

TPO 36 – 1 Soil Formation 土壤形成

Living organisms play an essential role in soil formation. The numerous plants and animals living in the soil release minerals from the parent material from which soil is formed, supply organic matter, aid in the translocation(movement) and aeration of the soil, and help protect the soil from erosion. The types of organisms growing or living in the soil greatly influence the soil's physical and chemical characteristics. In fact, for **mature soils** in many parts of the world, the predominant type of natural vegetation is considered the most important direct influence on soil characteristics. For this reason, a soil scientist can tell a great deal about the **attributes** of the soil in any given area simply from knowing what kind of flora the soil supports. Thus prairies and tundra regions, which have characteristic vegetations, also have characteristic soils.★

活的有机体在土壤形成的过程中起到关键的作用。大量的生活在土壤里的植物和动物从土壤形成的母质层释放矿物质，提供有机物，帮助土壤的运动和通风，并且帮助保护土壤免受侵蚀。在土壤里生长或生活的有机体的种类极大地影响了土壤的物理和化学特性。实际上，对于各地的成熟土壤而言，占据优势地位的植被物种被认为是影响土壤特性的最重要的直接因素。因为这个原因，土壤学家仅仅通过土壤所支持的植物群种类就能推断出关于任意给定地区土壤属性的大量信息。因此，拥有特征性植被的大草原和苔原地区也同样拥有特征性土壤。

The quantity and total weight of soil flora generally exceed that of soil fauna. By far the most numerous and smallest of the plants living in soil are bacteria. Under favorable conditions, a million or more of these tiny, single-celled plants can inhabit each cubic centimeter of soil. It is the bacteria, more than any other organisms, that enable rock or other parent material to undergo the gradual transformation to soil. Some bacteria produce organic acids that directly attack parent material, breaking it down and releasing plant nutrients. Others decompose organic litter (debris) to form humus (nutrient-rich organic matter). A third group of bacteria inhabits the root systems of plants called legumes. These include many important agricultural crops, such as alfalfa, clover, soybeans, peas, and peanuts. The bacteria that legumes host within their root nodules (small swellings on the root) change nitrogen gas from the atmosphere into nitrogen compounds that plants are able to metabolize, a process, known as nitrogen fixation, that makes the soil more fertile. Other microscopic plants also are important in soil development. For example, in highly acidic soils where few bacteria can survive, fungi frequently become the chief decomposers of organic matter.★

一片土壤的植物群的数量和总重量一般会超过其承载的动物群的对应数值。至今为止，数量最多和体积最小的土壤生物是细菌。在适宜的条件下，一立方厘米体积的土壤可以容纳一百万或者更多的这种小小的单细胞生物。是这种细菌，而不是其他的有机体，使得岩石或者母质逐渐转化为土壤。一些细菌会分泌有机酸，这些有机酸直接腐蚀母质层，把它们分解掉并释放营养物质。其他的细菌则可以分解有机垃圾（残骸）来形成腐殖质（富含营养的有机物质）。第三种细菌存在于植物的根系里，被称作豆科植物。这些植物包括很多重要的农作物，比如说苜蓿，三叶草，大豆，豌豆和花生。寄生在豆科植物根瘤（根茎上的小肿块）中的细菌把空气中

批注 [1]: aeration

英 [eə'reɪʃn] 美 [e'reɪʃn]

•n. [环境] 曝气；通风；充气

批注 [2]: ★这一段在说什么？

首先，首句：Living organisms play an essential role in soil formation.

活的有机体在土壤形成中起到关键作用。

然后，介绍关键作用。

最后，引出 In fact，顺便出个题。

批注 [3]: 这种有括号的特别说明的，后面可能还会再使用。要注意留意。

批注 [4]: ★这一段在说什么？

首先，首句：The quantity and total weight of soil flora generally exceed that of soil fauna.

一片土壤的植物群的数量和总重量一般会超过其承载的动物群的对应数值。

然后，引出 bacteria，并介绍。顺便出个题：

接着，再出个长难句同义替换题：

最后，引怪里怪气的语气，出个看似很怪的题。

的氮气转化成植物可用以新陈代谢的含氮化合物。这个过程被称为固氮作用，可以使得土壤更肥沃。其他的微生物在土壤发育过程中也十分重要。例如，在酸度很高的土壤中，几乎没有细菌可以存活，真菌经常就变成了有机物的主要分解者。

More **complex forms** of vegetation play several vital roles with respect to the soil. **Trees, grass, and other large plants** supply the **bulk** of the soil's humus. The minerals released as these plants decompose on the surface constitute an important nutrient source for succeeding generations of plants as well as for **other soil organisms**. In addition, trees can extend their roots deep within the soil and bring up nutrients from far below the surface. These nutrients eventually enrich the surface soil when the tree drops its leaves or when it dies and decomposes. Finally, trees perform the vital function of slowing water runoff and holding the soil in place with their root systems, thus combating erosion. **The increased erosion that often accompanies agricultural use of sloping land is principally caused by the removal of its protective cover of natural vegetation.** ★

还有更复杂的植被也在土壤形成方面起到了至关重要的作用。树木枝条，草地，还有其他的大型植物为土壤提供了大量的腐殖质。这些植物在地表分解时产生的矿物质为后代的植物以及其他土壤内的有机体提供了营养。另外，树木可以把根延伸到土壤里，并且把土壤深处的营养物质带到土壤表面。这些营养经过树木落叶或者死亡分解的过程，最后会留在表层土里面。最后一点，树木在减缓水流速度和保持土壤方面有关键的作用，这就可以抵抗土壤的流失。日益严重的水土流失经常和斜坡上的农业用地一起出现，这往往是由自然植被保护层的砍伐而导致的。

Animals also influence soil composition. The faunal counterparts of bacteria are protozoa. These single-celled **organisms** are the most numerous representatives of the animal kingdom, and, like bacteria, a million or more can sometimes inhabit each cubic centimeter of soil. **Protozoa feed on** organic matter and **hasten** its decomposition. Among other soil-dwelling animals, the earthworm is probably the most important. Under exceptionally favorable conditions, up to a million earthworms (with a total body weight exceeding 450 **kilograms**) may inhabit an acre of soil. **Earthworms** ingest large quantities of **soil**, chemically alter it, and excrete it as organic matter called casts. The casts form a high-quality natural fertilizer. In addition, earthworms mix soil both vertically and horizontally, improving aeration and drainage. ★

动物也会影响土壤组成。与细菌在微生物界的地位相类似的是原生动物在动物界的地位。这些单细胞的有机体在自然界数量巨大。就像细菌一样，一立方厘米里可以生存百万个或更多的原生动物。原生动物以有机物为食，并且同时加速其分解。在其他生活在土壤里的动物里，蚯蚓可能是最重要的。在一些异常的有利条件下，多达一百万条蚯蚓（总重量可以超过 450 千克）可以存活在一英亩土壤里。蚯蚓可以吃下大量的土壤，改变其化学成分，并且产生一种被称为 **casts** 的有机物质。这种 **casts** 形成了一种高质量的自然肥料。另外，蚯蚓既会垂直地也会水平地搅动土壤，这改善了土壤的通风和排水情况。

批注 | 5: succeeding

英 [sək'si:diŋ] 美 [sək'si:diŋ]

•adj. 随后的，接着的

•v. 成功；接替（succeed 的现在分词）

批注 | 6: ★这一段在说什么？

首先，首句：More **complex forms of vegetation play several vital roles with respect to the soil**.

还有更复杂的植被也在土壤形成方面起到了至关重要的作用。

然后，介绍复杂植被的几个重要作用。对于第一个作用，出个一个题：

接着，基于句子的理解（考你长难句）再出个长难句理解基础上才能做出来的题。

批注 | 7: ★这一段在说什么？

首先，首句：Animals also influence soil composition. **The faunal counterparts of bacteria are protozoa**.

动物也会影响土壤组成。与细菌在微生物界的地位相类似的是原生动物在动物界的地位。

然后，由大到小，介绍

Protozoa → earthworm;

接着，具体介绍 earthworm，顺便出个题（earthworm 和 soil 关系）。

Insects such as ants and termites also can be **exceedingly** numerous under favorable climatic and soil conditions. In addition, **mammals** such as moles, field mice, gophers, and prairie dogs sometimes are present in sufficient numbers to have significant impact on the soil. These animals primarily work the soil **mechanically**. As a result, the soil is aerated, broken up, fertilized, and brought to the surface, hastening soil development. ★

像蚂蚁和白蚁的昆虫在适宜的气候和土壤条件下数量也是很多的。另外，哺乳动物比如说鼯鼠，田鼠，囊地鼠以及北美草原土拨鼠有时候也会数量充足，对于土壤造成重要的影响。这些动物不自觉地耕作着土壤。结果就是，土壤被打碎以便于通风，变得更加肥沃并且养料被带到表层土，这一切都加速了土壤的发育。

批注 [8]: exceedingly

英 [ɪk'siːdɪŋli] 美 [ɪk'siːdɪŋli]

•adv. 非常；极其；极度地；极端

批注 [9]: mechanically

英 [mə'kæni:kli] 美 [mə'kæni:kli]

•adv. 机械地；呆板地；物理上地

批注 [10]: ★这一段在说什么？

首先，首句：Insects such as ants and termites also can be **exceedingly** numerous under favorable climatic and soil conditions.

像蚂蚁和白蚁的昆虫在适宜的气候和土壤条件下数量也是很多的。

然后，又来一句 in addition，引出其他因素，顺便出个**题**；

接着，主要介绍这些因素怎样硬性土壤的。

【总的来说，在仔细介绍了影响土壤的重要因素后，简单提一提其他因素以及这些因素产生的影响】

TPO 36 – 2 Early Ideas about Deep-sea Biology 深海生物的早期研究

In 1841 Edward **Forbes** was offered the chance to serve as naturalist aboard **HMS Beacon**, an English Royal Navy ship assigned to survey the **Aegean Sea**. For a year and a half the Beacon **crisscrossed** the Aegean waters. During that time Forbes was able to drag his small, triangular dredge—a tool with a leather net for capturing creatures along the sea bottom—at a hundred locations, at depths ranging from 6 to 1,380 feet. **He collected hundreds of different species of animals, and he saw that they were distributed in eight different depth zones, each containing its own distinct assemblage of animal life, the way zones of elevation on the side of a mountain are populated by distinct sets of plants.** ★

在 1841 年，Edward Forbes 得到了一个作为自然学家随船考察的机会，这艘船叫做 HMS Beacon，是一艘意在探索爱琴海的英国皇家海军船只。一年半的时间里，Beacon 号详细考察了爱琴海。就是在这个时期内，Forbes 通过拖拽一种三角形的名为 dredge 的工具探究了上百处地点。这种工具有一个皮革制成的网，可以从海底捕获生物。它的作业范围可以从 6 英尺深入到 1380 英尺。他收集了上百种不同的海洋生物，并且观察到他们分布在八个不同深度的空间里。每一个空间都拥有自己独特的生物集合，就类似于不同高度的山上分布着明显是不同类型的植被一样。

Forbes also thought he saw, as he later told the British Association, that "the number of species and individuals diminishes as we descend, pointing to a zero in the distribution of animal life as yet unvisited." This zero, Forbes casually speculated—he simply **extended a line on his graph of animal number versus depth**—probably began at a depth of 1,800 feet. Below that was the final zone in Forbes's scheme, **zone nine**, a zone that covered most of the ocean floor and thus most of the solid surface of Earth: Forbes called this the azoic zone, where **no animal, to say nothing of plants, could survive.**

Forbes 后来告诉英国相关组织，他同样认为“越往海底潜，生物的种类和数量越少，这就暗示在我们还未探索过的海域，有一个空间是没有生物分布的”。这个没有生物存在的空间，Forbes 在他绘制的生物数量和深度示意图上划了条线，随意地推测这个区域的深度大约是从 1800 英尺向下。在这条线之下是 Forbes 图上的最后一个区域，第九区，这个区域涵盖了大部分的海床也就是大多数的地球固态表面：Forbes 把这个区域称为无生命区，动物和植物都不能在这个区域生存。

★这段在说什么？

首先，首句：Forbes also thought，表明他的观点。

然后，为什么做出这样的观点，这样观点的一些进一步解释，出个题（这么专业的手法）；

最后，推出什么结论，出个题。

批注 [11]: 这里呀，需要注意下，关于人物，一般都是要在后文提简称的，心理有个数，不用在后文见到简称的时候，还要费点脑细胞回忆这人是谁...

批注 [12]: crisscross
英 ['krɪs,krɒs] 美 ['krɪs,krɔːs]
•v. 在.....上构成十字形图案；多次往返于，来回奔波于；（在.....内）纵横交错，交叉；贯穿
•n. 线条纵横交错的图案
•adj. 十字形的，交叉的
•adv. 十字形地，十字交叉地

批注 [13]: assemblage
英 [ə'sembliʒ] 美 [ə'sembliːʒ]
•n. 装配；集合；聚集；集会；集合物；聚集的物或人

批注 [14]: 类似于 TPO2-3, Paragraph 1 最后一句: in the case of ...
简单表达: 就像..., 就类似...

批注 [15]: ★这段在说什么？
首先，首句: In 1841 Edward Forbes was offered the chance to serve as naturalist aboard HMS Beacon, an English Royal Navy ship assigned to survey the Aegean Sea.
介绍背景人物以及他要干什么，他干了什么，顺便出个背景题；
然后，说说他干的事情的大致内容，出现了一个长难句，ETS 肯定要考一考你的长难句能力，所以出了道同义替换题。

Forbes's **azoic zone** was entirely **plausible** at the time, and it was certainly far from the strangest idea that was then **entertained** about the deep sea. In the first decade of the nineteenth century, a French naturalist named François Péron had sailed around the world measuring the temperature of the ocean. He found that the deeper the water, the colder it got, and he concluded that the seafloor was covered with a thick layer of ice. **Péron ignored the fact that water expands when it freezes** and that ice therefore floats. A more popular belief at the time was that water at great depth would be compressed to such a density that nothing could sink through it. **This ignored the fact that water is all but incompressible.** But even the more **sensible** naturalists of the day were guilty of a similar misconception. They imagined the deep sea as being filled with an unmoving and undisturbable pool of cold, dense water. In reality the deep is always being refreshed by cold water sinking from above. ★

Forbes 的无生命区在当时看来是完全**可信的**。它和当时关于深海的最奇怪的理论大相径庭。在十九世纪开头的十年间，一个叫做 **Francois** 的法国自然学家环游世界，并且测量了海水的温度。他发现海水越深就越冷，这样他得出结论说 seabed 被厚厚的冰层覆盖着。Peron 忽视了水结冰以后密度会变低，冰会浮在水面上。当时更流行的观点是海洋最深处海水会被极度压缩，以至于没有生物可以潜入这一层。这个理论忽视了水是几乎不能压缩的这个事实。但是即使是当时更加**理智的**自然学家也会作出类似的误解。他们想象深海是一池不能运动的、波澜不惊的紧实冷水。但实际上，这个深度的海水是经常被上面流下来的冷水更新的。

The central implication of all these misconceptions was that nothing could live in the **abyss** (deep), just as Forbes's observations seemed to indicate. **But** Forbes erred in two ways. **One** was the particular **study site he happened to use** as a **springboard** for his **sweeping postulate** of a lifeless abyss. Although the Aegean had been the birthplace of marine biology, its depths are now known to be **exceptionally** lacking in animal diversity. **Moreover**, through no fault of his own, Forbes was not particularly successful at sampling **such life as did exist** at the bottom of the Aegean. It was his dredge that was inadequate. Its opening was so small and the holes in the net so large that the dredge **inevitably** missed animals. Many of those it did catch must have **poured out of** its open mouth when Forbes **reeled** it in. His azoic zone, then, was a plausible but wild **extrapolation** from pioneering but **feeble** data. ★

<p>springboard 英 ['sprɪŋbɔ:d] 美 ['sprɪŋbɔ:rd] n. 跳板；出发点 vi. 利用跳板跃进</p>	<p>sweeping 英 ['swi:pɪŋ] 美 ['swi:pɪŋ] adj. 影响广泛的；笼统的；规模大的；含丰富信息的；（投票等中的）大胜；弧线的；连绵曲折的；意义深远的 n. (sweepings) 扫集的尘土（或垃圾）；扫除 v. 打扫，扫除（sweep 的现在分词）</p>
<p>Inevitably (necessarily) 英 [ɪn'evɪtəbli] 美 [ɪn'evɪtəbli] adv. 不可避免地；必然地</p>	<p>feeble adj. 微弱的，无力的；虚弱的；薄弱的</p>

这些错误理论的中心观点是没有生物可以在深海中生存，就像 Forbes 的观察结论所说明的一样。但是 Forbes 在两点上弄错了。第一点是他用以得出无人区存在这个普遍结论的研究地点选择有误。即使爱琴海是海洋生物学的起源地，它的深度范围里的生物种类是特别有限的。

批注 [16]: plausible
英 ['plɔ:zəbl] 美 ['plɔ:zəbl]
•adj. 看似可信的；花言巧语的，巧言令色的；貌似真实的，貌似有理的

批注 [17]: ★这段在说什么？
首先，首句：Forbes's **azoic zone** was entirely **plausible** at the time...
一个词贯穿整段，首先表明，理论看似可信，（潜台词：**但实际上是有问题的**），举几个有问题的例子，并解释有问题的地方，对应的，少不了要出个**题**；
然后，说出实际情况。

批注 [18]:这种看上去很难的单词，后面有括号解释的，后面会再次出现的哦，要注意！

批注 [19]: exceptionally
•adv. 异常地；特殊地；例外地

批注 [20]: extrapolation
英 [ɪk'stræpə'leɪʃn] 美 [ɪk'stræpə'leɪʃn]
•n. [数] 外推法；推断

批注 [21]: ★这段在说什么？
首先，首句：The central implication of all these misconceptions was that...
整个段落基调是说错误理论及其原因。
然后，进一步具体展开说 Forbes 的理论和错误原因，必须出个**题**考考你看懂他说的了没。

第二点是，尽管 **Frobes** 本身并没有错，但是他在爱琴海深海取样的过程是不成功的。原因是他使用的工具 **dredge** 并不足以成功取样。这个工具的直径太小了，网上的洞又太大了，导致这个工具不可避免地会漏掉一些海底生物。它可能确实能捕捉到一些生物，但是当 **Frobes** 开始拉起它时，很多动物就从洞里漏出去了。所以他的无生物区的理论看上去是貌似可信的，而且推动了对海底生物的研究，但实际上是站不住脚的。

As it turned out, the existence of the azoic zone had been disproved even before Forbes **suggested** it, and the theory continued to be contradicted regularly throughout its long and influential life. Searching for the Northwest Passage from the Atlantic to the Pacific in 1818, Sir John Ross **had lowered** his "deep-sea clam"-a sort of **bivalved** sediment **scoop**-into the waters of Baffin Bay(an **inlet** between the Atlantic and Arctic oceans), which he determined to be more than a thousand fathoms deep in some places. Modern soundings indicate he overestimated his depths by several hundred fathoms, but in any case Ross's clam dove several times deeper than Forbes's dredge. It **brought back** mud **laced with** worms, and starfish that had entangled themselves in the line at depths well below the supposed boundary of the azoic zone. ★

就像事实所说明的那样，无生物区的存在在 **Forbes** 提出其存在之前就已经被否定了。在 **Frobes** 理论漫长而具有影响力的一生中，它被多次反对过。John Ross 爵士在 1818 年探索从大西洋到太平洋的西北航道中，把他的测量工具 **deep-sea clam**——一种双壳沉淀的**勺子**——深入到巴芬湾（大西洋和北冰洋的**入口**）里，深度超过了一千英寻。现代测量水深的工具显示他高估了几百英寻的深度，但是即便如此，**Ross** 的工具下潜的深度也比 **Frobes** 的深。这个工具带上来**含有**虫子的海泥，还捞上来缠在工具上的海星。它们被打捞上来的深度已经在无生物区的划分界线之下了。

批注 [22]: **bivalve**

英 ['baɪvəl] 美 ['baɪvəl]

- n. 双壳贝；[无脊椎] 双壳类动物
- adj. 双壳的；两瓣的

批注 [23]: **scoop**

英 [sku:p] 美 [sku:p]

- n. 勺，铲子；一勺（的量）；独家新闻；最新消息；夸张的上滑音
- v. 用勺舀；抱起；抢先报道；赢得；滑唱

批注 [24]: **inlet**

英 ['ɪnlet] 美 ['ɪnlet]

- n. 入口，进口；插入物；水湾
- v. 引进；嵌入；插入；

批注 [25]: 比较级，几倍深！

批注 [26]: ★这段在说什么？

首先，首句：As it turned out, the existence of the azoic zone had been disproved...

整段主要说，被 **disproved** 了；然后，举个例子说明具体的 **disproved** 的过程。落基调是说错误理论及其原因。和第一句对比，考一道题：所举例子和被 **disproved** 的例子之间的关系。

TPO 36 – 3 Industrial Melanism: The Case of the Peppered Moth

工业黑变病：以桦尺蠖为例

The idea of natural selection is that organisms in a species that have characteristics **favoring survival** are most likely to survive and produce offspring with the same characteristics. Because *the survival of organisms* with particular characteristics is **favored over** the *survival of other organisms* in the same species that lack these characteristics, future generations of the species are likely to include more organisms with the **favorable** characteristics. ★

自然选择的思想是：一个物种里拥有有利于生存的特征的个体更容易生存下来并产生相同特征的后代。因为在同一个物种内部，拥有某种特定特征的生物会比没有这种特征的生物的存活更容易。所以这一物种的下一代里，拥有这种特征的个体会变多。

Favoring (现在分词短语作后置定语) 英 美 ['feɪvərɪŋ] v. 赞同; 偏袒; 有利于; (非正式) 长得像(父亲、母亲或亲戚); 悉心照料(受伤的肢体)(favor 的现在分词, favor 等于 favour) adj. 有帮助的	favored 英 ['feɪvəd] 美 ['feɪvərd] adj. 有利的; 受到优待的, 受宠的; 称心如意的; 被推荐的; (运动员等) 被看好的 v. 支持; 对……有利; 优惠; 宠爱, 偏袒; 外貌像; 悉心照料; 帮助 (favor 的过去分词)
survival 英 [sə'vaɪvl] 美 [sər'vaɪvl] n. 幸存, 残存; 幸存者, 残存物	favorable 英 ['feɪvərəbl] 美 ['feɪvərəbl] adj. 有利的; 良好的; 赞成的, 赞许的; 讨人喜欢的

批注 [27]: ★这段在说什么?

首先, 首句: The idea of natural selection...

介绍自然选择的概念;

然后, 解释这个概念。

【和 favor 这个单词过不去了!】

favor

英 ['feɪvə(r)] 美 ['feɪvər]

- v. 较喜欢; 偏袒; 有利于; (非正式) 长得像; 悉心照料
- n. 帮助; 提拔; 徽章; 赞同; 偏袒; 同意性交

One of the most **thoroughly analyzed** examples of natural selection in operation is the change in color that has occurred in certain populations of the peppered moth, *Biston betularia*, in industrial regions of Europe during the past 100 years. Originally moths were **uniformly** pale gray or whitish in color; dark-colored (**melanic**) individuals were rare and **made up** less than 2 percent of the population. **Over a period of decades**, dark-colored forms **became an increasingly large fraction** of some populations and eventually came to dominate peppered moth populations in certain areas—especially those of extreme industrialization such as the Ruhr Valley of Germany and the Midlands of England. Coal from industry released large amounts of black soot into the environment, **but the increase of the dark-colored forms was not due to genetic mutations caused by industrial pollution**. For example, caterpillars that **feed on** soot-covered leaves did not **give rise to** dark-colored adults. Rather, pollution **promoted the survival of** dark forms on soot-covered trees. **Melanics** were normally quickly eliminated in nonindustrial areas by adverse selection; birds spotted them easily. This phenomenon, an increase in the frequency of dark-colored **mutants** in polluted areas, is known as industrial melanism. The North American equivalent of this story is another moth, **the swettaria form of *Biston cognataria***, first noticed in industrialized areas such as Chicago and New York City in the early 1900s. By 1961 it constituted over 90 percent of the population in parts of Michigan. ★

批注 [28]: **uniformly**

英 ['ju:nɪfɔ:mli] 美 ['ju:nɪfɔ:r mli]

•adv. 一致地

批注 [29]: **fraction**

英 ['frækʃn] 美 ['frækʃn]

•n. 分数; 部分; 小部分; 稍微

批注 [30]: ★这段在说什么?

首先, 首句: **One of the most thoroughly analyzed examples...**

介绍一个经典的例子 of 自然选;

然后, 进一步解释这个例子的详细原因, 并且给出相关说明。

最后, 引出题目的概念。(还捎带提了一下相似例子)

【To reject a view of the role of pollution in the increase of dark peppered moths that would not involve natural selection. 拒绝接受污染在黑色斑纹蛾数量增加中所起的作用, 这与自然选择无关。】

这里有一个 **被全面分析过的** 自然选择的相关例子, 那就是某几种桦尺蠖颜色的改变。这个案例发生在过去 100 年间欧洲的工业地区。在一开始, 桦尺蠖都是灰色或者白色的; 黑色的桦尺

蛾很少，也就占不到总族群百分之二的比例。但是几十年过去，黑色桦尺蛾在某些桦尺蛾种群中所占的比例越来越大，最终在某些地区成为优势物种——尤其是重度工业化的地区例如德国的 Ruhr Valley 和英国的 Midlands。工业生产需要的煤块会产生大量的黑色煤烟，排放进环境中，但是黑色桦尺蛾数量的增加并不是因为工业污染导致的基因突变。例如，毛毛虫形态的幼年桦尺蛾并不会因为吃了覆盖了煤烟的树叶而长成黑色的成年桦尺蛾。然而，工业污染促进了被黑色煤烟覆盖的叶子上的黑色桦尺蛾的存活。在非工业地区，黑色桦尺蛾一般来说很快就会被不利的自然选择淘汰了；因为鸟类很容易（从绿色树叶上）发现（黑色的）它们。这种工业污染地区黑色桦尺蛾数量增长的现象被称为工业黑变病。北美的相似例子是另外一种蛾子，它是 swettaria 形态的 Biston cognataria。它们首先是在 20 世纪早期于芝加哥以及纽约的工业地区被人发现的。到 1961 年的时候，它已经占据了密歇根地区它们种族百分之九十的比例。

The idea that natural selection was responsible for the changing ratio of dark- to light-colored peppered moths was developed in the 1950s by H.B.D.Kettlewell of Oxford University. If natural selection was the explanation, then **there should be** different survival rates for dark- and light-colored moths. To determine whether this was true, Kettlewell released thousands of light and dark moths (each **marked** with a **paint spot**) into rural and industrialized areas. In the **nonindustrial** area of Dorset, he recaptured 14.6 percent of the **pale** forms but only 4.7 percent of the dark forms. In the **industrial** area of Birmingham, the situation was reversed: 13 percent of pale forms but 27.5 percent of dark forms were recaptured. ★

在 20 世纪 50 年代，牛津大学的 H. B. D. Kettlewell 提出，自然选择可以解释桦尺蛾种群里黑色桦尺蛾和浅色桦尺蛾数量比例的变化。如果这个理论是正解，那么黑色桦尺蛾和浅色桦尺蛾的存活率应该有区别。为了确定这个理论是不是对的，Kettlewell 在乡村和工业地区放生了几千只浅色和黑色的桦尺蛾（每一只都做好了标记）。在多赛特的非工业地区，他回收了百分之 14.6 的浅色桦尺蛾，但是仅仅回收了百分之 4.7 的黑色桦尺蛾。在伯明翰的工业地区，情况翻转了：他回收了百分之 13 的浅色桦尺蛾和百分之 27.5 的黑色桦尺蛾。

Clearly some environmental factor was responsible for the greater survival rates of dark moths. Birds were predators of peppered moths. Kettlewell hypothesized that the normal pale forms are difficult to see when resting on lichen-covered trees, whereas dark forms are **conspicuous**. In industrialized areas, lichens are destroyed by pollution, **tree barks** become darker, and dark moths **are the ones birds have difficulty detecting**. As a test, Kettlewell set up hidden observation positions and watched birds **voraciously** eat moths placed on tree trunks of a contrasting color. The action of natural selection in producing a small but highly significant step of evolution was **seemingly** demonstrated, with birds as the selecting force. ★

显然，一些环境因素导致了黑色桦尺蛾更高的存活率。鸟类是桦尺蛾的捕食者。Kettlewell 假设，正常的浅色桦尺蛾栖息在地衣覆盖的树叶上的时候是很难被鸟类发现的。但是黑色桦尺蛾就比较容易被发现。在工业地区，地衣已经被工业污染破坏了，树干被染成了黑色，这样黑色桦尺蛾就变成了难以被发现的种类。Kettlewell 在一个测试中躲在隐秘的观察点，观察到鸟类大吃特吃与树干颜色形成鲜明对比的桦尺蛾。这种自然选择使得桦尺蛾出现了一步步微小但重要的进化。这个把鸟类视为桦尺蛾进化动力的理论似乎说得通。

批注 [31]: pale
英 [peɪl] 美 [peɪl]
•adj. 苍白的；无力的；暗淡的
•n. 前哨；栅栏；范围
•vt. 使失色；使变苍白；用栅栏围
•vi. 失色；变苍白；变得暗淡

批注 [32]: ★这段在说什么？
首先，首句：The idea that natural selection was responsible for...
介绍 idea 的最开始的提出者，并进一步阐述提出的过程；提出的过程出了个实验设置相关的题。
然后，进一步解释这个例子的详细原因，并且给出相关说明。

批注 [33]: voraciously
英 [və'reɪʃəsli] 美 [və'reɪʃəlɪ]
•adv. 狼吞虎咽地；贪得无厌地

批注 [34]: ★这段在说什么？
首先，首句：Clearly some environmental factor was responsible for...
提出得到的观点，进一步证明观点。【承接前一段的实验】
然后，进一步从观察过程，总结观点。

Not every researcher has been **convinced** that natural selection by **birds** is the only explanation of the observed frequencies of dark and light peppered moths. More recent data, however, provide additional support for Kettlewell's ideas about natural selection. The light-colored form of the peppered moth **is making a strong comeback**. In Britain, a **Clean Air Act was passed** in 1965. Sir Cyril Clarke has been trapping moths at his home in Liverpool, Merseyside, since 1959. **Before about 1975**, 90 percent of the moths were dark, but since then there has been a steep decline in melanic forms, **and in 1989 only 29.6 percent** of the moths caught were **melanic**. The **mean concentration of** sulphur dioxide pollution fell from about 300 micrograms per cubic meter in 1970 to less than 50 micrograms per cubic meter in 1975 and has remained fairly constant since then. If the spread of the light-colored form of the moth continues at the same speed as the melanic form spread in the last century, soon the melanic form will again be only an occasional resident of the Liverpool area. ★

并不是每个研究者都相信自然选择是黑色和浅色桦尺蠖数量变化的唯一解释。然而，更近期的数据为 Kettlewell 的自然选择学说提供了更多的支持。浅色桦尺蠖卷土重来了。在英国，1965 年通过了一部净化空气法案。自从 1959 年起，Cyril Clarke 爵士就在他的家乡利物浦的默西塞德捕获桦尺蠖。在 1975 年以前，他捕获的桦尺蠖里百分之九十都是黑色的，但是从 1975 年开始，黑色桦尺蠖的数量突然急剧下跌。到 1989 年，只有百分之 29.6 的桦尺蠖是黑色的了。这片地区的平均二氧化硫的浓度也从 1970 年的每立方米 300 微克降到了 1975 年的每立方米 50 微克，并且稳定在这个水平。如果浅色桦尺蠖数量增长的速度和黑色桦尺蠖在上个世纪增长的速度一样，那么很快黑色桦尺蠖在利物浦地区就会重新变得稀少。

批注 [35]: comeback

英 ['kʌmbæk] 美 ['kʌmbæk]

•n. 恢复，复出；再度流行；迅速反驳；追究……责任；回交羊

批注 [36]: it is making a strong comeback

它正在强势回归

批注 [37]: ★这段在说什么？

首先，首句：**Not every researcher has been convinced that natural selection by birds is...**

However,...

首先，提出别人的看法，进一步找例子巩固本文核心看法。

然后，详细说说具体例子，随着例子中前后的时间推移，产生的变化，考了一道题。

【一般而言，托福文章的段落第一句，就是本段的主旨句。】

（也有主旨句在段中间的，不过比较少。前面的 TPO 里有一篇是文章的其中一段是这样的。）