TPO 8 – 1 The Rise of Teotihuacán
特奥蒂瓦坎的崛起

感悟：全文在讨论的对象到底是哪个，要知道。

The city of Teotihuacán, which lay about 50 kilometers northeast of modern-day Mexico City, began its growth by 200-100 B.C. At its height, between about A.D.150 and 700, it probably had a population of more than 125,000 people and covered at least 20 square kilometers. It had over 2,000 apartment complexes, a great market, a large number of industrial workshops, an administrative center, a number of massive religious edifices, and a regular grid pattern of streets and buildings. **Clearly, much planning and central control were involved in the expansion and ordering of this great metropolis.** Moreover, the city had economic and perhaps religious contacts with most parts of Mesoamerica (modern Central America and Mexico).

起源于公元前 200 到 100 年前的特奥蒂瓦坎城位于现在的墨西哥城东北约 50 公里处。在鼎盛时期，也就是大约在公元 150 到 700 年间，它可能有超过 12.5 万的人口至少覆盖圆 20 平方公里。它拥有超过 2 000 座大厦、一座大型市场、大量的工业作坊、一个行政管理中心、数量庞大的宗教场所，还有规则的街道建筑网络。**显然，这座伟大的都市的管理和扩张时经过了精心的规划和集中管理的。**甚至特奥蒂瓦坎城与中美洲的大部分都保持着经济也许还有宗教的联系。

How did this tremendous development take place, and why did it happen in the Teotihuacán Valley? Among the main factors are Teotihuacán's geographic location on a natural trade route to the south and east of the Valley of Mexico, the obsidian resources in the **Teotihuacán Valley itself**, and the valley's potential for extensive irrigation. The exact role of other factors is much more difficult to *pinpoint*: for instance, Teotihuacán's religious significance **as a shrine**, the historical situation in and around the Valley of Mexico toward the end of the first millennium B.C., the ingenuity and foresightedness of Teotihuacán's elite, and, finally, the **impact** of natural disasters, such as the volcanic eruptions of the late *first millennium B.C.*

这惊人的发展是如何完成的，又为什么会发生在特奥蒂瓦坎峡谷呢？其中最主要的原因就是特奥蒂瓦坎地处联通墨西哥峡谷南部和东部的自然形成的通商线路中，**特奥蒂瓦坎峡谷本身**拥有的黑曜石资源，还有特奥蒂瓦坎峡谷大面积灌溉的潜能。而其他的因素的准确作用则很难*表述清楚*——例如，特奥蒂瓦坎**作为宗教圣地**的重要地位，在公元前一千年后期墨西哥峡谷及其周围地区的历史情况，特奥蒂瓦坎精英们的机智和深谋远虑，以及自然灾害的**冲击**，比如在*公元前一千年*后期的火山喷发。

感悟：地点，数量有时候需要特别注意一下。

This last factor is at least circumstantially implicated in Teotihuacán's rise. Prior to 200 B.C., a number of relatively small centers **coexisted** in and near the Valley of Mexico. Around this time, the largest of these centers, Cuicuilco, was seriously affected by a volcanic eruption, with much of its **agricultural land** covered by lava. **With Cuicuilco eliminated as a potential rival**, any one of a number of relatively **modest** towns might have emerged as a leading economic and political power in Central Mexico. The archaeological evidence clearly

indicates, **though**, that Teotihuacán was the center that did arise as the predominant force in the area by the first century A.D.
这最后的因素至少偶然地暗示了特奥蒂瓦坎的崛起。在公元前 200 年以前，有很多相对较小的中心在墨西哥峡谷内部和周围**和谐共存着**。就在这时其中最大的中心，Cuicuilco 遭到火山爆发的严重影响，其大部分**农田**被岩浆覆盖了。随着 Cuicuilco 失去了**竞争**能力，其他任何一个中等的城镇都可能成为墨西哥中部新一代政治经济中心。考古资料明确地表明，特奥蒂瓦坎**就**是在公元 1 世纪时崛起的中心。

It seems likely that Teotihuacán's natural resources, along with the city elite's ability to recognize their potential, gave the city a competitive edge over its neighbors. The valley, like many other places in Mexican and Guatemalan highlands, was rich in obsidian. The hard volcanic stone was a resource that had been in great demand for many years, at least since the rise of the Olmecs (a people who flourished between 1200 and 400 B.C.), and it apparently had a secure market. Moreover, recent research on obsidian tools found at Olmec sites has shown that some of the obsidian obtained by the Olmecs originated near Teotihuacán. Teotihuacán obsidian **must have been recognized as a valuable commodity** for many centuries before the great city arose.
很可能是特奥蒂瓦坎的自然资源和精英们发挥其潜能们的才能，给予了这座城市以与其邻居们抗衡的力量。像墨西哥和危地马拉高地的其他地区一样，这个峡谷也富含黑曜岩。那坚硬的火成岩在很多年内都是需求量极大的资源，至少从奥尔麦克人(一个在公元前 1 200 到公元前 400 年间繁荣过的名族)的崛起之后就是这样了，显然它有着一个稳定的市场。关于最近在奥尔达克遗址中发掘的黑曜岩工具的研究表明，奥尔麦克人所得到的部分黑曜石工具源自特奥蒂瓦坎地区。在这座伟大的城市崛起之前，特奥蒂瓦坎的黑曜岩一定已经作为极有价值的商品闻名数世纪了。

Long-distance trade in obsidian probably gave the elite residents of Teotihuacán access to a wide variety of exotic good, as well as a relatively prosperous life. Such success may have attracted immigrants to Teotihuacán. In addition, Teotihuacán's elite may have consciously attempted to attract new inhabitants. It is also probable that as early as 200 B.C.,Teotihuacán may have **achieved some religious significance** and its shrine (or shrines) may have **served as an additional population magnet**. Finally, the growing population was probably fed by increasing the number and size of irrigated fields.
长距离的黑曜岩交易可能就使得特奥蒂瓦坎的精英们有机会得到外来的商品和相对繁荣的生活，这种成功可能会吸引移民到特奥蒂瓦坎。另外，特奥蒂瓦坎的贵族们也可能会有意地吸引新的移民。也有可能是早在公元前 200 年前，特奥蒂瓦坎的**宗教**就达到了**一定的高度**，所以其神殿**就是另一种对移民的吸引力**。最后，不断增加的人口可以通过扩大灌溉土地的面积和规模而得到给养。

The picture of Teotihuacán that emerges is a classic picture of positive feedback among obsidian mining and working, trade, population growth, irrigation, and religious tourism. The thriving obsidian operation, for example, would necessitate more miners, additional manufacturers of obsidian tools, and additional traders to carry the goods to new markets. All

this led to increased wealth, which in turn would attract more immigrants to Teotihuacán. The growing power of the elite, who controlled the economy, would give them the means to physically **coerce** people to move to Teotihuacán and serve as additions to the labor force. More irrigation works would have to be built to feed the growing population, and this resulted in more power and wealth for the elite.

那展现出来的特奥蒂瓦坎的生活图景是一种经典的在黑曜岩开采和交易，人口的增长，灌溉的扩张，还有宗教旅游业之间的良性反馈。比如说，黑曜岩交易的发展将需要更多的矿工，更多的黑曜岩工具的制造商和更多的商人将工具运往新的市场。所有的这一切导致了财富的增加，而财富的增加，这反过来又会吸引更多的人移民到特奥蒂瓦坎。而那些掌控着经济命脉的社会精英们的力量的增长就会为他们提供了种种方法以**迫使**人们移往特奥蒂瓦坎以充当额外的劳动力。于是就不得不建成更多的灌溉工事以给养增长的人口，而这又会导致精英们力量和财富的增加。

TPO 8 – 2 Extinction of the Dinosaurs
恐龙的灭绝

Paleontologists have **argued** for a long time that the demise of the dinosaurs was caused by climatic alterations **associated with** slow changes in the positions of continents and seas resulting from plate tectonics. Off and on throughout the Cretaceous (the last period of the Mesozoic era, during which dinosaurs flourished), large shallow seas covered extensive areas of the continents. Data from diverse sources, including geochemical evidence *preserved in* seafloor sediments, indicate that the Late Cretaceous climate was **milder** than today's. The days were not too hot, nor the nights too cold. The summers were not too warm, nor the winters too frigid. The shallow seas on the continents probably *buffered* the temperature of the nearby air, keeping it relatively constant.

很长时间以来，古生物学家们**认为**恐龙的灭亡是与因地质构造而引起的海洋和大陆位置变迁**相关的**气候变化所致。**在整个白垩纪**（中生代的最后的一段时间，这时恐龙正值繁盛），广阔的浅海覆盖了大量的陆地。各方面的数据，包括海床沉积中的地理化学证据，都表明白垩纪后期的气候比现在的气候要**温和**得多。白天不是很热，夜间也不是很寒冷。夏天不是太炎热，而冬天也不是太寒冷。大陆上的浅海可能使其附近的空气少受影响，以保持相对稳定的温度。

At the end of the Cretaceous, the geological record shows that these seaways *retreated* from the continents back into the major ocean basins. No one knows why. Over a period of about 100,000 years, while the seas **pulled back**, climates around the world became dramatically more extreme: warmer days, cooler nights; hotter summers, colder winters. Perhaps dinosaurs could not tolerate these extreme temperature changes and became extinct.

在白垩纪后期，地质资料表明这些浅海都从大陆*退回*到主要的海洋盆地内了，没有人明白为什么。大约在 100 000 年内，海洋**收缩了**，世界的气候也随之变得更极端：白天更热，夜间更冷，夏天更炎热，冬天更寒冷。恐龙或许就是因为无法忍受这种严峻的气温变化因而灭绝。

If true, though, why did cold-blooded animals such as snakes, lizards, turtles, and crocodiles ***survive*** the freezing winters and torrid summers? These animals are at the mercy of the climate to maintain a livable body temperature. It's hard to understand why they would not be affected, **whereas** dinosaurs were left too crippled to cope, **especially if**, as some scientists believe, dinosaurs were warm-blooded. Critics also point out that the shallow seaways had retreated from and advanced on the continents numerous times during the Mesozoic, so why did the dinosaurs survive the climatic changes associated with the earlier fluctuations but not with this one? Although initially appealing, the hypothesis of a simple climatic change related to *sea levels* is insufficient to explain all the data.

如果真是这样，那么为什么冷血动物，比如蛇类、蜥蜴、乌龟和鳄鱼却***能够幸免于***寒冬和酷夏呢？这些动物都是依赖于气温以使其身体保持适合生存的温度。很难理解它们为什么毫不受影响，**然而**恐龙却如此的无能以至于无法适应，**尤其是**有些科学家认为恐龙是热血动物。批评者们也指出浅海在中生代曾有过无数次的进入大陆而又退回盆地的过程，所以为什么恐龙在前面的海洋起伏中能幸免于难，而在这一次中却不能呢？尽管最初人们这样认为，但是简单的与*海平面*高度有关的气候变化假设是不足以解释所有数据的。

Dissatisfaction with **conventional** explanations for dinosaur extinctions led to a surprising observation that, in turn, has suggested a new hypothesis. Many plants and animals disappear abruptly from the fossil record as one moves from layers of rock documenting the end of the Cretaceous up into rocks representing the beginning of the Cenozoic (the era after the Mesozoic). Between the last layer of Cretaceous rock and the first layer of Cenozoic rock, there is often a thin layer of clay. Scientists felt that they could get an idea of how long the extinctions took by determining how long it took to deposit this one centimeter of clay ***and*** they thought they could determine the time it took to deposit the clay by determining the amount of the element iridium (Ir) it contained.
对**传统的**关于恐龙灭绝解释的不满使得人们反过来惊奇的发现，从而产生了新的假设。当人们对比白垩纪后期的岩层资料和新生代（中生代后面的一个时期）早期的资料时发现很多植物和动物都突然地消失了。在白垩纪最后的一层岩石和新生代的第一层岩石之间，常有一层很薄的粘土。科学家们感觉到他们可以通过确定这层一厘米厚的粘土层中元素铱的含量来推测其的沉积时间，进而推测大灭绝所用的时间。

Ir has not been common at Earth's since the very beginning of the planet's history. Because it usually exists in a metallic state, it was **preferentially** incorporated in Earth's core as the planet cooled and *consolidated*. Ir is found in high **concentrations** in some meteorites, in which the solar system's original chemical composition is preserved. Even today, *microscopic meteorites* continually **bombard** Earth, falling on both land and sea. By measuring how many of these meteorites fall to Earth over a given period of time, scientists can estimate how long it might have taken to deposit the observed amount of Ir in the boundary clay. These calculations suggest that a period of about one million years would have been required. However, other reliable evidence suggests that the deposition of the boundary clay could not have taken one million years. So the unusually high concentration of Ir seems to *require a special explanation*.
自从地球以来，铱元素在地球的表面上就不常见。因为它通常是以金属状态存在，并随着地球的冷却和*固结*而**优先地**合并到地核中了。在一些陨石中，依可能会高度**富集**，而这里常保存着太阳系内原始的化学组成。直到今天，小型的陨石也在连续不断地**撞击**地球，并掉落在陆地和海洋中。通过确定在一段给定时间内掉落在地球上的这种陨石的数量，科学家们就可以确定沉积隔层粘土的形成时间。这种计算表明形成这种沉积可能需要一百万年。然而其他可靠的证据则表明沉积这层粘土不可能花费了一百万年。所以这种不正常的铱的富集可能*需要一种特殊的解释*。

In view of these facts, scientists hypothesized that a single large asteroid, **about 10 to 15 kilometers across**, collided with Earth, and the resulting fallout created the boundary clay. Their calculations show that the impact **kicked up** a dust cloud that cut off sunlight for several months, **inhibiting** photosynthesis in plants; decreased surface temperatures on continents to below freezing; caused extreme episodes of acid rain; and significantly raised long-term global temperatures through the greenhouse effect. This disruption of food chain and climate would have **eradicated** the dinosaurs and other organisms in less than fifty years.

考虑到这些事实，科学家们就假设有一个较大的小行星，直径差不多有 10 到 15 公里，曾与地球相撞，所以碰撞扬起的灰尘等就形成了这层粘土层。他们的计算表明撞击扬起的灰尘遮挡了阳光达几个月之久，阻止了植物的光合作用，将陆地上的气温降到了零点之下，导致酸雨，通过温室效应造成了长期的、严重的全球升温。这种对食物链和气候的极大扰乱将可使恐龙和其他生物在不到 50 年的时间内绝迹。

TPO 8 – 3 Running Water on Mars
火星上的流水

Photographic evidence suggests that liquid water once existed in great quantity on the surface of Mars. Two types of flow features are seen: **runoff** channels and **outflow** channels. Runoff channels are found in the southern highlands. These flow features are extensive systems-sometimes hundreds of kilometers in total length-of interconnecting, twisting channels that seem to merge into larger, wider channels. They **bear a strong resemblance to** river systems on Earth, and geologists think that they are dried-up beds of long-gone rivers **that** once carried rainfall on Mars from the mountains down into the valleys. Runoff channels on Mars ***speak*** of a time 4 billion years ago (the age of the Martian highlands), when the atmosphere was thicker, the surface warmer, and liquid water widespread.
来自照片的证据显示在火星的表面曾有过大量的液态水。两种流动形式已经被发现：径流通道和外流通道。径流通道发现于南部的高地。这些流动形式有着庞大的系统——有时竟有数百千米长——这些通道相互交错、扭转，并可能汇入更大更宽的通道中。它们**和地球上的河流系统非常相似**，地质学家们认为它们是以前曾将火星上的雨水从高山携带到峡谷中的那些河流干涸后的遗迹。火星上的径流通道*存在于*40 亿年以前（就是火星高地的年龄），那时候火星的大气层更厚，地表更暖和，并且液态水分布很广。

Outflow channels are probably relics of catastrophic flooding on Mars long ago. They appear only in **equatorial regions** and generally do not form extensive interconnected networks. *Instead*, they are probably the paths taken by huge volumes of water draining from the southern highlands into the northern plains. The **onrushing water** arising from these flash floods likely also formed the *odd* **teardrop-shaped** "islands" (resembling the miniature versions seen in the wet sand of our beaches at low tide) that have been found on the plains close to the ends of the outflow channels. Judging from the width and depth of the channels, the flow rates must have been truly enormous-perhaps as much as a hundred times greater than the 105 tons per second carried by the great Amazon river. Flooding **shaped** the outflow channels approximately 3 billion years ago, about the same times as the northern volcanic plains formed.
外流通道可能是很久以前火星上洪灾的遗迹。它们只形成于**赤道附近**，并一般没有形成广泛的交错的网络。*相反*，它们可能是携带大量水从南部高地到北部平原的排水系统。由泛滥的洪水而产生的**激 流**可能也形成*奇怪的***泪滴状**小岛（就像是在低潮时湿沙地或海滩上看到的缩小版本一样），已经在靠近出流通道末尾处的平原上被看到。从这些通道的宽度和深度可判断，当时流速一定很大——有可能是亚马逊河的每秒钟 105 吨的流量的一百多倍。大约在 30 亿年以前，北部火山平原形成的同时，洪水**改变了**外流通道**的形状**。

Some scientists speculate that Mars may have enjoyed an extended early Period during which rivers, lakes, and perhaps even oceans **adorned its surface**. A 2003 Mars Global Surveyor image shows what mission specialists think may be a delta-a fan-shaped network of channels and sediments where a river once flowed into a larger body of water, in this case a lake filling a crater in the southern highlands. Other researchers go even further, suggesting

that the data provide evidence for *large open expanses* of water on the early Martian surface. A computer-generated view of the Martian north polar region shows *the extent of what* may have been an ancient ocean covering much of the northern lowlands. The Hellas Basin, which measures some **3,000 kilometers across** and has a floor that lies nearly 9 kilometers below the basin' rim, is another candidate for an ancient Martian sea.
一些科学家认为早期的火星上广泛存在着河流，湖泊甚至是海洋。一份 2003 年的对火星全球的调查照片显示了一个科学家们认为是三角洲的构造——一个扇形的沉积物和水流通道的网络，河流可能是从这里流入了一个更大的水体；在这种情况下，它可能是南部高地的一个火山口湖泊。其他研究者做了更大胆的猜测，他们认为那些数据表明早期在火星表面*存在大量的水*。一张关于火星北部极地地区的电脑图片说明*有可能有*一个古老的海洋覆盖了大部分北部的低洼处。那座有大约 3 000 公里宽，9 公里深的希腊盆地也可能是火星海洋。

These ideas remain controversial. **Proponents** point to features such as the **terraced** "beaches" shown in one image, which could conceivably have been left behind as a lake or ocean evaporated and the shoreline **receded**. But **detractors** maintain that the terraces could also have been created by geological activity, perhaps related to the geologic forces that depressed the Northern Hemisphere far below the level of the south, in which case they have nothing whatever to do with Martian water. *Furthermore*, Mars Global Surveyor data released in 2003 seem to indicate that the Martian surface contains too few carbonate rock layers-layers containing compounds of carbon and oxygen-that should have been formed in abundance in an ancient ocean. Their absence supports the picture of a cold, dry Mars that never experienced the extended mild period required to form lakes and oceans. However, **more recent data** imply that at least some parts of the planet did in fact experience long periods in the past during which liquid water existed on the surface.
这些观点仍然有争议。支持者们指出照片里显示的台地“海滩”可以是由湖泊或者海洋蒸发干涸之后或者海退之后形成的。但是反对者认为这些台地也可能是由于地质活动造成的，也许与使得北半球比南半球地势更低的地质力量有关，在这种情况下，它们就和火星水系没有任何关系。*而且*，2003 发布的火星全球调查数据也表明火星表面含有太少的碳化岩层——含有碳氧化合物的岩层——它们应该是在古代海洋中大量形成的。这些岩层的缺失支持了火星是一个又冷又干燥的星球这一说法，并且不可能拥有形成湖泊和海洋的温和气候。然而，更新的数据表明至少该星球上的一些部分表面的确在过去的很长时间内存在液态水。

Aside from some small-scale **gullies** (channels) found since 2000, which are inconclusive, astronomers have no direct evidence for liquid water anywhere on the surface of Mars today, and the amount of water vapor in the Martian atmosphere is tiny. *Yet* even **setting aside** the unproven **hints** of ancient oceans, the **extent** of the outflow channels suggests that a huge total volume of water existed on Mars in the past. Where did all the water go? The answer may be that ***virtually*** all the water on Mars is now locked in the **permafrost** layer under the surface, with more contained in the **planet' polar caps**.
除了在 2000 年发现了一些小规模的、不确定的溪谷以外，宇航员到目前为止还没有在星球的什么地方找到液态水存在的直接证据。而且火星大气中的水蒸气的含量也是微乎其微的。*然而*就算不考虑尚未证明的古代海洋存在的观点，出流通道的广泛存在就足以证明在火星上曾有大

量的水体，水都去了哪里呢？答案可能是火星上所有的水*实际上*现在已经封存在其地下的永久冻层中，并且在极地地区最多。