tore through the North Atlantic basin, laying waste to entire communities. In Eatonville, Florida, the storm forced many to flee. But for Janie Crawford, it inspired an unexpected homecoming. Janie's return begins "Their Eyes Were Watching God," Zora Neale Hurston's acclaimed novel about a Black woman's quest for love and agency in a time that sought to deprive her of both. When Janie arrives back in Eatonville, her arrival is shrouded in mystery. Her neighbors and friends are quick to gossip about her reappearance, her finances, and most importantly, the whereabouts of her missing husband. But only Janie's friend Pheoby gets to hear the whole story. Over the course of a conversation that spans most of the novel, Hurston untangles Janie's life story; from her complicated childhood and her life in Eatonville, to her scandalous departure and the shocking events that followed. The specifics of Janie's story are often larger than life, but many of the book's details reflect the incredible experiences of its author. Zora Neale Hurston was raised in Eatonville, one of the first planned and incorporated all-Black communities in America. Like Janie, she also left Eatonville abruptly, traveling first to Jacksonville and DC, before eventually moving further north. In New York City, Hurston studied anthropology and became a renowned author in the Harlem Renaissance, a cultural, literary and artistic movement that's still considered a golden era of Black artistry and creativity. Here, her work garnered enough support to fund research trips through the South, where she collected stories and folktales from Black Americans. By 1937, her fieldwork had taken her all the way to Haiti, where she wrote most of "Their Eyes Were Watching God." Hurston drew on all these experiences for the novel, incorporating folkloric elements alongside her own family and romantic history to bring readers into the intimate spaces of Black southern life. She uses regional phrases and sayings to capture the dialect of her Floridian characters. And the novel's omniscient third-person narration allows Hurston to unleash her poetic prose on everything from birdsong, architecture, and fashion, to her characters' deepest feelings and motivations. Perhaps more than any specific details, Hurston's experiences of being a Black woman in America at this time are more evident in the novel's themes. Over the course of one long evening, Janie and Pheoby discuss the nature of family, marriage, spirituality and more. But their conversation always comes back to Janie's truest desire: to live honestly and be truly loved in return. As a teenager, Janie resents an arranged marriage, despite the safety it offers her and the wishes of her loving grandmother. When her family becomes well-respected in Eatonville, she struggles with the judgmental eyes of strangers and a husband who wants her to be something she's not. Throughout her life, Janie frequently feels she's at the whim of natural and spiritual forces that can shift the course of her existence without warning. And when she finally does find true love, these unknowable powers continue to act on her, threatening to destroy the life she's so painstakingly built. The story takes place during a time where women had little to no agency, and Janie's life is full of complicated characters who demand different kinds of love and submission. But despite the loneliness of her situation, Janie navigates these trials with defiance and curiosity. Her questions and commentary push back in subtle, clever ways. And as the reader follows Janie's journey from childhood to middle age, her confidence becomes infectious. Just like Hurston, Janie defies the restrictive expectations for a woman in her time. Early in the novel, Hurston writes that "there are years that ask questions and years that answer," suggesting that life can only truly be understood by living it. But through her empathetic storytelling, Hurston invites us into Janie's life, her life, and the lives of so many other women.

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翻译人员: ranning tang 校对人员: Helen Chang 电闪雷鸣, 狂风大作, 暴雨倾泻。1928 年, 一场灾难性的 飓风——奥基乔比肆虐美国北部盆地, 到处废墟遍地。在佛罗里达的伊顿维尔, 许多人因为飓风而背井离乡。但是对于 Janie Crawford 来说, 这却让她意外地踏上了返乡的旅程。佐拉·尼尔·赫斯顿的著名小说 《他们眼望上苍》就从 Janie 的这次返乡开始讲起, 讲述一位黑人女性在被压抑的时期 仍然追寻爱与权利的故事。当 Janie 重新抵达伊顿维尔时, 她的回归笼罩了一团神秘的色彩。她的邻居和朋友很快地长舌闲话她的回归、经济状况, 但最议论纷纷的 则是她失踪的丈夫的下落。不过只有 Janie 的朋友 Phoeby 有机会听到事情完整的经过。在持续了几乎整本小说的对话过程中, Hurston 整理了 Janie 的一生, 从她的复杂的童年生活 和她在伊顿维尔的生活, 一直到那次可耻的离开 和随之而来的骇人听闻的事件。当然, Janie 的故事经过艺术加工, 但是书中的许多细节却真实地反映着 作者不可思议的人生经历。Hurston 同样在伊顿维尔长大, 伊顿维尔也是美国第一个 全黑人的社区。和书中的 Janie 一样, 她也突然离开了伊顿维尔, 路途中经过了 Jacksonville 和华盛顿特区, 最终向更远的北方走去。在纽约, Hurston 学习了人类学并且成为了美国黑人 哈林区文艺复兴时期的著名作家。这个时期对于黑人的艺术创作来说可以称得上是文艺运动的黄金年代。也正是在这个时期 她的作品获得了足够的支持, 让她有财力完成在南部的研究之旅。在那里, 她沿途收集了 美国黑人更多的故事和民间传说。直到 1937 年, 她的实地 研究之旅来到了海地, 也就是她完成《他们眼望上苍》 这本书的地方。赫斯顿在小说中 利用这次实地考察的经验, 并且很好地融合了民间元素 与她自己家庭的故事, 还有浪漫的历史, 让小说读者和南方黑人的生活 进行了一次亲密接触。她在小说中运用了方言和俚语来展现她佛罗里达人的一面。小说以全知的第三人称视角展开叙述, 这也让赫斯顿可以 尽情使用她诗情画意般的语言, 来描绘从鸟鸣、建筑、时尚, 一直到她角色内心中 最深处的感受和需求。但或许与这些细节相比, 赫斯顿在当时的美国 作为黑人女性的经历在小说的主题中更是体现得淋漓尽致。在那个持续了整整一个傍晚的对话中, Janie 和 Pheoby 聊起了 家庭、婚姻、精神等等。但种种话题最后都回归到 Janie 内心中最真实的诉求: 真实地活着, 同时也被真实地爱着。年轻的时候, Janie 一直 对包办婚姻感到愤恨, 尽管它让人很有安全感, 同时也是深爱她的外婆的愿望。而当她的家庭在伊顿维尔 变得受人尊敬时, 她也曾在陌生人和丈夫的 评头论足中彷徨过, 因为他们都希望她成为 完全不像她自己的另一个人。在 Janie 的一生中, 她时常感觉到大脑被一些来自自然的 精神世界的力量所控制, 而这些力量能毫无预兆 改变她的人生进程。所以当她们最终找到真爱的时候, 这些未知的力量完全占据了上风, 威胁着要破坏她煞费苦心 建立起来的现在生活。这一切都发生在一个 女性得不到任何机构帮助的年代, 而 Janie 的生活中 却又充满错综复杂的人物, 以至于她需要来自不同人的 不同的爱和建议。但是尽管她一直孤身一人, 她仍然用她的反叛精神和好奇心 来应对一切。她提出的问题和评论 总能用最巧妙的方式回击。所以当读者跟随着 Janie 重温了她从童年到中年的成长经历, Janie 的自信心 也能感染到每一个读者。就像赫斯顿一样, Janie 同样藐视对于当时每一个女人的设限的期待。在小说的开头, Hurston 写到“总有疑惑的岁月 但也一定有明朗的时候”, 这也表明, 只有坚强地活下去 才能更好理解生活。但是通过她富有共鸣的讲述, Hurston 带领我们走入了 Janie 的一生, 她自己的一生, 同时又是千千万万的女人的一生。

P104 2021-10-21 Why is this 2,500 year old shipwreck so well-preserved - Helen Farr a[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=104>)

It's midnight on September 16th, 2017, 60 kilometers off the Bulgarian coast and 2 kilometers beneath the Black Sea's surface. A remotely operated vehicle surveys the seabed, transmitting video to researchers above as it goes. Suddenly, it discerns another ghostly vessel in the gloom. But this is a relic from another age. It's an undoubtedly ancient shipwreck, but its mast, rowing benches, and some of its upper deck remain eerily intact. It might be an ancient Roman ship, but its appearance doesn't quite match. Notably, its splayed rudder blade more closely resembles those depicted on an even older Greek vase. To get a definitive answer, the research team takes three samples from the wreck and radiocarbon dating confirms its ancient origins. The ship is dated to between 350 and 410 BCE. It is, in fact, the oldest intact shipwreck ever found. This ancient Greek vessel traversed the Black Sea's coasts during the time of Aristotle and has since rested in its depths, unseen and undisturbed, for almost 2,500 years. This was just one of 65 shipwrecks a research team discovered at the bottom of the Black Sea between 2015 and 2017. Others date from the Roman, Byzantine, and Ottoman empires. And despite the centuries, they've all survived in remarkable condition. So, why does the Black Sea contain so many well-preserved shipwrecks? In prehistoric times, the

land surrounding the Black Sea hosted early human settlements. Eventually, it became a hub for trade, battle, and empire-building because of its strategic position between eastern and western Eurasian civilizations. For thousands of years, it was traversed by merchants, pirates, and warriors. And with sustained seafaring activity came inevitable losses. But unlike other bodies of water in the region, the Black Sea is a particularly deep, semi-enclosed basin. Seasonal changes usually cause the layers within a contained body of water to mix together, oxygenating the water. But because the Black Sea is fed with fresh water from European rivers, and saltwater from the Mediterranean Sea, it contains two distinct layers. The denser saltwater flows beneath the freshwater, where it remains permanently, making the Black Sea the world's largest meromictic—or un-mixing—basin. Oxygen doesn't reach its lower, saltier zone, which creates the ideal environment for preservation, and is why the Black Sea has been called “the world's biggest pickle jar.” In other bodies of water, marine organisms decompose materials over time. Had the ancient Greek ship sunk in the Mediterranean, for example, there would likely be no organic material left today. But in the depths of the Black Sea, only anaerobic bacteria—those that don't require oxygen—can survive. This is why ancient ships can still be found carrying their original cargo, with carvings in their wood, and their rigging still assembled. Among the recent findings was a medieval Italian merchant ship, likely from around the time Italy had a virtual monopoly over Black Sea trade. Venetian traveler Marco Polo would've probably been familiar with this kind of ship. Although vessels like this one helped to modernize Europe, contemporary scholars had never before seen such a complete example. And it was largely intact—a ship's boat still lying on its deck, even though some seven centuries had passed. Many of the 65 ships that were recently uncovered have retained their original forms. But while there are far fewer degradative forces at play in the Black Sea's depths, anaerobic bacteria do gradually weaken organic materials. When researchers lifted a plank from the ancient Greek wreck for dating, it broke under its own weight. While the ships are exceptionally well-preserved, they're also fragile. This makes it impossible to bring them to the surface intact. Scientists may carefully remove and study select objects from the wreckages. But the sunken ships will remain protected where they are, perhaps among thousands of others—deep beneath us, suspended in time, at the bottom of the Black Sea.

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翻译人员: Zizhuo Liang 校对人员: Helen Chang 2017 年 9 月 16 日午夜, 距离保加利亚海岸 60 公里的黑海海平面下 2 公里处, 一个远程操作的 探测器正在探测海床, 向在地表的研究人员传送视频。忽然, 它在黑暗中发现了 另一个幽灵般的容器。但这是另一个时代的遗物。这无疑是一艘古老的沉船, 但它的桅杆、划艇凳和一些 上层甲板完好地令人惊悚。这可能是一艘古罗马时期的船, 但它的外观并不完全匹配。值得注意的是, 它的八字舵叶片更像那些画在更古老的 希腊花瓶上的图案。为了得到明确的答案, 研究小组从沉船上采集了三个样本放射性碳年代测定 证实了它的古老起源。这艘船的年代 在公元前 350 年到 410 年之间。事实上, 这是迄今为止发现的 最古老且完整的沉船。这艘古希腊船只曾在 亚里士多德时期横穿黑海海岸。从那时起, 它就永远的栖息在了深处, 从未发现, 从未被干扰, 将近 2500 年了。这只是一个研究小组发现的 在 2015 年至 2017 年间在黑海海底发现的 65 起沉船中的一艘。另一些沉船起源于罗马、拜占庭和奥斯曼帝国。尽管经历了几个世纪, 它们都在 非凡的条件下生存了下来。那么, 为什么黑海有这么多 保存完好的沉船? 在史前时代, 黑海周围的土地是 早期人类住区的所在地。最终, 它成为了贸易、战争和帝国建设的中心, 因为它的战略地位位于欧亚大陆东西方文明之间。几千年来, 商人、海盗和战士们一直横穿此地。持续的航海活动 带来了不可避免的损失。但与该地区的水体不同, 黑海是一个特别深的半封闭盆地。季节性变化通常会导致 水体中的分层混合, 并与氧气结合。但由于黑海是由欧洲河流的淡水 和地中海的盐水组成的, 因此它包含两个不同的层。密度更高的盐水在淡水下流动, 并在淡水下永久存在, 这使黑海成为世界上最大的 半冰期或非混合盆地。氧气没有到达较低的含盐区域, 为船只的保护创造了理想的环境, 这也是黑海被称为 “世界上最大的泡菜罐” 的原因。在其他水体中, 海洋生物会 随着时间的推移分解物质。例如, 如果古希腊船只 沉没在地中海里, 可能今天就没有剩余的有机物质了。但在黑海深处, 只有不需要氧气的 厌氧细菌才能生存。这就是为什么人们仍然可以发现 古代船只所携带的原始货物, 木头上的雕刻, 和仍然组装在一起的索具。在最近的发现中, 有一艘中世纪的意大利商船, 很可能来自于在意大利 几乎垄断黑海贸易的时期。威尼斯旅行者马可波罗可能对这种船很熟悉。虽然像这样的船只 曾帮助欧洲走向现代化, 当代学者从未见过 保存如此完好的例子。它基本上完好无损——一艘船的小艇仍躺在它的甲板上, 尽管已经过去了大约七个世纪。最近被发现的 65 艘船中有很多保留了原有的形式。但尽管黑海深处 起降解作用的力量极少, 厌氧菌也确实会逐渐削弱有机物质。当研究人员

从古希腊残骸中 取出一块木板进行年代测定时，它因承受不了 自己的重量而破碎了。虽然这些船只保存得非常完好，但同时它们也很脆弱。这使得它们不可能 被完好无损地打捞上岸。科学家们可能会小心地从残骸中 移除并研究选定的物体。但沉船会继续留在 它受保护的海底，也许与上千只沉船一起 ——在我们脚下的深处，在黑海海底，继续被时间所冻结。

P105 2021-10-26 The surprisingly long history of electric cars - Daniel Sperling and

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=105>)

If you were buying a car in 1899, you would've had three major options to choose from. You could buy a steam-powered car. Typically relying on gas-powered boilers, these could drive as far as you wanted— provided you also wanted to lug around extra water to refuel and didn't mind waiting 30 minutes for your engine to heat up. Alternatively, you could buy a car powered by gasoline. However, the internal combustion engines in these models required dangerous hand-cranking to start and emitted loud noises and foul-smelling exhaust while driving. So your best bet was probably option number three: a battery-powered electric vehicle. These cars were quick to start, clean and quiet to run, and if you lived somewhere with access to electricity, easy to refuel overnight. If this seems like an easy choice, you're not alone. By the end of the 19th century, nearly 40% of American cars were electric. In cities with early electric systems, battery-powered cars were a popular and reliable alternative to their occasionally explosive competitors. But electric vehicles had one major problem— batteries. Early car batteries were expensive and inefficient. Many inventors, including Thomas Edison, tried to build batteries that stored more electricity. Others even built exchange stations in urban areas to swap out dead batteries for charged ones. But these measures weren't enough to allow electric vehicles to make long trips. And at over twice the price of a gas-powered car, many couldn't afford these luxury items. At the same time, oil discoveries lowered the price of gasoline, and new advances made internal combustion engines more appealing. Electric starters removed the need for hand-cranking, mufflers made engines quieter and rubber engine mounts reduced vibration. In 1908, Ford released the Model T; a cheap, high-quality gas-powered car that captured the public imagination. By 1915, the percentage of electric cars on the road had plummeted. For the next 55 years, internal combustion engines ruled the roads. Aside from some special-purpose vehicles, electric cars were nowhere to be found. However, in the 1970s, the tide began to turn. US concerns about oil availability renewed interest in alternative energy sources. And studies in the 1980s linking car emissions with smog in cities like Los Angeles encouraged governments and environmental organizations to reconsider electric vehicles. At this point, car companies had spent decades investing in internal combustion engines without devoting any resources to solving the century-old battery problem. But other companies were developing increasingly efficient batteries to power a new wave of portable electronics. By the 1990s, energy dense nickel metal hydride batteries were on the market, soon followed by lithium-ion batteries. Alongside regulatory mandates by California to reduce smog, these innovations sparked a small wave of new electric vehicles, including hybrid cars. Hybrids aren't true electric vehicles; their nickel metal hydride batteries are only used to optimize the efficiency of gas-burning engines. But in 2008, Tesla Motors went further, grabbing the attention of consumers, automakers, and regulators with its lithium-ion-powered Roadster. This purely electric vehicle could travel more than 320 kilometers on a single charge, almost doubling the previous record. Since then, electric vehicles have vastly improved in cost, performance, efficiency, and availability. They can accelerate much faster than gas-powered sports cars, and while some models still have a high upfront cost, they reliably save their drivers money in the long run. As governments around the world focus on slowing climate change, electric vehicles are now expected to replace gas-powered ones altogether. In Norway, 75% of car sales in 2020 were plug-in electric vehicles. And policies such as California's Zero Emission Vehicle mandate and Europe's aggressive CO2 emission standards have dramatically slowed investments in gas-powered vehicles worldwide. Soon, electric cars will reclaim their place on the road, putting gasoline in our rearview.

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翻译人员: Zizhuo Liang 校对人员: Helen Chang 如果你要在 1899 年买一辆车，你会面临三个主要的选择。你可以买一辆蒸汽动力汽车，通常靠锅炉推动， 想要去多远都到得了，前提是你不介意携带 额外的备用补充水，也不介意

等 30 分钟烧水暖机。你也可以买一辆汽油驱动的汽车，然而这些车型的内燃机需要危险的手摇启动，行驶中还发出巨大的噪音和难闻的废气。所以你最好的选择可能是第三个选项：由电池驱动的电动汽车。这些车启动快、环保，且运行安静，如果你住在供电的地方，很容易在夜间充电。如果看似选择简单，并不只有你这么想。到 19 世纪末，近 40% 的美国汽车是电动的。在一些有早期电力系统的城市，电动汽车是一种受欢迎且可靠的替代品，与它们偶尔会爆炸的竞争对手相比。但电动汽车有一个主要问题——电池。早期的汽车电池既昂贵又低效。许多发明家，包括托马斯·爱迪生，试图制造能储存更多电能的电池。其他人甚至在城市地区建造电池交换站来更换没电了的电池。但这些措施还不足以让电动汽车长途旅行，而且售价是汽油车的两倍多，许多人买不起这些奢侈品。与此同时，石油的发现降低了汽油的价格，新的技术进步使内燃机更具吸引力。电子启动替代了手摇点火，消音器使发动机更安静，橡胶支座使发动机减少振动。1908 年，福特发布了 T 型车，这款廉价、高品质的汽油动力汽车攫取了公众的兴趣。到了 1915 年，公路上行驶的电动汽车的比例急剧下降。在接下来的 55 年里，内燃机主宰了道路。除了一些特殊用途的汽车，电动汽车几乎绝迹。然而，在 20 世纪 70 年代，潮流开始转向。美国对石油供应的担忧重新激发了人们对新能源的兴趣。20 世纪 80 年代洛杉矶等城市的汽车排放与雾霾有关的研究鼓励政府和环境保护组织重新考虑电动汽车。至此，汽车公司已经花了几十年投资于内燃机，却没有投入任何资源来解决长达一个世纪的电池问题。但其他公司正在开发越来越高效的电池为新蜂拥而至的便携式电子产品供电。到了 20 世纪 90 年代，市场上出现了高能量密度的镍氢电池，很快，锂离子电池也问世了。与加利福尼亚州减少雾霾的监管规定一起，这些创新引发了一波新的电动汽车的浪潮，这也包括混合动力汽车。混合动力车并不是真正的电动汽车：他们的镍氢电池仅用于优化燃油发动机的效率。但在 2008 年，特斯拉汽车公司进一步创新，其锂离子电池跑车吸引了消费者、汽车制造商和监管机构的注意力。这种纯电动汽车一次充电可以行驶 320 多公里这几乎是以前记录的两倍。从那以后，电动汽车在成本、性能和成本方面都大大提高了。它们的提速比汽油动力跑车快得多，尽管有些车型的前期费用仍然很高，从长远来看，它们确实为车主省了钱。随着世界各国政府对减缓气候变化的关注，电动汽车有望完全取代汽油驱动车。在挪威，2020 年 75% 的汽车销售是插入式电动汽车。加利福尼亚州等的零排放汽车法令和欧洲积极减排等政策极大地减缓了全球对汽油动力车的投资。电动汽车很快将重新占据它们在道路上的位置，超车汽油车，将其抛在后面。

P106 2021-10-28 The Norse myth that inspired “The Lord of the Rings” - Iseult Gillesp

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=106>)

The supreme god, Óðinn, was exploring the nine realms with his travel companions Hœnir, and the notoriously mischievous Loki. After a long journey, the three reached a waterfall in Niðavellir, the subterranean land of the dwarves, and stopped for water. Óðinn and Hœnir were eager to meet Hreiðmarr, the king of the dwarves, but Loki was bored and hungry. Spotting an otter nearby, Loki tossed a stone at its head, killing the animal. He kept its pelt and slouched after the others. When they greeted Hreiðmarr, the king paled, for the pelt belonged to none other than his shapeshifting son. Hreiðmarr summoned his two surviving sons, Fáfnir and Regin, and bound the gods. He decided he would let them go in exchange for gold, as was the custom, but only if they could fill the otter pelt with the finest gold until not even a hair was visible. Because of how the otter skin stretched, this meant procuring a nearly impossible amount—but Loki had an idea. The dwarves were master craftspeople. One of them, Andvari, was said to forge marvelous creations. Andvari often took the form of a fish and, one day, he dove deeper than ever before—so deep he reached the land of the water nymphs, who guarded mounds of gold. At first, Andvari merely wanted to see their treasures for himself. But when the nymphs laughed at his awkward appearance, Andvari grew infuriated and seized their gold. With it, he crafted himself a special ring. As long as he wore it, Andvari's wealth would grow and grow. Loki saw Andvari's riches as the perfect solution to their problem. He returned to the waterfall, conjured a huge net, and extracted a wriggling fish. As Andvari squirmed, Loki jeered that he'd kill him unless he handed over his treasure. Andvari directed Loki to his lair. Satisfied with the heaps of gold he saw there, Loki freed Andvari—but a sudden glint off of one of the dwarf's fingers alerted Loki that he'd missed the most powerful treasure of all. Despite Andvari's pleas, Loki tore the ring away. Seething, Andvari cursed the ring, declaring that it would be the doom of all its subsequent owners. Back at the palace, Andvari's gold appeared to completely cover the otter skin. But as Hreiðmarr inspected the pelt, he saw a single, bare whisker peeking out. So, the gods relinquished the ring. As Hreiðmarr slipped it onto his finger, Regin shuddered at the greed in his father's eyes, while his brother, Fáfnir, looked on in envy. Later, when Fáfnir demanded that the king share the wealth, Hreiðmarr refused. So, Fáfnir killed his father, pried the coveted ring from his finger, and fled the palace with the

treasure. He came to rest in a cave where he curled around his new possessions. The ring warped him inside and out, and over time, Fáfnir morphed into a gruesome dragon. Meanwhile, Fáfnir's betrayal and guarded treasure bore into Regin's mind. He finally enlisted the help of his loyal foster son, a warrior named Sigurd, to slay the monster his brother had become. Sigurd did as instructed. Afterwards, Regin asked Sigurd to roast the beast's heart so he could consume it. Sigurd obeyed and tasted the heart's blood before serving him. But as soon as the liquid met Sigurd's tongue, he understood the chatter of the surrounding birds. They were singing of but one thing: Regin was going to kill him. So, Sigurd slayed Regin and seized the wealth for himself. This was only the beginning. Over the coming years, the ring would tear families apart, doom lovers, and empower, then ultimately destroy, any who had it in their possession. Andvari's curse set a vicious cycle in motion that would consume many lives— and inspire some of the most influential works of the 19th and 20th centuries.

P106 2021-10-28 The Norse myth that inspired “The Lord of the Rings” - Iseult Gillesp

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翻译人员: Zizhuo Liang 校对人员: Helen Chang 至高无上的神奥丁 正和他的旅伴赫尼尔和臭名昭著的 爱恶作剧的洛基一起探索九界。经过长途旅行， 三人到达了矮人的地下土地，尼亚维尔的瀑布来取水。奥丁和赫尼尔渴望 见到矮人之王赫雷马尔，但是洛基又无聊又饿。洛基发现附近有一只水獭， 便向它头上扔了块石头，将其杀死。他下了它的毛皮， 跟在其他人后面没精打采地走着。当他们向赫雷马尔致意时， 国王脸色瞬间变得苍白因为毛皮不是别人的， 是他变形的儿子。赫雷马尔召见了他的 两个幸存的儿子法夫尼尔和雷金，并囚禁了众神。他答应放了众神，但按照惯例，他们要用金子作为交换，他要求众神用最好的 金子填满水獭皮，直到连一根头发都看不见为止。因为水獭皮肤具有伸展性，这意味着众神需要设法获得 一笔根本无法获得的黄金——但洛基有个主意。矮人是手工艺大师。他们中的一个叫安德瓦里的 矮人能创造出奇妙的作品。安德瓦里经常以 鱼的形式出现，有一天，他潜得比以往任何时候都深——深得可以到达 水仙女的土地，她们守护着成堆的黄金。起初，安德瓦里只是想 亲自看看她们的宝藏。但是当仙女们 嘲笑他笨拙的外表时，安德瓦里怒不可遏， 抢走了她们的黄金。他用这些黄金为自己 制作了一枚特殊的戒指。只要他戴着它， 安德瓦里的财富就会不断增加。洛基将安德瓦里的财富视为 他们决绝问题的完美方案。洛基回到瀑布边， 变出一张巨大的网，捉住了一条蠕动的鱼。安德瓦里蠕动着， 洛基嘲笑说他会杀了他除非他交出他的宝物。安德瓦里指引洛基去他的巢穴。洛基看到成堆的黄金十分满足，洛基于是放了安德瓦里——但是矮人指间发出的闪光提醒洛基他错过了 最强大的宝藏。尽管安德瓦里一再恳求， 洛基还是把戒指抢走了。怒不可遏的安德瓦里 诅咒了那枚戒指，宣布这将是其所有 后续拥有者的末日。回到宫殿，安德瓦里的黄金似乎完全覆盖了水獭的皮肤。但当赫雷马尔检查毛皮时，他看见一根光秃秃毛露了出来。于是，众神放弃了戒指 并把它给了赫雷马尔。当赫雷马尔把它放在手指上时，雷金对他父亲眼中的 贪婪感到不寒而栗，而他的兄弟法夫尼则嫉妒地看着他。后来，当法夫尼要求 国王分享财富时，赫雷马尔拒绝了。所以法夫尼杀了他的父亲，从父亲的手指上撬下那枚令人垂涎的 戒指，带着宝藏逃离了宫殿。他来到一个山洞里休息， 在那里他蜷缩在他的新财产周围。魔戒使他内外扭曲， 随着时间的推移，法夫尼变成了一条可怕的龙。与此同时，法夫尼的背叛 和守卫的宝藏在雷金的脑海中浮现。他最终得到了他忠诚的养子， 一个名叫西格德的战士的帮助，杀死了他哥哥变成的怪物。西格德按照指示做了。之后，雷金让西格德烤了野兽的心， 这样他就可以吃掉它了。西格德服从命令， 但在这之前他先尝了尝心脏的血。但当液体一接触到西格德的舌头，他便听懂了周围鸟儿 叽叽喳喳的叫声。他们唱的只有一件事：雷金要杀了他。所以，西格德杀了雷金 并为自己攫取了财富。这只是开始。在未来的几年里，这枚魔戒 将使家庭四分五裂，毁灭相恋中的人并赋予它所有者力量， 然后最终摧毁他们。安德瓦里的诅咒引发了一场 恶性循环，它将吞噬许多生命，并激发 19 世纪和 20 世纪 一些最有影响力的作品的创作。

P107 2021-11-02 How to get better at video games, according to babies - Brian Christi

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=107>)

In 2013, a group of researchers at DeepMind in London had set their sights on a grand challenge. They wanted to create an AI system that could beat, not just a single Atari game, but every Atari game. They developed a system they called Deep Q Networks, or DQN, and less than two years later, it was superhuman. DQN was getting scores 13 times better than professional human games testers at “Breakout,” 17 times better at “Boxing,” and 25 times better at “Video Pinball.” But there was one notable, and glaring, exception. When playing “Montezuma’s Revenge” DQN couldn’t score a single point, even after playing

for weeks. What was it that made this particular game so vexingly difficult for AI? And what would it take to solve it? Spoiler alert: babies. We'll come back to that in a minute. Playing Atari games with AI involves what's called reinforcement learning, where the system is designed to maximize some kind of numerical rewards. In this case, those rewards were simply the game's points. This underlying goal drives the system to learn which buttons to press and when to press them to get the most points. Some systems use model-based approaches, where they have a model of the environment that they can use to predict what will happen next once they take a certain action. DQN, however, is model free. Instead of explicitly modeling its environment, it just learns to predict, based on the images on screen, how many future points it can expect to earn by pressing different buttons. For instance, "if the ball is here and I move left, more points, but if I move right, no more points." But learning these connections requires a lot of trial and error. The DQN system would start by mashing buttons randomly, and then slowly piece together which buttons to mash when in order to maximize its score. But in playing "Montezuma's Revenge," this approach of random button-mashing fell flat on its face. A player would have to perform this entire sequence just to score their first points at the very end. A mistake? Game over. So how could DQN even know it was on the right track? This is where babies come in. In studies, infants consistently look longer at pictures they haven't seen before than ones they have. There just seems to be something intrinsically rewarding about novelty. This behavior has been essential in understanding the infant mind. It also turned out to be the secret to beating "Montezuma's Revenge." The DeepMind researchers worked out an ingenious way to plug this preference for novelty into reinforcement learning. They made it so that unusual or new images appearing on the screen were every bit as rewarding as real in-game points. Suddenly, DQN was behaving totally differently from before. It wanted to explore the room it was in, to grab the key and escape through the locked door—not because it was worth 100 points, but for the same reason we would: to see what was on the other side. With this new drive, DQN not only managed to grab that first key—it explored all the way through 15 of the temple's 24 chambers. But emphasizing novelty-based rewards can sometimes create more problems than it solves. A novelty-seeking system that's played a game too long will eventually lose motivation. If it's seen it all before, why go anywhere? Alternately, if it encounters, say, a television, it will freeze. The constant novel images are essentially paralyzing. The ideas and inspiration here go in both directions. AI researchers stuck on a practical problem, like how to get DQN to beat a difficult game, are turning increasingly to experts in human intelligence for ideas. At the same time, AI is giving us new insights into the ways we get stuck and unstuck: into boredom, depression, and addiction, along with curiosity, creativity, and play.

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翻译人员: psjzmz mz 校对人员: Helen Chang 2013 年一群伦敦 DeepMind 公司的研究者把目光放在一大挑战上。他们想要创建一个人工智能系统, 不仅能胜一个, 而是能够全部完胜雅达利 (Atari) 游戏。他们开发了个名叫 强化学习的网络 (DQN), 在不到两年, 它超越人类。DQN 打砖块游戏 (Breakout) 的得分比人类专业游戏玩家高 13 倍, 在拳击游戏中高 17 倍, 在电子弹珠台中高 25 倍。但有一很明显的例外。玩游戏《Montezuma's Revenge》时, DQN 一分都拿不到, 即便玩了几周后。是什么让这个特别的游戏 对人工智能这么难胜? 需要采取什么来解决它? 剧透警告: 婴儿。我们 1 分钟后回来。人工智能玩雅达利游戏 涉及到强化学习, 在这里系统被设计为 最大化某种量化的奖励。在这个例子中, 这些奖励是游戏分数。这个潜在的目标驱使系统 学习按哪个按键以及何时去按来获得最高分数。一些系统使用基于模型的方法, 它们有一个环境的模型这样它们就能用来预测 一旦它们采取特定行动后, 下一步会发生什么。然而, DQN 没有任何模型。与其明确地建模环境, 它只需要基于屏幕上的图像学习预测, 它们按不同的键能够 期望获得多少分数。例如, "如果球在这里, 我向左移就得更多的分数, 但如果向右移就不得分。" 但学习这些联系需要大量的试错。DQN 系统从随意敲按键开始, 然后慢慢拼凑 何时需要敲哪个按键才能够得到最高分。但在玩《Montezuma's Revenge》时, 这种随意敲按键的方法彻底失效了。玩家得做完这整个序列动作才能最终得到第一分。犯个错误? 游戏结束。那么 DQN 如何知道它在正确的道路上? 婴儿上场的时候到了。在研究中, 婴儿看没见过的图片要比见过的图片花更多的时间。新奇似乎就是某种内在奖励。这种行为对于理解 婴儿的心理至关重要。这正好也是玩好 《Montezuma's Revenge》游戏的秘密。DeepMind 研究人员找到 巧妙的方法将这种对新奇事物的偏好 插入到强化学习中。他们让不同寻常 或新的图片出现在屏幕中时与真正的游戏积分一样有奖励意义。突然之间, DQN 的行为 完全跟起初不一样了。它想要探索所处的房间, 去抓住钥匙并 通过锁住的门逃出去——不是因为这价值 100 分, 而是跟我们的理由一样: 去看看另一边有什么。通过这种新的激励, DQN 不仅 能够抓

住第一把钥匙——它还在 24 个房间中，探索了 15 个房间。但强调基于新奇的奖励有时候会带来比它解决的问题更多的问题。一个新颖性探索的系统 如果玩游戏太久最终会失去动力。如果这都是一直见过的，为什么还要去呢？换之，假如它遇到电视，它就会停下来。不断出现的新奇图像基本让人瘫痪。这个想法和启发是双向的。人工智能研究人员被一个问题困住了，比如如何让 DQN 打赢一个不同的游戏，逐渐变成了探索人类的思想智能。同时，人工智能给我们提供了新的视角，让我们了解如何陷入和摆脱困境：变得无聊、沮丧和上瘾，还有好奇心、创造力和玩乐。

P108 2021-11-04 Just add water - The garden insect that can turn into a plague - Jeff

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=108>)

The ravenous swarm stretches as far as the eye can see. It has no commanding general or strategic plan; its only goals are to eat, breed, and move on—a relentless advance that transforms pastures and farms into barren wastelands. These are desert locusts—infamous among their locust cousins for their massive swarms and capacity for destruction. But these insects aren't always so insatiable. In fact, most of the time desert locusts are no more dangerous than garden-variety grasshoppers. So what does it take to turn these harmless insects into a crop-consuming plague? Desert locust eggs are laid in the damp depths of desert soil, in arid regions stretching from North Africa to South Asia. During the dry weather typical in these ecosystems, desert locusts live a solitary lifestyle. Adolescent hoppers will spend a few lonely weeks foraging for plants, before growing wings, reproducing, and dying. But when a region receives an abundance of rain, the scene is set for a startling transformation. Increased moisture supports more vegetation for newly hatched hoppers to eat, leading large groups to feed in close proximity. The frequent contact stimulates their leg hairs, triggering the release of a hormone that causes them to actively cluster even closer. Gluttonous crowds of locusts produce huge amounts of poop, which carries a pheromone that furthers their transformation. The hopper's diet shifts to include plants with toxic alkaloids. Soon, the locusts take on a striking pattern that warns predators of their newly poisonous nature. Smaller groups merge into bands of millions, which mow down virtually all plant life in a kilometer-wide swath. Roughly every week they shed and expand their exoskeletons, growing to roughly 50 times their hatching weight in just one month. Finally, the metamorphosis is complete. The adults beat their translucent wings and take flight as a full-fledged locust swarm. In this gregarious phase, these long-winged, brightly colored creatures appear so different from their solitary counterparts that they were long thought to be a separate species. A typical swarm contains more locusts than there are humans on the planet, covering hundreds of square kilometers in a dense cloud. At these numbers, desert locusts easily overwhelm their predators. A large swarm can match the daily food intake of a city of millions, and flying with the wind, the insect invasion can travel up to 150 kilometers a day. This living tornado can also cross large bodies of water. In 1988, a swarm even managed to traverse the Atlantic Ocean. The locusts likely formed rafts to rest at night, before fueling up in the morning with a nourishing breakfast of their dead kin. While flying over land, they seek out moist soil to lay eggs. Swarming mothers transfer their gregarious condition to their offspring, making it likely that the next generation will form another swarm. This means that while an individual desert locust lives only three months, a plague can last up to a decade. The potential for a years-long plague isn't unique to desert locusts, but the region they inhabit makes the prospect particularly deadly. Their habitat spans some of the world's poorest countries, largely populated by people who grow their own food. By consuming crops and pastures, these insects directly endanger 10% of humanity. Fortunately, a desert locust plague doesn't last forever. When a wet period ends, vegetation becomes scarce and egg laying conditions decline. As existing swarms die off, new hatchlings spread out in search of food, creating enough distance to prevent solitary locusts from transforming. Human intervention can also help. Researchers use satellite imagery to identify regions at risk of becoming locust hotspots and alert local governments. While most countries fight back with chemical insecticides, some regions have found success using fungal diseases that are lethal to locusts but safe for people and the environment. Unfortunately, other modern practices are exacerbating the threat. Fields densely packed with a single crop are like a table set for locusts. And erratic weather caused by climate change makes swarms harder to predict. If we plan to discourage lonely locusts from becoming catastrophic crowds, humans need to cut carbon emissions, rethink our agriculture, and generally reconsider our own ravenous appetites.

P108 2021-11-04 Just add water - The garden insect that can turn into a plague - Jeff

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=108>)

翻译人员: Lexi Ding 校对人员: Helen Chang 肆虐的蝗虫成群结队，蔓延至天际。蝗群没有将帅，也无策略指导；它们的目标只有蚕食、繁衍，然后继续向前——残酷无情的蝗虫过境之后，牧场、农场全都沦为不毛之地。这是沙漠蝗虫——在蝗虫家族中臭名昭著因为它们数量庞大且破坏力惊人。但这类昆虫并非总是如此贪得无厌。事实是，大多数时间，沙漠蝗虫并不比花园中的蚱蜢们危险多少。那么，是什么驱使这些无害的昆虫们酿成一场毁坏庄稼的蝗灾呢？在干燥的北非到南亚一带，沙漠蝗虫将卵产在潮湿的沙漠土壤深处。在这些生态系统中典型的干燥天气里，沙漠蝗虫过着孤独的生活。幼蝗虫会独自生活几周，孤单地寻觅植物，然后会长出翅膀，繁衍后代，最后死去。但如果某个地区经历了一场充沛的降雨，这个场景则将迎来惊人的转变。增长的水汽滋养了更多植被，新生的蝗虫有了更多的食物，导致大群蝗虫在邻近区域觅食。频繁的接触刺激了它们腿毛的生长，引发一种激素的释放，这种激素会导致它们主动聚集地更加紧密。贪吃的蝗虫们排出大量粪便，其中所含的一种信息素进一步促进它们的变化。幼蝗虫的饮食发生转变，它们开始吃含有有毒生物碱的植物。不久后，蝗虫的外表变得鲜艳这一变化警告捕食者们它们身上开始带有毒性。小蝗群融合成上百万只的大部队，像一把长达千米的镰刀，几乎将所经之处的植物收割殆尽。它们几乎每周都会褪一次壳，其外骨骼将会变大，短短一个月时间，就能长到约出生时的 50 倍重。最终，变形完成。成年蝗虫们扇动半透明的翅膀，随进化完全的蝗虫群一起飞去。在这一群居阶段，这群长翅、色彩明亮的生物与独居时期的蝗虫差异显著，以至于人们一直以为它们是两种物种。一个蝗群内的蝗虫数量一般比世界人口数量还多，面积可达上百平方公里，如乌云般遮天蔽日。数量如此巨大，沙漠蝗虫轻易便压制了其捕食者。一个大蝗群每日消耗的食物抵得上数百万人口的城市所需，顺着风向，蝗群每日可飞行高达 150 公里。这群活飓风还能飞越广阔的河流海洋。1988 年，一个蝗群甚至成功横穿大西洋。蝗虫们晚上大概会排成筏子一样来休息，早上它们会将亲属的尸体当作早餐，饱餐一顿补充能量。飞越陆地时，他们会寻找潮湿的土壤产卵。蝗群中的蝗虫妈妈们将群居的生活习惯传给后代，这样很可能它们的下一代又会组成下一个蝗群。这就意味着，尽管一只沙漠蝗虫的寿命只有三个月，一场蝗灾却可能持续十年。并非只有沙漠蝗虫有酿成数年蝗灾的可能，但它们生活的地区，使得蝗灾的影响尤其致命。它们生活的区域贯穿了若干世界上最贫困的国家，那里居住着大量种植庄稼自给自足的人。通过啃食农作物和牧草，这些蝗虫直接导致全球 10% 的人口面临死亡风险。幸运的是，沙漠蝗虫蝗灾并不会一直持续下去。当雨季结束，植被减少，产卵条件恶化。随着现有的蝗群逐渐消亡，新生蝗虫四散开来寻找食物，创造出足够大的距离，阻止这些独居的蝗虫们变化习性。人类干预也能起到作用。研究人员使用卫星影像来识别蝗灾风险区域，并向当地政府发出警告。在大多数国家使用化学杀虫剂对抗蝗灾时，一些地区使用能够杀死蝗虫的真菌病害成功地消灭了蝗灾，但其对人和环境无害。不幸的是，现代社会的一些做法加剧了蝗灾威胁。稠密地种植着单一作物的田野，就像给蝗虫摆放的餐桌。气候变化导致的多变天气，也使蝗灾更难预测。如果想要阻止散居的蝗虫演变成灾难性的蝗群，人类需要减少碳排放，重新考虑农业布局，以及再反思一下我们自己贪婪的口腹之欲。

P109 2021-11-09 Why do some people snore so loudly - Alayna Vaughan

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=109>)

A leather mask that clamps the mouth shut. A cannonball sewn into a soldier's uniform. And a machine that delivers sudden electrical pulses. These old items were all intended treatments for a problem that has haunted humanity for millennia: snoring. It might seem harmless, but snoring can be a sign of something more dangerous. So, what exactly causes snoring? And when does it become a problem? A snore's quality can range from a gentle mew to a stuttering chainsaw— but all snores originate from the respiratory tract, which is lined with soft tissues. During sleep, the muscles around these tissues relax, narrowing the airway. Many factors, including congestion, anatomical features, and the position you're sleeping in, can further constrict this passage and lead to or exacerbate snoring. The narrower the respiratory tract is, the stronger the airflow, and the more those relaxed tissues may vibrate, producing sound. Most of us will snore at some point in our lives. But loud, chronic snoring is one sign of a sleep disorder known as obstructive sleep apnea. It affects about a quarter of all adults, but it's estimated that around 80% of people who suffer from it aren't aware they have it. This is especially troublesome because it can lead to serious cardiovascular issues. Obstructive sleep apnea is usually caused by blockages in the airway and is mainly characterized by pauses in breathing during sleep. There's one other kind of sleep apnea called central sleep apnea, which occurs when the brain temporarily fails to regulate the body's breathing. This condition isn't as common, and snoring is usually a less prominent

feature— though you can have both. If you're experiencing obstructive sleep apnea, you might stop breathing for 10 or more seconds before waking, sometimes without realizing it, to catch your breath. In doing so, you might make a snorting or a choking sound. This may happen five times an hour, though in severe cases, it could occur more than 30. And it's a problem because your tissues are getting less oxygen. As you experience periods of low oxygen intake, your body releases stress hormones. And your blood vessels constrict to get oxygenated blood to your vital organs. This increases your blood pressure and puts additional stress on your heart. And this is why obstructive sleep apnea can be linked to hypertension and other cardiovascular problems. Your difficulty breathing and poor-quality rest may also lead to headaches, decreased concentration, and chronic fatigue. So what puts someone at risk of developing obstructive sleep apnea? Features like larger tongues, thicker necks, and smaller jaws can make people more susceptible. Older people are more at risk because, as we age, our soft tissues loosen, further narrowing our airways. Drinking alcohol before going to sleep can cause excessive relaxation of our throat and jaw muscles. And one of the main contributors to obstructive sleep apnea is weight gain because more tissue around the neck can constrict the airway. Many researchers see weight loss as a solution to obstructive sleep apnea. Certain behavioral shifts, like limiting your alcohol consumption before bed, elevating your head, and avoiding sleeping on your back may also help. For people who have a milder condition, mouth and throat exercises have been shown to alleviate obstructive sleep apnea in some preliminary trials. But these approaches, and devices like oral appliances, may not always be sufficient. Sleep apnea can be reliably treated using CPAP machines, which keep the airway open by delivering a constant stream of pressurized air. Doctors will usually aim to remedy sleep apnea with non-invasive treatments like these first, but if they don't work, they may consider surgery. Snores can be silly. But intense ones are well-worth investigating with a doctor. After all, everyone needs a chance to catch their breath— and some z's...

P109 2021-11-09 Why do some people snore so loudly - Alayna Vaughan

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翻译人员: Elena W 校对人员: Bruce Sung 夹住嘴巴的皮革面具。缝在士兵制服上的炮弹。还有一台能突然发出电脉冲的机器。这些旧物品都是为了治疗困扰人类几千年的问题:打鼾。打鼾看似无害,但它可能是个危险的征兆。那么,打鼾是什么原因导致的?什么时候算是有问题?鼾声的质量可以从轻柔的猫叫声到断断续续的电锯声——但所有的鼾声都起源于呼吸道,这里有软组织内衬。睡觉时,这些组织周围的肌肉会放松,使气道变窄。许多因素,包括充血、结构本身的特征、以及你的睡姿都可以进一步收缩气道,导致或加剧鼾症。呼吸道越窄,气流越强,那些松弛的组织就可能振动得更厉害,从而产生声音。我们大多数人在生命中的某个阶段都会打呼噜。但是大声、长期的鼾声是一种睡眠障碍的症状之一,被称为阻塞性睡眠呼吸暂停。它影响着大约四分之一的成年人,但据估计,这些人中的80%都不知道自己患有此病。这尤其麻烦,因为它可能会导致严重的心血管问题。阻塞性睡眠呼吸暂停通常由气道阻塞引起,主要特征是睡眠期间呼吸的暂停。另一种睡眠呼吸暂停叫做中枢性睡眠呼吸暂停,在大脑暂时无法调节身体的呼吸时发生。这个病没有那么常见,并且打鼾不是一个特别突出的特征——虽然两种睡眠呼吸暂停有同时出现的可能性。如果你正在经历阻塞性睡眠呼吸暂停,你可能会有10秒或更长的时间停止呼吸,有时是不知不觉地,然后醒来喘口气。过程中,你可能会发出鼾声或哽咽声。每小时可能发生五次,但在严重的情况下,能发生30多次。这是个问题,因为你的组织获得的氧气会越来越少。当你经历低氧摄入时,你的身体会释放应激激素。你的血管会收缩,将含氧血液输送到你的重要器官。这会增加你的血压,并给心脏带来额外的压力。这就是为什么阻塞性睡眠呼吸暂停会导致高血压和其他心血管疾病。呼吸困难和不足的休息质量也可能导致头痛、注意力下降和慢性疲劳。那么什么人患有阻塞性睡眠呼吸暂停的风险呢?舌头更大、脖子更粗、以及下颚更小等特征会让人更容易受到影响。老年人的风险更大,因为随着年龄的增长,我们的软组织会松动,进一步缩小我们的气道。睡前饮酒会使喉咙和下颚的肌肉过度放松。阻塞性睡眠呼吸暂停的主要原因之一是增重,因为颈部周围会有更多的组织收缩气道。许多研究人员将减肥视为阻塞性睡眠呼吸暂停的治疗方法。行为上的改变,比如睡前限制饮酒,睡觉时抬起头,避免平躺着睡觉也会有所帮助。对于病情较轻的人,一些初步的试验已证明口腔和咽喉的锻炼可以缓解阻碍性睡眠呼吸暂停。但这些方法以及口腔用具等设备不一定足够。使用CPAP机器可以有效地治疗睡眠呼吸暂停,通过提供稳定的压缩空气流保持气道开放。医生通常会先用非侵入性的方法来治疗睡眠呼吸暂停,但如果不起作用,他们可能会考虑手术。打鼾可能很傻。但严重的情况值得被医生查看。毕竟,每个人都需要喘气的机会——并小睡一会儿.....

P110 2021-11-11 The twins who tricked the Maya gods of death - Ilan Stavans

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=110>)

Day after day, the twin brothers, Jun and Wuqub, ran back and forth playing ball. One day, their vigorous game disturbed the lords of the underworld, who challenged the twins to a match. But when the brothers arrived, the lords trapped and killed them, hanging Jun's head from a tree as a trophy. The tree soon sprouted massive fruit, which caught the attention of one of the lords' daughters. When she reached for it, the skull of Jun spat on her hand and impregnated her. Fleeing of her father's wrath, she sought refuge with her mother-in-law and gave birth to twin sons: Junajpu and Ixb'alanke. The second generation of twins discovered their father's ballgame equipment, which their grandmother had hidden, and began to play. Soon enough, the messengers from the underworld arrived to issue another challenge. Knowing what had happened to their fathers, the twins nevertheless answered the call, trekking through deep caverns and across rivers filled with scorpions, blood, and pus, until they reached the great city from which the lords of the underworld controlled every aspect of nature and caused suffering for humans. The twins pressed on, searching for the lords who had challenged them. The lords had hidden among statues of themselves to confuse their guests, but the brothers sent a mosquito ahead of them. When it stung the figures, the lords cried out, revealing themselves. They forced the twins to spend the night in the House of Darkness. They gave them a torch, but warned they must return it unburnt or face death. As the darkness closed in, the quick-thinking brothers adorned the torch with red macaw feathers and fireflies. Come morning, the lords were shocked to see the torch lit, but unburnt. They insisted on playing the game with their own ball. The twins agreed, only to find that the lords had hidden a weapon inside the ball, which chased them around the court, trying to kill them. The twins survived that first round, but by now they were sure this would be no ordinary match. They played many more rounds, and each time the twins scored no better than a tie, leaving them to face whatever supernatural trial the lords set for them before picking up the game again. They survived the House of Cold by lighting a fire, and the House of Jaguars by feeding bones to the beasts. But in the House of Bats, a bat bit off Junajpu's head. Certain they now had the advantage, the lords called for another round of the ballgame, hanging Junajpu's head over the court. The quick-thinking Ixb'alanke called the animals to him. A turtle brought him a chilacayote squash, and he carved it into the likeness of a head. While the lords chased the ball, he swapped it with the head. With Junajpu's head back on his body, the twins played harder than ever. Finally, they won the game, hitting the hanging squash so it shattered on the ground. The twins knew their treacherous hosts would not take the loss well. To protect themselves, they enlisted a pair of seers. Sure enough, the lords burned the brothers in an oven, but the seers made sure their remains were thrown in the river, which restored them to life. The brothers then came before the lords disguised as two disheveled children and began to dance and perform miracles. For their final trick, Ixb'alanke pretended to kill Junajpu, then resurrect him. The lords were so delighted that they demanded the same trick be performed on them. Still in disguise, the brothers were only too happy to oblige, and began killing the lords one by one. As the surviving lords realized who stood before them and that no resurrection was forthcoming, they begged for mercy, and the twins spoke their curse. Henceforth, the lords would have no sacrifices and no power over the surface world. Their days of terrorizing humans were over.

P110 2021-11-11 The twins who tricked the Maya gods of death - Ilan Stavans

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=110>)

翻译人员: psjnz mz 校对人员: Helen Chang 一天又一天, 双胞胎兄弟, Jun (昏) 和 Wuqub (乌库夫), 跑来跑去玩球。有一天, 他们激烈的游戏 惊扰了地府的主人, 他向双胞胎发起了比赛的挑战。但当双胞胎到达时, 冥王设陷杀害了他们, 把昏的头挂在树上作为战利品。这棵树很快结出了大量的果实, 这吸引了冥王一个女儿的注意。当她去摘果实时, 昏的头骨 向她手上吐了口水让她怀了孕。为了躲避父亲的愤怒, 她逃到婆婆家, 生下了双胞胎儿子: Junajpu 和 Ixb'alanke。 (胡那普和艾克斯巴兰克) 第二代双胞胎发现了 被他们的奶奶藏着的父亲的球具, 开始玩了起来。很快, 来自地府的信使发起了另一场挑战。尽管知道他们父亲的遭遇, 这对双胞胎还是接受了挑战, 他们长途跋涉穿过深深的洞穴, 穿越满是蝎子、血和脓的河流, 到达了这座伟大的城市, 在那里, 地府的领主们控制着 大自然的方方面面, 给人类带来了痛苦。双胞胎继续赶路, 寻找向他们发起挑战的地府领主。领主们藏匿于自身的雕像之中, 以迷惑他们的客人, 但兄弟俩在他们面前 放飞了一只蚊子。当它扎入时, 地府领主叫出了声, 露出了真面目。他们迫使双胞胎整晚呆在黑暗之屋。他们给兄弟一把火把, 但警告说 回来时不能燃尽它否则将面临死亡。夜

幕降临，这对思维敏捷的兄弟用红色金刚鹦鹉羽毛 和萤火虫装饰了火炬。到了早上，地府领主震惊地看到火把 被点燃，但没被燃尽。他们坚持用自己的球比赛。双胞胎兄弟同意了， 却发现地府领主在球中藏了一件武器，武器在球场追着他们， 试图杀死他们。双胞胎在第一回合中幸存了下来，但此时他们知道这不是寻常的比赛。他们比了更多的回合，每一次双胞胎的得分都不超过平局，让他们在重新开始游戏前，不得不面对地府领主 为他们设置的超自然审判。他们在寒冷之屋生火，在猛兽之屋喂给它们骨头而脱难。但在蝙蝠之屋，一只蝙蝠 咬下了胡那普的头。确定现在有了优势，地府领主要求另一回合的球赛，他们在球场上挂着胡那普的头。思维敏捷的艾克斯巴兰克 召唤来动物。一只乌龟给他带来 chilacayote 南瓜，他把它刻成头的样子。当领主们追着球时， 他用它替换了头。胡那普的头回到了他的身体上， 兄弟两比任何时候都要更努力。最终，他们赢得了比赛，击打到挂着的南瓜， 把它摔碎在地上。双胞胎知道他们背信弃义的主人 不会接受失败。为了保护自己， 他们谋求先知的帮忙。很快，地府领主把兄弟两烧死，但先知确保他们的骨灰被倒入河流，这让他们恢复了生命。然后兄弟两化装成衣冠不整的 两个孩子，来到地府领主面前，开始跳舞和表演奇迹。他们最后的戏法是， 艾克斯巴兰克假装杀死胡那普，然后复活他。地府领主很高兴地要求在他们身上施用同样的把戏。仍在伪装的兄弟非常高兴地服从了，开始一个接一个地杀死地府领主。当幸存的领主意识到 站在他们面前的是谁，并且复活不会到来时，他们祈求宽恕，双胞胎 说出了他们的诅咒。从今以后，地府领主 将不再有任何献祭，也不再拥有地面世界的权力。他们恐怖统治人类的日子终结了。

P112 2021-11-18 Nature's fortress - How cacti keep water in and predators out - Lucas

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=112>)

If you were a jackrabbit hopping through the desert, you'd be glad to stumble— well, maybe not stumble— across a cactus: the succulent flesh of these plants is a water source for many desert animals. Native to the Americas and known for their spines and succulent stems, cacti of all shapes and sizes have evolved to not just survive, but thrive, in some of the harshest desert climates on Earth. So how do they do it? A cactus's spines are one key to its survival— but not for the reason you might think. Take a look at the prickly pear. Its spines are highly modified leaves. A normal leaf's large surface area would be ill-suited to the desert, transpiring massive amounts of water under the baking sun. The dramatically reduced surface area of the spines limits water loss. They also shade the cactus and reflect the sun's rays, reducing the plant's core temperature during the heat of the day. Then, at night, when air temperatures plummet, the spines act as an insulating layer, keeping the cactus from cooling down too much. These functions are just as important, if not more, than defending against predators. From Cuba to Mexico, and as far south as Brazil and Peru, Melon cacti grow on limestone soils in seasonally dry tropical forests, where they're constantly exposed to the beating sun. They rely on another adaptation common to cacti: a thick skin, which is coated in a waxy substance called a cuticle that limits water loss. Meanwhile, the stomata— tiny holes that allow the exchange of gases that enable photosynthesis— remain firmly closed until night when they open. The lower temperatures at night mean the cactus loses less water from the stem when the stomata open. The bulk of the plant acts as a large barrel of water, storing it for times of need. But to survive the desert, a cactus can't just limit water loss— it has to be prepared to take full advantage of the rare situations where water is readily available. In North America's Sonoran Desert, the towering Saguaro cactus can grow up to 20 meters tall and live for up to 200 years. Woody tissue, like the kind found in tree trunks, give the Saguaro its height, but the Saguaro survives with way less water than most trees. Most of its roots are only a few inches deep. Just below the soil's surface, they spread out laterally for meters and hold the plant in place. Even its single deepest root, the taproot, extends less than one meter into the ground. After a rain, the lateral roots respond in real time, rapidly growing and spreading. They produce ephemeral rain roots that quickly take up the available water. The water is then pulled up into the plant body and stored in cells that contain mucilage, a gluey substance that clings to water molecules and stops them from evaporating if the plant's tissue is ever damaged and exposed. As the soil dries after the rain, the small rain roots also start to dry and wither away, and the cactus awaits the next time it can take advantage of a shower. Taken together, these features make cacti well-equipped to survive their environments, from the driest desert to... a tropical rainforest? The mistletoe cactus can live on the branches of trees in the rainforest. Though there's lots of water around, not much of it reaches the cactus here, and there's nowhere for its roots to go. So even here, the cactus survives using adaptations that long ago helped its ancestors survive the desert.

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翻译人员: Frank Xu 校对人员: Helen Chang 假设你是只蹦跳着穿越沙漠的野兔, 你会开心地碰到 —— 好吧, 也许不该碰到 —— 一棵仙人掌。这些多汁的多肉植物 是许多沙漠动物的水分来源。原产于美洲大陆, 因刺和多汁的茎而闻名, 各种形状及大小的仙人掌, 在地球上一些最恶劣的沙漠气候中, 不止进化得可以生存, 还得以繁茂。它们是怎么做到的呢? 一颗仙人掌的刺 是它生存的关键之一, 但不是因为你可能想到的理由。我们来看看胭脂仙人掌。它的刺是高度变化过的叶子。一片普通树叶大大的表面积 不适用于沙漠中, 大量的水分 在烈日下会蒸发出去。仙人掌刺极大减小的 表面积限制着水分流失。它们同时为仙人掌制造阴影 并反射太阳光, 以此在炎热的白天里 降低仙人掌的核心温度。然后, 在夜里, 当气温骤降时, 刺又作为保温层, 来防止仙人掌过度冷却。这些功能和预防天敌比起来一样, 或者说更加重要。从古巴到墨西哥, 再南至巴西和秘鲁, 甜瓜仙人掌长在 季节性干旱热带森林里的石灰岩土中, 在那儿它们一直被暴露在烈日下。它们依靠着在其它仙人掌中又一 普遍的适应特性: 一层厚厚的外皮, 它被包裹在一层防止水分丢失、 被叫做表皮层的蜡状物质中。与此同时, 气孔——允许促成光合作用的 气体交换的小孔——在夜晚开启前紧紧地保持关闭。夜里气温越低, 意味着气孔打开时仙人掌通过茎丢失的水分越少。仙人掌的主体就和一只大水桶一样, 把水存起来应急。但要在沙漠中生存, 仙人掌不能只是限制水分丢失 —— 它还必须准备好充分利用少有的水分充足的情况。在北美洲的索诺兰沙漠, 巨大的树形仙人掌能长到 20 米高并活到 200 岁。木质组织, 就像 在树干里见到的一样, 成就了树形仙人掌的身高, 但它们依靠着比大多树 少得多的水生存着。树形仙人掌大部分的根 只有几英寸深。在土壤的表面下, 这些根茎散开来好几米并将树形仙人掌固定住。就连它最深的根茎, 直根, 往地面下延伸也不会超过一米。在雨后, 它的侧根即时作出反应, 快速地生长并分散。这些侧根长出能快速 吸收水分的短生雨根。然后水被快速地吸入主体内并被贮存在带有黏质的细胞里。黏质是一种像胶水一样的物质, 它吸附在水分子上并防止它们在植物组织被破坏和暴露的情况下蒸发。在雨后土壤变干的时候, 细小的雨根也开始变干枯萎, 而仙人掌也开始等待 下一次利用降雨的机会。合起来, 这些特质 将仙人掌们变得适合在它们的环境中生存, 从最干的沙漠到..... 一片热带雨林? 蕁寄生仙人掌能够在 雨林中树木的枝干上生活。尽管周围有很多水分, 但却没有多少能够触及这些仙人掌, 而它们的根也无处可去。所以就算在这儿, 这些仙人掌 利用它们祖先沙漠生存进化出的特性在雨林中生存。

P114 2021-11-23 The wild sex lives of marine creatures - Luka Seamus Wright

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=114>)

A June full moon is glowing upon this reef in the middle of the Pacific Ocean. Beneath the surface, 17,000 camouflage groupers dart about in the cloudy water. What you're witnessing is, in fact, an underwater orgy— turned feeding frenzy. The water is hazy because groupers are ejecting sperm and eggs in dense clouds. This spawning behavior happens during full and new moons, when strong tidal currents carry the fertilized eggs away from corals and other voracious predators on the reef. An orgy might seem like a rather flamboyant way to breed, but sex in the sea is a surprisingly inventive affair. In fact, most of those voracious corals use male and female sex organs at the same time. Corals also have mass spawning episodes, but they release buoyant bundles of eggs and sperm all at once. This happens around half-moons, when weaker tides calm the water's surface, creating the perfect conditions for their sex cells to couple up. During these events, there can be hundreds of coral eggs and more than a billion sperm floating in every liter of surface seawater, where they create a sticky slick. But corals are far from the only animals in the sea that can express two sexes. Nearby, a humphead wrasse is undergoing a remarkable transformation. These fish breed in groups where one male fertilizes several females. And, likely because there aren't many dominant males around, the largest female is becoming one. Unlike corals, humphead wrasse can switch sexes, but they only exhibit one sex at a time. The wrasse changes colors, loses her eyeline, and grows dramatically. Soon, the metamorphosis is complete, and he can fertilize the females' eggs, ensuring that procreation persists. Interestingly, this bluestreak cleaner wrasse that's grooming the humphead was also once a female. But unlike the humphead, he can change sex again should he become single. About 7,000 kilometers away, in the shallows of eastern Australia, this male mourning cuttlefish boasts a much sneakier mating strategy. A female cuttlefish has garnered his attention, but she's also attracted another male. Competing directly with this rival would be a demanding ordeal, so the cuttlefish opts for trickery instead. Positioning himself between the female and his rival, on one side, he displays a mottled skin pattern resembling that of a female to appease the competitor. On the other, he flashes a shimmering courtship display at the female and covertly passes her parcels of sperm. This duplicitous strategy

allows the male to reproduce without putting up a fight. These sexual escapades are just a sampling of what goes on beneath the waves. The striking diversity of sex in the sea is partially enabled by water's unique physical properties. Its stable temperature and high density help preserve and disperse reproductive cells. Unless land organisms return to the water to reproduce or have specially adapted sex cells, their options are limited. For many terrestrial animals, reproduction is usually only possible internally, with organs that resemble the moist ocean environment. This restriction may cause us to see only one facet of sex, but a brief tour of marine life shows us just how diverse sex really is. It does not always involve strictly female and male individuals with differently sized sex cells that fuse internally. Many algae, for example, have sex cells that are indistinguishable in size. Some animals are both male and female, while others change sex. A large proportion of organisms don't need to touch each other to reproduce. And thousands of animals, from bluestreak cleaner wrasse to Humboldt squid, participate in same-sex sexual behavior. So, peeking beneath the ocean's covers doesn't just provide a spectacle. It also gives us a more complete appreciation of sex in all its fascinating forms.

P114 2021-11-23 The wild sex lives of marine creatures - Luka Seamus Wright

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=114>)

翻译人员: psjmmz 校对人员: Helen Chang6 月的满月在太平洋中部的珊瑚礁上 散发着光芒。水下, 17,000 条迷彩石斑鱼 在浑浊的水中穿梭。你将要见证的其实是 一场水下狂欢——变成了大鱼吃小鱼。水变得浑浊是因为石斑鱼密集喷射出精子和卵子。这种产卵行为发生在满月和新月期间, 强烈的潮流带着受精卵远离珊瑚和其他在珊瑚礁里贪婪的捕食者。纵情狂欢似乎是一种 相当华丽的繁殖方式, 但海中的性爱是种令人惊讶的 创造性活动。事实上, 大多数贪婪的珊瑚同时使用雄性和雌性性器官。珊瑚也有大量的产卵期, 但它们会同时释放 大量漂浮的卵子和精子。这发生在半月时候, 当较弱的潮汐让海面平静, 为它们的生殖细胞配对 创造了完美的条件。在这种情况下, 每升海面海水中漂浮着数百个珊瑚卵 和超过 10 亿个精子, 在那里它们会形成黏稠的浮油。但珊瑚远算不上是海中唯一一种 能够表现两种性别的动物。不远处, 一只波纹唇鱼 正在经历一场非凡的变化。这些鱼成群繁殖, 一只雄鱼使几只雌鱼受精。有可能是因为附近 主导地位的雄性并不多, 最大的雌性正在变成雄性。跟珊瑚不同, 波纹唇鱼可以变换性别, 但它们一个时间只能表现出一个性别。波纹唇鱼改变颜色, 失去眼线, 快速变大。很快, 变态就完成了, 它就能使雌性卵子受精, 确保生育持续进行了。有趣的是, 这条正在清洁波纹唇鱼的蓝条纹的清洁鱼也曾经是雌性。但跟波纹唇鱼不同的是, 如果它单身了可以再次改变性别。大约 7000 公里外, 在澳大利亚东部的浅滩上, 这种雄性哀悼乌贼的交配策略 要狡猾得多。一只雌性乌贼吸引了它的注意, 但她也吸引另一只雄性乌贼的注意。跟这个竞争对手直接竞争 可能是自讨苦头, 于是乌贼选择了诡计。把自己置于雌性和它的对手中间, 一面, 它展示了类似雌性的斑驳的皮肤图案用来安抚竞争对手。另一面, 它向雌性闪烁着求爱的光芒, 偷偷地把他的精子递给她。这种两面派的策略使得雄性 无需打架就能繁殖后代。这些性行为只是波涛之下 发生的一个样本。海洋性爱的多样性部分是由水的独特物理特性决定的。稳定的温度和较高的密度 有助于保存和分散生殖细胞。除非陆地生物回到水中繁殖或有特别适应的生殖细胞, 否则它们的选择是有限的。对很多陆生动物来说, 生殖只能在体内进行, 它们的器官类似于潮湿的海洋环境。这种限制可能让我们 只看到性的一个方面, 但对海洋生物的短暂参观 让我们看到了性的多样性。它并不总是严格涉及拥有不同大小内部融合的 生殖细胞的女性和男性个体。例如, 许多藻类的生殖细胞 大小难以区分。一些动物同时扮演雄雌二性, 而另一些能够改变性别。大部分生物体不需要触碰彼此来繁殖。数千种动物, 从蓝条纹的清洁鱼到洪堡乌贼, 有同性性行为。所以, 在海洋覆盖下的窥视 不仅仅带来一种奇观。它也让我们对性爱的各种迷人形式有了更全面的认识。

P116 2021-12-02 Can stereotypes ever be good - Sheila Marie Orfano and Densho

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=116>)

In 2007, researchers surveyed over 180 teachers to understand if they held stereotypes about students from three racial groups. The results surfaced several negative stereotypes, labeling Black students as aggressive and stubborn, white students as selfish and materialistic, and Asian students as shy and meek. But regardless of the teachers' other biases, the most commonly held opinion was that Asian students were significantly more industrious, intelligent, and gentle than their peers. On the surface, this might seem like a good thing, or at least better than other, negative characterizations. But treating this seemingly favorable stereotype as reality can actually cause a surprising amount of harm—to those it describes, those it doesn't, and even those

who believe it to be true. This image of humble, hard-working Asians is actually well-known as the “model minority” stereotype. Versions of this stereotype emerged in the mid-20th century to describe Chinese Americans. But following World War II, the label became commonly used to claim that Japanese Americans had overcome their mistreatment in US incarceration camps, and successfully integrated into American society. Former incarcerated were praised as compliant, diligent, and respectful of authority. In the following decades, “model minority” became a label for many Asian populations in the US. But the truth behind this story of thriving Asian Americans is much more complicated. During World War II, the US government tried to “Americanize” incarcerated Japanese Americans. They did this through English language classes, patriotic exercises, and lessons on how to behave in white American society. When incarcerated were released, they were instructed to avoid returning to their own communities and cultural practices, and instead, integrate into white society. But after decades of anti-Asian policies and propaganda, white Americans had to be persuaded that Japanese Americans were no longer a threat. So the government organized media coverage to transform the public perception of Japanese Americans from suspected traitors to an American success story. In fact, the phrase “model minority” was coined by one such article from 1966. But this article, and others like it, didn’t just cast Asian Americans as an obedient and respectful “model minority.” They also criticized so-called “problem minorities,” primarily Black Americans. Politicians who were threatened by the rising Civil Rights movement used this rhetoric to discredit Black Americans’ demands for justice and equality. They presented a fabricated story of Asian American success to paint struggling Black communities as inferior. This narrative put a wedge between Black and Asian Americans. It erased their shared history of fighting oppression alongside other marginalized groups, and pit the two communities against each other. In doing so, the model minority myth also enforced a racial hierarchy, with white Americans on top and everyone else underneath. Certainly, many people who still believe the model minority stereotype, either consciously or unconsciously, might not agree with that idea. But comparing the imagined strengths and weaknesses of racial groups places value on how well those groups meet certain standards—typically, standards set by a white majority. In this case, the model minority stereotype suggests that marginalized groups who are compliant, gentle, and respectful of white authority are deserving of tolerance, while groups that challenge the status quo are not. This stereotype also negatively impacts the Asian individuals it describes. According to a psychological phenomenon known as stereotype threat, members of a group often place pressure on their individual actions to avoid encouraging negative group stereotypes. But this phenomenon can occur around seemingly positive stereotypes as well. The pressure associated with living up to impossibly high standards can lead to poor performance. And teachers are less likely to notice when Asian students are struggling. Outside the classroom, social programs catering to Asian communities are frequently overlooked or cut, because they’re assumed to need less support than other disadvantaged groups. The favorable portrait created by this stereotype can also make it harder to recognize racially motivated violence and discrimination against Asian Americans. And since this stereotype carelessly groups all Asians under the same umbrella, it impacts people with various backgrounds and unique histories of discrimination. So while the model minority label might appear to benefit Asian populations at first, in practice, it works like every other racial stereotype. It reduces a group of people to a one-dimensional image. And that single image hinders our ability to understand the history, struggles, and triumphs of the individuals within that group. Acknowledging and challenging these labels is essential for building coalitions across communities and eliminating harmful stereotypes for good.

P116 2021-12-02 Can stereotypes ever be good - Sheila Marie Orfano and Densho

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=116>)

翻译人员: FFish Y 校对人员: Helen Chang 在 2017 年, 研究人员调查了超过 180 名教师去了解他们是否对于来自三个不同种族的学生们持有刻板偏见。其结果表明了几种负面的刻板偏见, 黑人学生标签为爱攻击的和顽固的, 白人学生为自私的和物质的, 亚洲学生则是害羞的和温顺的。但抛开教师们的其他偏见, 最为普遍的一个看法是亚洲学生比其他的同学 格外的勤勉、聪慧和温顺。表面上这看似好事, 或者至少比其他消极的特征要好些。但把这些看起来令人喜欢的 刻板偏见当做现实可能实际上会引起惊人的伤害——对于那些被其描述的人, 没被描述的人, 甚至那些信以为真的人。这谦逊、努力的亚洲人形象实际上以“模范少数族裔”的 刻板印象为人所知。这种刻板偏见的各种版本 在二十世纪中期出现, 用来描述美籍华人。但在第二次世界大战之后, 这个标签更常用来表明美籍日本人在美国集中营被虐待之后重获新生并成功融入美国社会。之前被囚禁者被称赞为 顺从、勤勉、尊重权威。在接下来的几十年中, “模范少数族裔”成为了 在美国的许多亚裔人口的标签。但在亚裔美国人蒸蒸日上的故事背后, 其现实

更加复杂。在第二次世界大战期间，美国政府曾试图“美国化”被囚禁的美籍日本人。他们通过英文课程、爱国活动和课程来教授如何在白人美国社会正确表现。当囚犯们被释放时，他们被教育不要返回他们自己的社区和文化环境，而是要去融入白人社会。在几十年反亚裔的政策和宣传之后，美国白人必须被说服美籍日本人对他们来说不再是威胁。所以政府组织媒体报道，让公众对日裔美国人的认知从可疑的叛徒转变为美国成功故事。事实上，“模范少数族裔”的说法是在 1966 年的一篇文章中被创造出来的。但是这篇文章，和那些喜欢它的人，不仅仅把亚裔美国人打造成为顺从和谦恭的“模范少数族裔”。他们还批评所谓的“问题少数族裔”，主要是美籍黑人。因民权运动的兴起而感觉受到威胁的政客们用这个说辞来怀疑美籍黑人 对公正和平等的的需求。他们展现了一个编造出来的 美国亚裔的成功故事用来把仍在挣扎的黑人社区 描绘为是更差等的。这种叙事方式把隔阂 植入美国黑人和亚裔之中。磨灭了他们与其他边缘群体 共同的与压迫作斗争的历史，并使这两个群体互相争斗。如此作为时，模范少数族裔的神话同时也强化了种族等级，白种美国人处于最高等级 而其他人都 在他们之下。当然，许多人仍然相信 模范少数族裔的刻板印象，可能有意或无意地不同意那个观点。但当对不同种族的人群 想象出来的强项和弱点进行比较，为这些种族的人能怎样达到 特定标准而赋予价值——特别是由多数族裔的白人制定标准。在这样的情况下，模范少数族裔的刻板印象暗示那些顺从的、温和的、对白种人权威谦恭的边缘化群体更值得被容忍，而那些挑战生存现状的种族则不值得。这样的刻板偏见同样会 消极地影响它所描述的亚裔个体。根据“刻板偏见威胁”这心理现象，团队成员常对他们的个体行为施压来避免助长负面的团队刻板印象。但这种现象同样会发生在 看似正面的刻板偏见。与难以置信的高标准所关联的压力会导致糟糕的表现。当亚裔学生遭遇困难时，老师们更难注意到。为亚裔社区服务的课外社会活动也通常被忽视或是削减，因为他们被认为 比其他弱势群体更不需要支持。被这刻板印象创造出的讨喜形象也造成更难识别由种族冲突造成的对美国亚裔的暴力和歧视。由于这样的刻板偏见无所顾忌地 把所有亚裔归入同一种类，影响了来自不同背景 和特定有受歧视历史的人群。所以模范少数族裔的标签可能一开始看似对亚裔族群有益，但事实上就像 其他任何一种刻板偏见一样，把一个族群简化成为单面的形象，而那个单一的形象阻碍了我们理解该群体中个人的历史、斗争和胜利的能力。承认和挑战这些标签对于在社区之间建立联盟 和永远消除有害的刻板印象至关重要。

P118 2021-12-09 How one of the most profitable companies in history rose to power - A

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=118>)

During the 17th century, the three letters “VOC” formed the world’s most recognizable logo. These initials belonged to the Verenigde Oostindische Compagnie, or the Dutch East India Company— widely considered the most profitable corporation ever created. Starting in 1602, it cornered the booming spice market and pioneered trade routes between Asia and Europe. But such success came with an overwhelming cost in human life. When the Dutch state created the Company, it granted the organization the power to wage war, conduct diplomacy, and seize colonies throughout Asia. The Dutch East India Company was intended to make money and battle competing European empires. The Asian market was the largest at the time and spices were in great demand throughout Europe. Nutmeg was among the most precious. But it was only cultivated on Indonesia’s Banda Islands. If Dutch officials could seize exclusive control over nutmeg, they’d make their investors rich, ensure the Company’s long-term survival and deprive their adversaries of the same gains. However, their plan hinged on the submission of the Bandanese people. This was something Company officials, like the ruthless Jan Pieterszoon Coen, were willing to go to great lengths to ensure. Home to around 15,000 people, the Banda Islands were composed of village confederations controlled by rich men called orang kaya, who were expert traders. They’d retained their virtual monopoly over nutmeg for centuries, selling at the highest price to Asian and European merchants. When the Dutch East India Company arrived in the early 1600s, its officials persuaded a group of orang kaya to sign a treaty. It guaranteed protection in exchange for monopoly rights to their nutmeg. Bandanese leaders had made similar agreements before, but were able to break them without serious consequences. The Dutch represented a new threat. They attempted to build forts to control trade and stop smuggling, and insisted that all nutmeg be sold to them at deflated prices. Many Bandanese refused and relations continued to deteriorate. In 1609, a group of villagers ambushed and killed a Dutch admiral and 40 of his men. Over the next decade, tensions escalated as treaties were broken and re-signed. The Company and Jan Pieterszoon Coen, its Governor-General, began considering new strategies. The Bandanese, one official wrote, should be “brought to reason or entirely exterminated.” Coen himself believed that there could be no trade without war. In 1621, with the approval of his superiors, he staged a massive invasion and made Bandanese leaders sign another document. But this time, the terms didn’t recognize the Bandanese as a sovereign people—

they were the Dutch East India Company's colonial subjects. Soon, Dutch officials claimed they'd detected a conspiracy against them. Coen used this to eliminate further resistance. He ordered his soldiers to torture Bandanese leaders to extract confessions. Over the following months, Company troops waged a brutal campaign that decimated the population. Many Bandanese people were starved to death or enslaved and sent to distant Dutch colonies. Others jumped from cliffs rather than surrender. Thousands fled, emptying out whole villages. Some survivors resettled on other islands, where they preserved remnants of Bandanese language and culture. When the Company's violent campaign was over, the indigenous population had plummeted to less than a thousand, most of whom were enslaved. The Dutch East India Company sliced the islands into plantations and imported an enslaved workforce. It was, by many measures, an act of genocide. By securing this global monopoly over nutmeg, the Company supercharged its economic development, contributing to the Dutch Golden Age. Although Coen faced criticism, he was celebrated as a national hero well into the 20th century. 400 years after the massacre on Banda, Coen's statue still stands in the city of Hoorn— despite mounting pressure for its removal. Coen and the Dutch East India Company brought a prized commodity under their control and profits soared. But they achieved this by violently tearing another society apart.

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翻译人员: maria antonia santos 校对人员: Helen Chang 在十七世纪,“VOC”成为了世界上最知名的标志,它是 Verenigde Oostindische Compagnie 的缩写,或称荷兰东印度公司,普遍被认为是世上最获利的公司。从 1602 年起,它垄断了蓬勃发展的香料市场,也开发了新的亚欧贸易路线。但是这样的成功伴随着压倒性的人命成本。当荷兰政府创造了公司,政府给了这个组织发动战争的能力,进行外交和在亚洲抢占殖民地。荷兰东印度公司本为赚钱和对抗竞争的欧洲国家。亚洲市场当时是世上最大的,欧洲对香料有很大的需求。肉豆蔻是最珍贵的。但是它只在印度尼西亚的班达群岛生长。如果荷兰官方可以占有肉豆蔻他们的投资者获利丰盛,保证了公司的长期生存,竞争者得不到同样的利润。然而他们的计划取决于班达人的服从。这正是一些官方像扬·彼得斯佐恩·库恩愿意竭尽全力而保证的。这是一万五千人的家乡,班达群岛是被村联合会组成的,被富人控制,这些是很有头脑的商人。几个世纪以来,他们保持着几乎全然的肉豆蔻垄断,用高价卖给亚洲和欧洲的商人。当荷兰东印度公司在 1600 年抵达了班达群岛,官方和当地的富人们签了一个协议。这个协议保证了对肉豆蔻独有的权利。班达人的领导们之前也做过类似的协议,但能够违反协议也没有严重的后果。荷兰带来了新的威胁。他们为了控制商议和走私建了堡垒,执意所有的肉豆蔻以低价卖给他们。很多班达人拒绝了这个要求,造成了关系继续恶化。1609 年,一帮村民击杀了荷兰上将和 40 个部下。接下来的十年里,紧张局势升级,条约被破坏和重新签署。公司和总督扬·彼得斯佐恩·库恩开始重新考虑新的策略。班达人,一个官员写道,应该“讲道理或被全部消灭”。库恩认为没有战争就没有贸易。1621 年被上级批准他大举入侵,逼着班达人的领导者们签新文件。但是这次条约不承认班达人的民族主权,反而成了荷兰东印度公司的殖民。不久以后荷兰官方宣称察觉到一个反对他们的阴谋。库恩利用这一点来消灭反抗。他命令士兵去折磨班达领导者以取得供词。在接下来几个月里,公司的士兵发动一场大屠杀。很多的班达人被饿死,或被送到远方的荷兰殖民地成为奴隶。有一些人宁可跳崖也不要投降。上千人逃走了,整村变成了鬼域。有些幸存者搬移到了别的岛上生活,保存他们的语言和文化。公司暴力的活动结束后,土著人民只剩下不到一千人,大多数成为了奴隶。荷兰东印度公司把班达群岛转化成了种植园,引进奴工。这是种族灭绝。保持了对肉豆蔻的独占事业,公司大大地推动经济发展,贡献了荷兰的黄金年代。尽管佐恩被批评,直到 20 世纪他仍被看作是国家英雄。班达岛大屠杀过了 400 年后,佐恩的雕像还在霍伦城里,尽管移除雕像的压力越来越大。佐恩和荷兰东印度公司带来珍贵的产品,在他们的控制下利润飙升。但是在这个过程中他们暴力撕裂另一个社会。

P120 2021-12-16 The dark history of Mount Rushmore - Ned Blackhawk and Jeffrey D. Mea

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=120>)

Between 1927 and 1941, 400 workers blasted 450,000 tons of rock from a mountainside using chisels, jackhammers, and a lot of dynamite. Gradually, they carved out Mount Rushmore. Now, the monument draws nearly 3 million people to South Dakota's Black Hills every year. But its façade belies a dark history. About 10,000 years ago, Native American people began inhabiting the Black Hills. The area became especially sacred to the Lakota people, who formed the western branch of what

the US called the Sioux Nation. The Lakota believed one cave within the Black Hills to be where they first emerged. And they named one of the Black Hills mountain peaks the Six Grandfathers after their sacred directional spirits. But in the 1800s, Lakota access to this land came under threat. White settlers in North America expanded their territories by using physical violence or negotiating with Indigenous peoples. After its establishment in the late 1700s, the US government ratified hundreds of treaties with Native American nations. However, it often broke them or created them using coercion. Between 1866 in 1868, the Lakota and their allies successfully defended their land from the U.S. military and negotiated a new treaty with the government. In the 1868 Treaty at Fort Laramie, all parties agreed that a vast territory, including the Black Hills, belonged to the Sioux Nation. In return, the Lakota would allow US travelers to pass safely through. But many aspects of the Treaty also aimed to assimilate the Lakota into white culture. This included incentives to convert them from hunting to farming, abandon their nomadic lifestyle, and wear clothes the US provided. Meanwhile, just seven years later, the US broke the treaty after an expedition found gold in the Black Hills. Miners set up camps, the military attacked and ultimately defeated the Lakota, and the US passed legislation illegally seizing the land. 50 years later, workers began etching into the Lakota's sacred Six Grandfather's Mountain. The project was led by an arrogant sculptor named Gutzon Borglum, who had ties to the KKK. A historian originally proposed that Mount Rushmore include Western figures—like Lakota Chief Red Cloud. But Borglum chose to feature his own heroes. By October of 1941, Borglum had died from surgical complications and work stopped, though the project was unfinished. None of the four figures had torsos, as intended, and rubble was left piled below. To the Lakota, the monument was a desecration. And the presidents immortalized on the rockface all had brutal anti-Indigenous legacies. Members of the Iroquois Confederacy called George Washington “Town Destroyer” for encouraging military campaigns that burned 50 of their villages in 1779. Theodore Roosevelt championed forced assimilation and said, “I don't go so far as to think that the only good Indians are dead Indians, but I believe nine out of 10 are.” In 1980, after the Sioux Nation had sued the US for treaty violations, the Supreme Court ruled that the Black Hills had been unlawfully taken, and the Sioux were entitled to compensation. The amount named has since reached over a billion dollars. But the Sioux Nation refused to take the money and to give up their claim to the Black Hills, maintaining that they were never for sale. So, what should happen to Mount Rushmore and the Black Hills? Responses to that question are wide-ranging. Some, including tribal leaders and Borglum's great-granddaughter, have called for Mount Rushmore to be removed. Others see it as an important patriotic symbol and vital aspect of South Dakota's economy that should remain. Many Lakota people want the 1868 Treaty to be honored and the now-federally controlled lands to be returned to their tribal communities. Others have said that the Lakota and the US should at least co-manage parts of the Black Hills. Currently, there are no plans for change. The US broke many of its promises with Indigenous nations making issues like this common. Native people have been fighting for broken treaties to be honoured for generations, achieving some major victories along the way. Meanwhile, if untouched, the faces engraved on the Six Grandfathers Mountain are expected to remain for thousands of years to come.

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翻译人员: Yuxin Zhang 校对人员: Helen Chang 1927 年至 1941 年间, 400 名工人爆破了 45 万吨岩石, 在山坡上用凿子, 手提钻和大量炸药。渐渐地, 他们凿出了拉什莫尔山。现在, 这座纪念碑 每年吸引了近 300 万人去参观南达科他州的布莱克山。但它的外表掩盖了 一段黑暗的历史。大约一万年, 美洲原住民开始在布拉克山居住。这个地区对拉科塔人来说 变得特别神圣, 他们组成了 美国称之为苏族的西部分支。拉科塔人相信 布拉克山的一个洞穴是他们最初出现在的地方。他们将黑山的一座山峰 命名为“六祖山”, 以纪念他们神圣的定向祖灵。但在 19 世纪, 拉科塔人进入这片土地受到了威胁, 北美的白人定居者扩大他们的领土, 通过使用暴力 或与土著人民谈判的方式。在 18 世纪末美国政府成立之后, 其批准了数百项 与美洲原住民的条约。然而, 政府经常撕毁它们 或强制创造它们。在 1866 年到 1868 年间, 拉科塔族人和他们的盟友成功地保卫了他们的土地 免受美国军队的攻击, 并与政府谈判了一项新的条约。在 1868 年的拉勒米堡条约中, 各方一致同意, 包括布拉克山在内的大片领土属于苏族。作为交换, 拉科塔允许美国游客安全通过。但条约的许多方面也旨在同化, 把拉科塔人融入白人文化。这包括激励他们 从狩猎转向农耕, 放弃游牧生活方式, 穿上美国提供的衣服。与此同时, 仅仅 7 年后, 美国就违反了条约, 那是在一支探险队 在布拉克山发现了黄金之后。矿工开始扎营, 军队进攻, 击败了拉科塔人, 美国通过立法非法征用土地。50 年后, 工人们开始在拉科塔人神圣的六祖山上蚀刻。这个项目是由一位名叫格松·博格勒姆的 傲慢

的雕塑家领导的，他与三 k 党有联系。一位历史学家最初提出拉什莫尔山应该包括 像拉科塔酋长红云这样的西方人物。但博格勒姆选择了自己的英雄。1941 年 10 月，博格勒姆 死于手术并发症，工作停止了，尽管这个项目还没有完成。四个人像中没有一个人 像预期的那样有躯干，并且下面堆满了碎石。对拉科塔人来说，这座纪念碑是一种亵渎。在岩壁上永垂不朽的总统们，都有残酷的反土著遗绪。易洛魁联盟的成员 称乔治华盛顿为“城市毁灭者”因为他鼓励军事行动，在 1779 年烧毁了他们的 50 个村庄。西奥多·罗斯福支持强制同化，他说，“我不至于宣称只有死去的印第安人 才算是好的印第安人，但我认为十分之九的人都是。”1980 年，在苏族起诉美国违反条约后，最高法院裁定 布拉克山被非法占领，苏族人有权得到补偿。赔偿金额已经超过了 10 亿美元。但是苏族拒绝接受这笔钱，因那是放弃对布拉克山的主权，他们坚称从未出售过。那么，拉什莫尔山 和黑山应该怎么办？对这个问题的回答是广泛的。包括部落领袖 和博格勒姆的曾孙女在内的一些人呼吁拆除拉什莫尔山。另一些人将其视为 重要的爱国象征，也是南达科他州经济的重要方面。许多拉科塔人希望 1868 年的条约得到遵守，并把现在由联邦政府控制的土地 归还给他们的部落社区。也有人则表示，拉科塔和美国至少应该共同管理布拉克山的部分地区。目前还没有改变的计划。美国违背了 对土著民族的许多承诺，使这样的问题变得普遍。原住民一直在 为被撕毁的条约而战，奋斗了许多代，一路上取得了一些重大的胜利。与此同时，如果不被干扰，六祖山上雕刻的面孔预计将保留数千年。

P121 2021-12-21 You can only save one— who do you choose - Doug MacKay

[播放链接](<https://www.bilibili.com/video/BV1zZ4y1S75L?p=121>)

You are the captain of the Mallory 7, an interstellar cargo transport. On your way to the New Lindley spaceport, you receive a distress call. There's been an explosion on the Telic 12 and its passengers are running out of oxygen. As you set a course to intercept, you check the Telic 12's manifest. It's currently transporting 30 middle-aged individuals from some of Earth's poorest districts to the labor center on New Lindley, where they'll be assigned jobs on the spaceport. But as you approach the Telic 12, you receive a second distress call. A luxury space cruiser called the Pareto has lost a thruster, sending them careening towards an asteroid belt. Without your help, the 20 college students headed for vacation aboard the Pareto are all doomed. So with only enough time to save one ship, which one should you choose? This dilemma is an example of a broader class of problems where a life-saving resource— such as a donated organ or vaccine— is scarce. There are many schools of thought on how to approach these problems, and one of the most influential is utilitarianism, an ethical view first systematically developed by Jeremy Bentham and John Stuart Mill. In this view, you should choose the action which promises the greatest sum of happiness. Though, how to define and measure happiness is a difficult question. For example, hedonists would suggest a happy life contains the most pleasure and the least pain. Others might say it's the life where your desires are most fulfilled. However happiness is defined, most would agree that saving 30 lives has the potential to generate more happiness than saving 20. But is it enough to consider how many lives would be saved? Or should you also consider how many life years would be? Assuming a life expectancy of 80, saving the lives of the students, with an average age of 20, saves 1,200 life years, while saving the workers, with an average age of 45, saves 1,050. All things being equal, a longer life should promise a greater sum of happiness than a shorter one. So perhaps saving the smaller ship actually has the potential to generate the most happiness. If all these calculations feel a bit cold, you may want to consider a different approach. The philosopher Derek Parfit argues we should give priority to the worse off, since benefits to those groups matter more than equivalent benefits to the well-off. In this view, it's more urgent to help those whose basic needs aren't met even if they're harder to help than those who are flourishing. But often, determining which group is truly worse off can get complicated fast. In our case, Earth is still beset by drastic inequalities in wealth and opportunity. And those able to afford a vacation on New Lindley and transport on a luxury cruiser are no doubt among the most well-off people on the planet. The workers, by contrast, are among the most disadvantaged, traveling away from home for months at a time to perform service work. With fewer resources and opportunities, it's likely they've experienced more hardship in their lives than the vacationers, so maybe they're more deserving of rescue? On the other hand, the students have experienced less life overall— so perhaps they're worse off? Or maybe none of these variables should influence our decision. The philosopher John Taurek famously argued that in these types of cases, the numbers don't count. Each person is deserving of equal concern and respect, so the best way to decide which passengers to save is to flip a coin. While this might seem arbitrary at first, this approach treats all parties equally, giving each individual an equal chance of being rescued. Could any passenger argue that they're being treated unfairly by a coin flip? It's tough to say. But how they— and you— feel about the result may be another dilemma altogether.

P121 2021-12-21 You can only save one— who do you choose - Doug MacKay

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翻译人员: Nancy Huang 校对人员: Thomas Tam 你是马洛里 7 号 星际货物运输太空船的船长。在你前往新林德利太空港的路上, 收到了一个求救信号。泰利奇 12 号发生了爆炸它里面的乘客用完了所有氧气。当你设置拦截路线时, 会检查泰利奇 12 号的手册。目前它正在运送 30 名中年人, 从地球上一些最贫穷的地区, 到新林德利的劳动力中心, 在那里他们会分配太空港的工作。但当你接近泰利奇 12 号时, 又收到了第二个求救信号。一艘名为帕累托的豪华太空巡洋舰 失去了一个推进器, 将它们送向了小行星带。如果没有你的帮助, 去度假的 20 名大学生 在帕累托号上的命运就注定了。所以当你只有足够时间救一艘太空船时, 你应该选择哪一艘呢? 这种困境是更广泛问题的一个例子在救生资源方面, 例如捐赠的器官或疫苗的稀缺情况下, 有很多学校思考如何应对这些问题, 其中最影响力的一种是功利主义, 还有伦理观首先被系统地发展, 多得杰里米·边沁 和约翰·斯图尔特·米尔的努力。在这种观点下, 你应该选择的行动是保证最大的幸福度总和。尽管, 如何定义和测量幸福度 是困难的问题。例如享乐主义者会提出的是快乐生活, 包含最大的乐趣和最少的痛苦。其他人可能会说的是, 那愿望能实现最满足的生活。但不管幸福是怎么定义的, 大多数人都会同意 拯救 30 个生命是最有潜力去产生更高的幸福度, 相比于只拯救 20 个人。但只思考去拯救多少生命足够吗? 或者你是不是应该也考虑一下 总共有多少的寿命年呢? 假设预期寿命为 80 岁, 若挽救学生的生命, 他们的平均年龄为 20 岁, 你就拯救了 1,200 寿命年, 工人平均年龄为 45 岁, 如果拯救他们, 你挽回了 1,050 寿命年。当万事平等, 能挽救 更长的寿命年, 应该保证了更满足的幸福度。所以拯救更小的那艘船, 或许更有潜力产生最大的幸福度。如果这些计算感觉有些冷血, 你可能想考虑一种不同的解决方案。哲学家德里克·帕菲特认为, 我们应该优先考虑处境更糟糕的人, 因为这些群体的利益相比富裕群体的更重要。在这种观点下, 帮助那些基本需求 得不到满足的人更为迫切, 尽管他们比那些富裕的人更难帮助。但在正常情况下, 确定哪个团体情况更糟 可能会很快变得复杂。在设定情况下, 地球仍然正在被严重的 财富不平等机遇所困扰。那些足够支付乘坐豪华巡洋舰费用到新林德利度假的人, 是毫无疑问属于地球上 最富裕的一群人。相比之下, 那些劳动人民, 是处于最不利的处境, 他们要离家数月执行服务工作。由于资源和机会的缺乏, 意味着他们很可能经历的艰辛, 远远多于那些富裕游客, 所以也许他们更值得拯救? 另一方面, 学生总体上经历的生活较少, 所以他们的情况也许更糟? 又或者这些因素 都不应该影响我们的选择。哲学家约翰·陶雷克有其著名论点, 在这种的案例中, 数量不是在计算之内。每个人都值得平等的关注和尊重, 因此决定要拯救哪些乘客, 最佳的方法是抛硬币。虽然这乍看似乎很随意, 但这种方法可平等对待所有当事人, 给予每个单独的个体被拯救的平等机会。会有乘客争辩说 受到了抛硬币的不公平对待吗? 这很难说。但他们以及你对结果的看法 可能完全是另一个两难选择。

通配标题 P[0-9]{1,3} [0-9]{4}?*^13