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Passage 01

Chinese Population Growth

Increases in population have usually been accompanied (indeed facilitated) by an increase in trade. **In the Western experience, commerce provided the conditions that allowed industrialization to get started, which in turn led to growth in science, technology, industry, transport, communications, social change, and the like that we group under the broad term of "development".** However, the massive increase in population that in Europe was at first attributed to industrialization starting in the eighteenth century occurred also and at the same period in China, even though there was no comparable industrialization.

人口的增加通常伴随着（事实上是被促进）贸易的增长。根据西方的经验，商业为工业化的开始提供了条件，这反过来又导致科学、技术、工业、交通、通信、社会变化以及我们广泛定义为发展的那些群体的增长。然而，起初欧洲人口的大规模增长是由十八世纪开始的工业化引起的，在同一时期，工业化也在中国发生，虽然（中国的）工业化并不能（和欧洲）相比。

It is estimated that the Chinese population by 1600 was close to 150 million. The transition between the Ming and Qing dynasties (the seventeenth century) may have seen a decline, but from 1741 to 1851 the annual figures rose steadily and spectacularly, perhaps beginning with 143 million and ending with 432 million. If we accept these totals, we are confronted with a situation in which the Chinese population doubled in the 50 years from 1790 to 1840. If, with greater caution, we assume lower totals in the early eighteenth century and only 400 million in 1850, we still face a startling fact: something like a doubling of the vast Chinese

population in the century before Western contact, foreign trade, and industrialization could have had much effect.

据估计，到 1600 年为止，中国人口接近 1 亿 5000 万。明清的过渡时期（十七世纪）可能经历了（人口）下滑，但从 1741 到 1851 年，年度数字有着明显地稳步上升，可能是从 1 亿 4300 万上升到 4 亿 3200 万。如果我们接受这些总数，我们将面临一个情况：中国人口从 1790 到 1840 年的 50 年间翻了一番。如果更谨慎些，我们假定在 18 世纪初的总数更低，在 1850 年只有 4 亿，我们仍然面临着一个令人吃惊的事实：中国人口的翻倍增长发生在和西方接触之前，也发生在对外贸易和工业化可以起到作用之前。

To explain this sudden increase we cannot point to factors constant in Chinese society but must find conditions or a combination of factors that were newly effective in this period. Among these is the almost complete internal peace maintained under Manchu rule during the eighteenth century. There was also an increase in foreign trade through Guangzhou (southern China) and some improvement of transportation within the empire. Control of disease, like the checking of smallpox by variolation may have been important. But of most critical importance was the food supply.

解释这种（人口的）突然增加，我们不能（将原因）指向在中国社会中恒定的因素，而是必须找到在这一时期以新的形势起到作用的条件或组合因素。其中一个就是：在满族统治下，几乎完全的内部和平。广州（华南）的对外贸易有所增加，并在帝国内进行了一些改进。控制疾病也可能非常重要（如通过天花接种来进行天花检查。但最重要的还是食品供应。

Confronted with a multitude of unreliable figures, economists have compared the population records with the aggregate data for cultivated land area and grain production in the six centuries since 1368. Assuming that China's population in 1400 was about 80 million, the economist Dwight Perkins concludes that its growth to 700 million or more in the 1960s was made possible by a steady increase in the grain supply, which evidently grew five or six times between 1400 and 1800 and rose another

50 percent between 1800 and 1965. This increase of food supply was due perhaps half to the increase of cultivated area, particularly by migration and settlement in the central and western provinces, and half to greater productivity-the farmers' success in raising more crops per unit of land.

面对大量的不可靠的数据，经济学家们将从 1368 年开始的 6 世纪的人口数据，与耕地面积和粮食生产总量的综合数据进行了比较。假设中国的人口在 1400 年是 8000 万左右，经济学家帕金斯德怀特得出结论，在 20 世纪 60 年代，由于粮食供应的稳定增长（在 1400 年和 1800 年之前增长了 5.6 倍，并且在 1800 年到 1965 年又增长了 50%)，中国人口增长到 7 亿是可能的。粮食供应的增加可能是一般是因为耕地面积增加，特别是在中西部省份的移民和定居；一半是因为增长的生产力（农民成功地提高每单位的土地上种植更多的庄稼）。

This technological advance took many forms: one was the continual introduction from the south of earlier-ripening varieties of rice, which made possible double-cropping (the production of two harvests per year from one field). New crops such as corn (maize) and sweet potatoes as well as peanuts and tobacco were introduced from the Americas. Corn, for instance, can be grown on the dry soil and marginal hill land of North China, where it is used for food, fuel, and fodder and provides something like one-seventh of the food energy available in the area. The sweet potato, growing in sandy soil and providing more food energy per unit of land than other crops, became the main food of the poor in much of the South China rice area.

这一技术进步有许多形式：一个是从南方不断引进从早熟的水稻品种，这使得双季种植（在一块地上每年生产两稻）变得可能的。从美洲引进新品种的农作物，如玉米、甘薯、花生和烟草等。例如，玉米可以生长在中国北方的干旱土壤和贫瘠的土地上，在那里它们被用于食品、燃料和饲料，并为该地区提供了七分之一的食物能源。甘薯，在沙质土壤中生长，比其他作物提供更多的粮食能量，成为南方大部分地区的主要粮食作物。

Productivity in agriculture was also improved by capital investments, first of all in irrigation. From 1400 to 1900 the total of irrigated land seems to

have increased almost three times. There was also a gain in farm tools, draft animals, and fertilizer, to say nothing of the population growth itself, which increased half again as fast as cultivated land area and so increased the ratio of human hands available per unit of land. Thus the rising population was fed by a more intensive agriculture, applying more labor and fertilizer to the land.

在农业生产中，生产力也得到了改善，首先是灌溉。从 1400 到 1900,灌溉土地的总量似乎已经增加了近三倍。农业工具、动物和肥料的收获也有了收获，对人口增长本身来说没有什么，这也增加了一半的耕地面积，从而增加了人均土地的比例。因此，不断上升的人口被一个更为密集的农业所喂养，在土地上应用更多的劳动力和肥料。

Passage 02

Determining Dinosaur Diet

Determining what extinct dinosaurs ate is difficult, but we can infer some aspects of their dietary preferences. Traditionally, this information has been derived from direct evidence, such as stomach contents, and indirect evidence, such as establishing a correlation between particular body characteristics and diets of living animals and then inferring habits for dinosaurs.

确定灭绝的恐龙吃什么是困难的，但我们可以推断出他们的饮食偏好的某些方面。传统上，这些信息来自直接的证据(如胃含物）和间接证据（如建立动物特定体征和饮食之间的关系，然后推断恐龙的生活习惯）。

Animals such as house cats and dogs have large, stabbing canine teeth at the front of the mouth and smaller, equally sharp teeth farther back in their jaws. Many of these animals are also armed with sharp claws. The advantage of teeth and claws as predatory tools is obvious. Now consider animals like cows, horses, rabbits, and mice. These animals have flat teeth at the back of the jaw that are analogous to and have the same function as grindstones. Unlike the meat-slicing and stabbing teeth of carnivores, the teeth of these animals grind and shred plant material before digestion.

像猫和狗这样的动物，在嘴巴前方有着又大、又尖利的牙齿，在下巴后面也有着同样锋利的牙齿。这些动物中也有许多都装备有锋利的爪子。牙齿和爪子作为捕食工具的优势是明显的。现在细想一下像牛、马、兔子和老鼠这样的动物。这些动物下巴后面有平齿，形似磨石并且功能也相同。不像食肉动物切肉的、尖锐的牙齿，这些动物在消化植物体之前，用牙齿将它们磨粉碎。

More clues exist in other parts of the skull. The jaw joint of carnivores such as dogs and cats has the mechanical advantage of being at the same level as the tooth row, allowing the jaws to close with tremendous speed and forcing the upper teeth to occlude against the lower teeth with great

precision. In herbivorous animals, rapid jaw closure is less important. Because the flat teeth of herbivores work like grindstones, however, the jaws must move both side to side and front to back. The jaw joints of many advanced herbivores, such as cows, lie at a different level than the tooth row, allowing transverse tearing, shredding, and compression of plant material. If we extend such observations to extinct dinosaurs, we can infer dietary preferences (such as carnivory and herbivory), even though we cannot determine the exact diet. The duck-billed dinosaurs known as hadrosaurs are a good example of a group whose jaw joint is below the level of the tooth row, which probably helped them grind up tough, fibrous vegetation.

在头骨的其他部分有更多的线索。像狗和猫这样的食肉动物的下颌关节有着机械优势，下颌关节和牙排在同一水平上，让下颌高速闭合，迫使上牙紧密地咬合下牙。在草食动物中，下颚快速闭合是不重要的。由于食草动物的牙齿像磨刀石一样工作，而下巴必须前后左右移动。许多先进的草食动物的颌关节和牙排排列在不同的水平面上（如牛），这样可以横向撕裂、切碎、压缩植物材料。如果我们将这样的观察延伸到灭绝的恐龙上，我们可以推断出饮食偏好(如食肉的和食草的），虽然我们无法确定准确的饮食。鸭嘴形的恐龙，也就是鸭嘴龙是一组已知的颌关节低于齿列水平的一个很好的例子，这可能帮助他们把坚韧的纤维植物磨碎。

Paleontologists would like to be much more specific about a dinosaur's diet than simply differentiating carnivore from herbivore. This finer level of resolution requires direct fossil evidence of dinosaur meals. Stomach contents are only rarely preserved, but when present, allow us to determine exactly what these animals were eating.

古生物学家希望更明确恐龙的饮食，而不是简单的区分食草动物和食肉动物。这一更高层次的决心需要直接的恐龙食物的化石证据。胃内容物很少被保存下来，但如果存在，就可以让我们来确定这些动物吃什么。

In the stomach contents of specimens of Coelophysis (a small, long-necked dinosaur) are bones from juvenile animals of the same species. At

one time, these were thought to represent embryonic animals, suggesting that this small dinosaur gave birth to live young rather than laying eggs. Further research indicated that the small dinosaurs were too large and too well developed to be prehatchling young. In addition, the juveniles inside the body cavity were of different sizes. All the evidence points to the conclusion that these are the remains of prey items and that, as an adult, Coelophysis was at least in part a cannibal.

腔骨龙标本的胃内容物（小的长颈恐龙的骨头）是同一物种的幼年动物的骨头。他们一度被认为是胚胎动物的代表，这表明这个小恐龙是怀孕生下的而不是产卵生下的。进一步的研究表明，小恐龙太大，成长地太好，他们是不可能是孵化出来的幼体。此外，在体腔内的幼崽大小各有不同。所有的证据都指向这个结论，这些都是猎物遗骸，作为一个成年恐龙，腔骨龙至少是某种程度上的食人族。

Fossilized stomach contents are not restricted to carnivorous dinosaurs. In a few rare cases, most of them "mummies" (unusually well preserved specimens), fossilized plant remains have been found inside the body cavity of hadrosaurs. Some paleontologists have argued that these represent stream accumulations rather than final meals. The best known of these cases is the second Edmontosaurus mummy collected by the Sternbergs. In the chest cavity of this specimen, which is housed in the Senckenberg Museum in Germany, are the fossil remains of conifer needles, twigs, seeds, and fruits. Similar finds in Corythosaurus specimens from Alberta, Canada, have also been reported, indicating that at least two kinds of Late Cretaceous hadrosaurs fed on the sorts of tress that are common in today's boreal woodlands.

化石胃内容物不局限于食肉恐龙。在一些罕见的情况下，他们中的大多数“木乃伊”（罕见的保存完好的化石标本），实话的植物遗已经在鸭嘴龙体腔内发现。一些古生物学家认为，这些代表食物链的累积，而不是最后的晚餐。这些案例中最著名的是施特恩伯格氏收集的第二个埃德蒙顿木乃伊。在这个标本胸腔内，现在被置于德国沙根堡博物馆，有针叶、小枝、种子和果实的化石。阿尔伯塔和加拿大冠的龙标本也有类似报道，这表明至少有两种晚白垩纪的鸭嘴龙以各种各样的枝条为食，这些种枝条在今天的北方针叶林很常见。

A second form of direct evidence comes from coprolites (fossilized bodily waste). Several dinosaur fossil localities preserve coprolites. Coprolites yield unequivocal evidence about the dietary habits of dinosaurs. Many parts of plants and animals are extremely resistant to the digestive systems of animals and pass completely through the body with little or no alteration. Study of coprolites has indicated that the diets of some herbivorous dinosaurs were relatively diverse, while other dinosaurs appear to have been specialists, feeding on particular types of plants. The problem with inferring diets from coprolites is the difficulty in accurately associating a particular coprolite with a specific dinosaur.

直接的证据第二种形式来自粪化石（身体废物化石）。几个恐龙化石的地点保存粪化石。粪化石为恐龙的饮食习惯的提供了明确证据。植物和动物的许多部分对动物的消化系统有着极强的抵抗力，并完整地通过身体，几乎没有任何变化。研究表明，一些粪化石显示，食草恐龙的饮食比较多样化，而其他恐龙似乎已吃的比较专一，取食特定种类的植物。从粪化石推断饮食的问题是：准确地将特定的粪化石与一个特定的恐龙联系起来的很困难。

Passage 03

Climate and Urban Development

For more than a hundred years, it has been known that cities are generally warmer than surrounding rural areas. This region of city warmth, known as the urban heat island, can influence the concentration of air pollution. However, before we look at its influence, let's see how the heat island actually forms.

一百多年来，大家都知道城市一般比周围的农村温度更高。被称为城市热岛的区域性温暖可以影响空气污染的聚集。然而，在着眼于它的影响之前，让我们看看热岛事实上是如何形成的。

The urban heat island is due to industrial and urban development. In rural areas, a large part of the incoming solar energy is used in evaporating water from vegetation and soil. In cities, where less vegetation and exposed soil exist, the majority of the Sun's energy is absorbed by urban structures and asphalt. Hence, during warm daylight hours, less evaporative cooling in cities allows surface temperatures to rise higher than in rural areas. The cause of the urban heat island is quite involved. Depending on the location, time of year, and time of day, any or all of the following differences between cities and their surroundings can be important: albedo (reflectivity of the surface), surface roughness, emissions of heat, emissions of moisture, and emissions of particles that affect net radiation and the growth of cloud droplets.

城市热岛是由于工业开发和城市开发产生的。在农村地区，很大一部分的入射太阳能被消耗于植被和土壤中水分的蒸发。城市的植被和裸土较少，大部分的太阳能量被城市建筑和沥青吸收。因此，在温暖的白天，城市更少的蒸发冷却使地面温度上升得比农村地区更高。城市热岛的原因很复杂。根据不同的位置、季节、一天中的不同时间，城市和周围环境之间的以下任何差异都可能是重要因素：反照率（表面反射率）、表面粗糙度、热量排放、水分排放、影响净辐射和云微滴增长的颗粒排放。

At night, the solar energy (stored as vast quantities of heat in city buildings and roads) is slowly released into the city air. Additional city heat is given off at night (and during the day) by vehicles and factories, as well as by industrial and domestic heating and cooling units. The release of heat energy is retarded by the tall vertical city walls that do not allow infrared radiation to escape as readily as does the relatively level surface of the surrounding countryside. The slow release of heat tends to keep nighttime city temperatures higher than those of the faster-cooling rural areas. Overall, the heat island is strongest at night when compensating sunlight is absent; during the winter, when nights are longer and there is more heat generated in the city; and when the region is dominated by a high-pressure area with light winds, clear skies, and less humid air. Over time, increasing urban heat islands affect climatological temperature records, producing artificial warming in climatic records taken in cities. This warming, therefore, must be accounted for in interpreting climate change over the past century.

在夜间，太阳能（储存在城市建筑和道路的巨大热量）缓慢释放到城市空气中。额外的城市热量也在夜间（当然白天也有）排放，来源包括车辆和工厂，以及工业和家庭的供热和制冷装置。热能量的释放是被高大垂直的城市墙所减缓，这些墙面使得红外线辐射不能像在附近乡村相对水平的表面那样逃离。热能的缓慢释放使得城市在夜间保持高于快速冷却农村地区的温度。总体而言，热岛在以下几个情况是最强的：（1）在夜间，当补偿性的阳光缺失的时候；（2）在冬季，当夜晚更长，有更多的热量在城市产生的时候；（3）当该地区被一个伴随轻风、晴朗天空和干燥空气的高压区控制的时候。随着时间的流逝，加剧的城市热岛影响气象温度记录，在城市中制造了人工气候变暖。因此，解释过去一个世纪的气候变化必须考虑这一变暖（现象）。

The constant outpouring of pollutants into the environment may influence the climate of the city. Certain particles reflect solar radiation, thereby reducing the sunlight that reaches the surface. Some particles serve as nuclei upon which water and ice form. Water vapor condenses onto these particles when the relative humidity is as low as 70 percent,

forming haze that greatly reduces visibility. Moreover, the added nuclei increase the frequency of city fog.

环境中污染物的不断涌入可能影响城市气候。某些颗粒反射太阳辐射，从而减少到达表面的阳光。有些颗粒成为形成水和冰的聚集核心。当相对湿度最低 70%时，水蒸气凝就能结在这些粒子上，形成大大降低能见度的灰霾。此外，增加的颗粒聚核提高了城市起雾的频率。

Studies suggest that precipitation may be greater in cities than in the surrounding countryside; this phenomenon may be due in part to the increased roughness of city terrain, brought on by large structures that cause surface air to slow and gradually converge. This piling up of air over the city then slowly rises, much like toothpaste does when its tube is squeezed. At the same time, city heat warms the surface air, making it more unstable, which enhances risings air motions, which, in turn, aids in forming clouds and thunderstorms. This process helps explain why both tend to be more frequent over cities.

研究表明，城市的降水量可能比周围的乡村更大；这一现象的部分原因可能是城市地形的更大的粗糙度，城市的大型建筑使得地表空气流动减缓并逐渐聚集。城市上空的空气堆积起来，然后慢慢地上升，像被挤的牙膏一样。同时，城市热量加热了表面空气，使其更加不稳定，提高了上升气流的运动，而这反过来，有助于云和雷暴的形成。这个过程有助于解释为什么这两个现象在城市中更加频繁。

On clear still nights when the heat island is pronounced, a small thermal low-pressure area forms over the city. Sometimes a light breeze-called a country breeze-blows from the countryside into the city. If there are major industrial areas along the outskirts, pollutants are carried into the heart of town, where they tend to concentrate. Such an event is especially probable if vertical mixing and dispersion of pollutants are inhibited. Pollutants from urban areas may even affect the weather downwind from them.

在晴朗平静的夜晚，当热岛效应最显著的时候，一个小的热低压区域在城市形成。有时一阵轻风——被称为乡村风——从乡村吹到城市。如果郊区有主要的工业区，污染物会被带到城市的核心，往往在这里聚集起来。如果污染物的垂直混合和扩散被抑制，这样的聚集事件就特别容易发生。来自于城市地区的污染物甚至影响它们下风区的天气。