## Nineteen-century Politics in the United States

The development of the modern presidency in the United States began with Andrew Jackson who swept to power in 1829 at the head of the Democratic Party and served until 1837. During his administration, he immeasurably enlarged the power of the presidency. "The President is the direct representative of the American people," he lectured the Senate when it opposed him. "He was elected by the people, and is responsible to them." With this declaration, Jackson redefined the character of the presidential office and its relationship to the people.

During Jackson's second term, his opponents had gradually come together to form the Whig party. Whigs and Democrats held different attitudes toward the changes brought about by the market, banks, and commerce. The Democrats tended to view society as a continuing conflict between "the people”-farmers, planters, and workers-and a set of greedy aristocrats. This "paper money aristocracy" of bankers and investors manipulated the banking system for their own profit, Democrats claimed, and sapped the nation's virtue by encouraging speculation and the desire for sudden, unearned wealth. The Democrats wanted the rewards of the market without sacrificing the features of a simple agrarian republic. They wanted the wealth that the market offered without the competitive, changing society; the complex dealing; the dominance of urban centers; and the loss of independence that came with it.

Whigs, on the other hand, were more comfortable with the market. For them, commerce and economic development were agents of civilization. Nor did the Whigs envision any conflict in society between farmers and workers on the one hand and businesspeople and bankers on the other. Economic growth would benefit everyone by raising national income and expanding opportunity. The government's responsibility was to provide a well-regulated economy that guaranteed opportunity for citizens of ability.

Whigs and Democrats differed not only in their attitudes toward the market but also about how active the central government should be in people's lives. Despite Andrew Jackson's inclination to be a strong President, Democrats as a rule believed in limited government. Government's role in the economy was to promote competition by destroying monopolies' and special privileges. In keeping with this philosophy of limited government, Democrats also rejected the idea that moral beliefs were the proper sphere of government action. Religion and politics, they believed, should be kept clearly separate, and they generally opposed humanitarian legislation.

The Whigs, in contrast, viewed government power positively. They believed that it should be used to protect individual rights and public liberty, and that it had a special role where individual effort was ineffective. By regulating the economy and competition, the government could ensure equal opportunity. Indeed, for Whigs the concept of government promoting the general welfare went beyond the economy. In particular, Whigs in the northern sections of the United States also believed that government power should be used to foster the moral welfare of the country. They were much more likely to favor social-reform legislation and aid to education.

In some ways the social makeup of the two parties was similar. To be competitive in winning votes, Whigs and Democrats both had to have significant support among farmers, the largest group in society, and workers. Neither party could win an election by appealing exclusively to the rich or the poor. The Whigs, however, enjoyed disproportionate strength among the business and commercial classes. Whigs appealed to planters who needed credit to finance their cotton and rice trade in the world market, to farmers who were eager to sell their surpluses, and to workers who wished to improve themselves. Democrats attracted farmers isolated from the market or uncomfortable with it, workers alienated from the emerging industrial system, and rising entrepreneurs who wanted to break monopolies and open the economy to newcomers like themselves. The Whigs were strongest in the towns, cities, and those rural areas that were fully integrated into the market economy, whereas Democrats dominated areas of semisubsistence farming that were more isolated and languishing economically.

## 十九世纪的美国政治

美国现代总统制度的发展是从安德鲁杰克逊开始的。这位民主党领导人在1829年掌权，直至1837年卸任。在他任职期间，总统的权力被无限量地扩大了。参议院反对他时，他曾说：“总统是美国人民的直接代表”，“美国总统由公民选举产生，对公民负责。” 杰克逊用这番话重新定义了内阁的角色，及其与民众的关系。

在杰克逊的第二任任职期间，他的反对者们逐渐联合起来形成了辉格党。辉格党和民主党在市场、银行、商业引发的变化上持有不同的态度。民主党倾向于把社会视作平民(农民、种植园主、工人)和一小撮贪婪的贵族间持续的斗争。他们宣称，那些银行家和投资者们都是“钞票贵族”，他们在自己利益的驱使下操纵着银行系统，并且以鼓励投机和迅速赚取不义之财的行为败坏国民道德。民主党人既想从市场经济中获得好处，又不想牺牲单一土地所有权的共和体制。他们想要市场经济带来的财富而不想要竞争，不想改变社会;不想要复杂的交易;不要大城市的主宰和随着市场经济而来的独立性的丧失。

另一方面，辉格党对市场更为适应。对于他们来说，商业和经济的发展是文明化的动力。然而，辉格党人并没有预见农民、工人和商人、银行家之间的冲突。他们认为，经济发展会通过增加国民收入和就业机会使每个人受益。政府的职责就是提供一个井然有序运作良好的经济环境，保证给每一个有能力的公民机会。

辉格党和民主党的分歧不仅表现在对市场的态度上，而且表现在中央政府究竟该在人民生活中起到多少作用上。抛开安德鲁杰克逊想做一个强势总统不谈，民主党本身就主张限制政府的做法。政府在经济中的角色就是通过摧毁垄断和特权来鼓励竞争。为了遵循限制政府的做法，民主党人同样否定了道德准则属政府行为的范畴。民主党人确信，宗教和政治应划清界限，而大体上，他们也反对人道主义立法。

相反地，政府权力在辉格党人眼中是积极的。他们认为，应该用政府权力保护个人权力和公众自由，在个人努力无效时扮演特殊角色。通过规划经济和竞争，政府可以保证机会平等。确实，辉格党的政府促进公众福利超过了经济所能承受的。个别来说，美国北部的辉格党还认为政府力量应该用来推广国家的道德福利。他们更加偏好社会重组法案和补助教育。

在某些方面两党对社会的完善是相似的。为了在投票中更具竞争力，辉格党和民主党都要在社会最大群体即农民和工人当中获得大力支持。任何一个党派若只讨好穷人或富人都不可能赢得选举。然而，辉格党偏好把精力花费在商业阶层上。辉格党博得了需要信用来贷款以在世界贸易中出售棉花和米的种地的人、渴望卖出余粮的农民和希望改变现状的工人的喜好。民主党则吸引了隔离于市场外或不习惯市场的农民、工业系统外的工人和想打破垄断开发新市场的新兴小企业家的欢心。辉格党在城镇市区还有完全融入市场经济的农村区域很强势，而民主党主宰了与市场隔绝，经济稍逊的半农耕地区。

## The Expression of Emotions

Joy and sadness are experienced by people in all cultures around the world, but how can we tell when other people are happy or despondent? It turns out that the expression of many emotions may be universal. Smiling is apparently a universal sign of friendliness and approval. Baring the teeth in a hostile way, as noted by Charles Darwin in the nineteenth century, may be a universal sign of anger. As the originator of the theory of evolution, Darwin believed that the universal recognition of facial expressions would have survival value. For example, facial expressions could signal the approach of enemies (or friends) in the absence of language.

Most investigators concur that certain facial expressions suggest the same emotions in all people. Moreover, people in diverse cultures recognize the emotions manifested by the facial expressions. In classic research Paul Ekman took photographs of people exhibiting the emotions of anger, disgust, fear, happiness, and sadness. He then asked people around the world to indicate what emotions were being depicted in them. Those queried ranged from European college students to members of the Fore, a tribe that dwells in the New Guinea highlands. All groups, including the Fore, who had almost no contact with Western culture, agreed on the portrayed emotions. The Fore also displayed familiar facial expressions when asked how they would respond if they were the characters in stories that called for basic emotional responses.Ekman and his colleagues more recently obtained similar results in a study of ten cultures in which participants were permitted to report that multiple emotions were shown by facial expressions. The participants generally agreed on which two emotions were being shown and which emotion was more intense.

Psychological researchers generally recognize that facial expressions reflect emotional states. In fact, various emotional states give rise to certain patterns of electrical activity in the facial muscles and in the brain. The facial-feedback hypothesis argues, however, that the causal relationship between emotions and facial expressions can also work in the opposite direction. According to this hypothesis, signals from the facial muscles (""feedback) are sent back to emotion centers of the brain, and so a person's facial expression can influence that person's emotional state. Consider Darwin's words: ""The free expression by outward signs of an emotion intensifies it. On the other hand, the repression, as far as possible, of all outward signs softens our emotions."" Can smiling give rise to feelings of good will, for example, and frowning to anger?

Psychological research has given rise to some interesting findings concerning the facial-feedback hypothesis. Causing participants in experiments to smile, for example, leads them to report more positive feelings and to rate cartoons (humorous drawings of people or situations) as being more humorous. When they are caused to frown, they rate cartoons as being more aggressive.

What are the possible links between facial expressions and emotion? One link is arousal, which is the level of activity or preparedness for activity in an organism. Intense contraction of facial muscles, such as those used in signifying fear, heightens arousal. Self-perception of heightened arousal then leads to heightened emotional activity. Other links may involve changes in brain temperature and the release of neurotransmitters (substances that transmit nerve impulses). The contraction of facial muscles both influences the internal emotional state and reflects it. Ekman has found that the so-called Duchenne smile, which is characterized by ''crow’s feet"" wrinkles around the eyes and a subtle drop in the eye cover fold so that the skin above the eye moves down slightly toward the eyeball, can lead to pleasant feelings.

Ekman’s observation may be relevant to the British expression “keep a stiff upper lip” as a recommendation for handling stress. It might be that a “stiff” lip suppresses emotional response -- as long as the lip is not quivering with fear or tension. But when the emotion that leads to stiffening the lip is more intense, and involves strong muscle tension, facial feedback may heighten emotional response.

## 情绪表达

在世界范围内各种不同的文化里，人们都是要经历欢乐和悲伤的，但我们怎么区分其他人是高兴还是沮丧呢?事实上，很多情感的表达可能是通用的。比如，微笑显然表示友好和赞同。查尔斯达尔文是进化论的创始人，他在19世纪曾指出，怀有敌意地露出牙齿表现的是愤怒的情绪。人类对面部表情的认知具有一定的生存值。例如，面部表情可以以非语言的方式帮你判断迎面而来的是敌还是友。

很多调查得出了同样的结论，即人类的某些面部表情表达的含义是通用的。此外，不同文化背景的人可以通过面部表情的识别来判断对方的情绪。在一个经典的研究项目中，保罗埃克曼拍下了一组人的照片，分别表示愤怒、厌恶、恐惧、幸福、悲伤。然后，他安排来自世界各地的人们识别照片中所表达的情感。这些人包括欧洲大学生，居住在新几内亚高地的部落等。包括几乎从未接触过西方文化的人在内的所有人得出了一致的答案。此外，问卷中还给出了一些人们熟悉的基本表情，要求答卷者回答如果你是故事中的人物你会作出哪种基本表情?埃克曼和他的同事们从近期的一项统计中得出了相同的结论，他们对来自10个不同文化背景的参与者们进行了调查，参与者可以通过多种面部表情传达复杂的情绪。画面表达了哪两种情感?其中那张更严肃?答案基本一致。

研究心理学的学者们通常认为，面部表情可以反映人们内心的情绪状态。事实上，各种情绪状态的波动都会使得面部肌肉和大脑的电波活动增加。然而，脸部回馈假说论者们却坚持，面部表情和情绪之间的因果关系也可能是反的。他们认为，脸部肌肉承载的信号会被传至大脑的控制情绪的部位中，因此人类面部表情会影响他们的情绪。试想达尔文的话：“自由的情绪表达方式会增强心中的情感。相反，如果抑制这种表达则会削弱心中的情感。” 比如，微笑可以让你心情大好吗?皱眉会让你变得愤怒吗?

关于脸部回馈假说，心理学研究提供了一些有趣的发现。比如，让参与实验的人们微笑，他们会表现的更加积极，他们评价图片相对而言更加风趣幽默。当他们皱眉头时，则变得加咄咄逼人。

面部表情和内心情感之间存在什么样可能的联系呢?首先，是刺激。这是一个有机体活动的准备阶段。面部肌肉的紧张收缩会加剧这种刺激，如那些表现得极度的恐惧肌肉收缩。加强刺激的自我感知会加剧内心各种情绪。其次，他们的联系可能会涉及到大脑温度变化和神经递质的释放(传递神经冲动的物质)。面部肌肉的收缩反映并影响内心情绪状态。埃克曼发现，所谓的杜兴微笑，就是指眼睛周围的鱼尾纹和眼皮的微微下垂，引发眼睛表面的皮肤轻微朝着眼球方向下降，从而引起愉快的感觉。

埃克曼的看法可能与英国习语“保持咬紧牙关”有关，人们可以用过紧咬牙关缓解自身压力。很有可能是因为紧咬牙关抑制了消极情绪，只要嘴唇没紧张或者恐惧得发抖。但是，当内心情绪导致僵硬的嘴唇更加紧张时，面部表情强有力的收缩很有可能会加剧内心的情绪反应。

## Geology and Landscape

Most people consider the landscape to be unchanging, but Earth is a dynamic body, and its surface is continually altering-slowly on the human time scale, but relatively rapidly when compared to the great age of Earth (about 4,500 billion years). There are two principal influences that shape the terrain: constructive processes such as uplift, which create new landscape features, and destructive forces such as erosion, which gradually wear away exposed landforms.

Hills and mountains are often regarded as the epitome of permanence, successfully resisting the destructive forces of nature, but in fact they tend to be relatively short-lived in geological terms.As a general rule, the higher a mountain is, the more recently it was formed; for example, the high mountains of the Himalayas are only about 50 million years old. Lower mountains tend to be older, and are often the eroded relics of much higher mountain chains. About 400 million years ago, when the present-day continents of North America and Europe were joined, the Caledonian mountain chain was the same size as the modern Himalayas. Today, however, the relics of the Caledonian orogeny (mountain-building period) exist as the comparatively low mountains of Greenland, the northern Appalachians in the United States, the Scottish Highlands, and the Norwegian coastal plateau.

The Earth's crust is thought to be divided into huge, movable segments, called plates, which float on a soft plastic layer of rock. Some mountains were formed as a result of these plates crashing into each other and forcing up the rock at the plate margins. In this process, sedimentary rocks that originally formed on the seabed may be folded upwards to altitudes of more than 26,000 feet. Other mountains may be raised by earthquakes, which fracture the Earth's crust and can displace enough rock to produce block mountains. A third type of mountain may be formed as a result of volcanic activity which occurs in regions of active fold mountain belts, such as in the Cascade Range of western North America. The Cascades are made up of lavas and volcanic materials. Many of the peaks are extinct volcanoes.

Whatever the reason for mountain formation, as soon as land rises above sea level it is subjected to destructive forces. The exposed rocks are attacked by the various weather processes and gradually broken down into fragments, which are then carried away and later deposited as sediments. Thus, any landscape represents only a temporary stage in the continuous battle between the forces of uplift and those of erosion.

The weather, in its many forms, is the main agent of erosion. Rain washes away loose soil and penetrates cracks in the rocks. Carbon dioxide in the air reacts with the rainwater, forming a weak acid (carbonic acid) that may chemically attack the rocks. The rain seepsunderground and the water may reappear later as springs. These springs are the sources of streams and rivers, which cut through the rocks and carry away debris from the mountains to the lowlands.

Under very cold conditions, rocks can be shattered by ice and frost. Glaciers may form in permanently cold areas, and these slowly moving masses of ice cut out valleys, carrying with them huge quantities of eroded rock debris. In dry areas the wind is the principal agent of erosion. It carries fine particles of sand, which bombard exposed rock surfaces, thereby wearing them into yet more sand. Even living things contribute to the formation of landscapes. Tree roots force their way into cracks in rocks and, in so doing, speed their splitting. In contrast, the roots of grasses and other small plants may help to hold loose soil fragments together, thereby helping to prevent erosion by the wind.

## 地质景观

大部分人认为自然风景是一成不变的，事实上地球是一个动态的机体,他的外貌在人类文明进程中一直保持着持续缓慢的变化。当然，与大约45000亿年前的冰河时代的地貌变化相比，这个进程的确快了很多。主要有两种影响会改变地形：建设性的过程，如产生新的地表特征的地壳隆起;和破坏性的力量，如缓慢清除突出地貌的地表侵蚀。

山峰和山脉因为能够经受得住自然的洗礼，通常被认作是永恒的代名词，但地质学的角度上来说，他们的存在实际上从是相对比较短暂的。一般来说，山峰越高，形成得越晚。例如喜马拉雅山，她只有5000万年的历史。低矮山峦的历史往往更加久远，它们通常是高耸的山脉崩塌后的遗留物。在大约4亿年前，当今天的北美和欧洲大陆相结合的时候，加勒多尼亚山脉与现今的喜马拉雅山脉同样雄伟。但是，加勒多尼亚山脉的形成(造山运动)在今天遗留下来的却只是相对非常低矮的格林兰山脉：美国的北阿巴拉契亚山区，苏格兰高地和挪威海岸高原。

地壳分裂成为巨大可移动的板块，板块在柔软的岩石可塑层中漂移。有的时候，这些板块互相冲击并迫使板块边缘的岩石突起，从而形成山脉。在这个过程中，原本形成在海床上的沉积岩可能被拱起高达26，000多英尺。在另一种情况下，地震将地壳震裂。产生的岩石堆积形成断块山，从而形成山脉。还有一种情况，活火山带的火山运动也会促使山脉的形成，例如北美洲西部的喀斯喀特山脉，他的产生就是由火山岩和火山灰形成的，上面的许多山峰都是死火山。

不论山脉形成的具体原因是什么，一旦陆地高出海平面，都难逃脱被外力摧毁的厄运。裸露的岩石遭受着不断变化天气的攻击，逐渐被碾成碎石块带走，然后形成沉积岩。因此，任何地貌都只是一个短暂的阶段，它所代表的是造山与侵蚀两种力量持续斗争。

多种多样的天气加速了大自然对地貌的侵蚀。雨水冲刷了疏松的土壤并渗入到岩石的缝隙。二氧化碳在空气中与雨水相互作用形成了可以对岩石进行化学腐蚀的弱酸(碳酸)。雨水渗透到地下并能在不久后以泉水的形式流出。那些从岩石间穿过并将碎石从高山带到平原的溪水就是来源于这些泉水。

在严寒的环境下，岩石能被冰霜粉碎。冰川在长期寒冷的区域形成，这些缓慢移动的大量冰块带着大量的腐蚀岩屑阻断了山谷。在干旱地带，风是大自然侵蚀的主要手段。它带着沙子中的微粒冲击着裸露的岩石表面，把岩石吹散成更多的沙粒。动植物们对自然风景的形成也是功不可没。大树植根于岩缝之中，加速了岩石的碎裂。相比之下，草根和其他矮小植物则利于固定土壤，弱化了风蚀作用的影响。

## Feeding Habits of East African Herbivres

Buffalo, zebras, wildebeests, topi, and Thomson’s gazelles live in huge groups that together make up some 90 percent of the total weight of mammals living on the Serengeti Plain of East Africa. They are all herbivores (plant-eating animals), and they all appear to be living on the same diet of grasses, herbs, and small bushes. This appearance, however, is illusory. When biologist Richard Bell and his colleagues analyzed the stomach contents of four of the five species (they did not study buffalo), they found that each species was living on a different part of the vegetation. The different vegetational parts differ in their food qualities: lower down, there are succulent, nutritious leaves; higher up are the harder stems. There are also sparsely distributed, highly nutritious fruits, and Bell found that only the Thomson’s gazelles eat much of these. The other three species differ in the proportion of lower leaves and higher stems that they eat: zebras eat the most stem matter, wildebeests eat the most leaves, and topi are intermediate.

How are we to understand their different feeding preferences？ The answer lies in two associated differences among the species, in their digestive systems and body sizes. According to their digestive systems, these herbivores can be divided into two categories: the nonruminants (such as the zebra, which has a digestive system like a horse) and the ruminants (such as the wildebeest, topi, and gazelle, which are like the cow). Nonruminants cannot extract much energy from the hard parts of a plant; however, this is more than made up for by the fast speed at which food passes through their guts. Thus, when there is only a short supply of poor-quality food, the wildebeest, topi, and gazelle enjoy an advantage. They are ruminants and have a special structure (the rumen) in their stomachs, which contains microorganisms that can break down the hard parts of plants. Food passes only slowly through the ruminant’s gut because ruminating—digesting the hard parts—takes time. The ruminant continually regurgitates food from its stomach back to its mouth to chew it up further (that is what a cow is doing when “chewing cud”). Only when it has been chewed up and digested almost to a liquid can the food pass through the rumen and on through the gut. Larger particles cannot pass through until they have been chewed down to size. Therefore, when food is in short supply, a ruminant can last longer than a nonruminant because it can derive more energy out of the same food. The difference can partially explain the eating habits of the Serengeti herbivores. The zebra chooses areas where there is more low-quality food. It migrates first to unexploited areas and chomps the abundant low-quality stems before moving on. It is a fast-in/fast-out feeder, relying on a high output of incompletely digested food. By the time the wildebeests (and other ruminants) arrive, the grazing and trampling of the zebras will have worn the vegetation down. As the ruminants then set to work, they eat down to the lower, leafier parts of the vegetation. All of this fits in with the differences in stomach contents with which we began.

The other part of the explanation is body size. Larger animals require more food than smaller animals, but smaller animals have a higher metabolic rate. Smaller animals can therefore live where there is less food, provided that such food is of high energy content. That is why the smallest of the herbivores, Thomson’s gazelle, lives on fruit that is very nutritious but too thin on the ground to support a larger animal. By contrast, the large zebra lives on the masses of low-quality stem material.

The differences in feeding preferences lead, in turn, to differences in migratory habits. The wildebeests follow, in their migration, the pattern of local rainfall. The other species do likewise. But when a new area is fueled by rain, the mammals migrate toward it in a set order to exploit it. The larger, less fastidious feeders, the zebras, move in first; the choosier, smaller wildebeests come later; and the smallest species of all, Thomson’s gazelle, arrives last. The later species all depend on the preparations of the earlier one, for the actions of the zebra alter the vegetation to suit the stomachs of the wildebeest, topi, and gazelle.

## 东非食草动物的食性

野牛，斑马，角马，转角牛羚和汤氏羚这些群居动物占据了非洲东部塞伦盖蒂平原的总哺乳动物的数量的90%。它们都是食草动物（以吃植物为生的动物），并且看似有着相同的日常饮食：草，香草，和小的灌木。不过，这个现象是假的。在生物学家Richard Bell和他的同僚分析5种物种其中的4个（他们没有研究野牛）的胃内含量时，他们发现其实每个物种所食用的植物部位是不同的。这些不一样的植物部分是区分于它们的食物质量：下部的是多汁又营养的树叶；上面的部分则是更坚硬的茎杆。Bell还在汤氏羚的胃里发现了一些分布稀少的高营养含量的水果，不过只有汤氏羚吃这些。其他三个物种是因为所食用的低树叶和高的茎杆的比例不同而区别的：斑马主要吃茎杆部分，角马主要吃树叶，转角牛羚则一半一半。

那么我们怎样来理解他们这些不同的食物选择呢？答案就在所有物种的两个相互关联的差异：他们的消化系统和体型大小。这些草食动物可根据他们的消化系统而分为两类：非反刍动物（比如说有着和马类似消化系统的斑马）和反刍动物（比如角马，转角牛羚，和小羚羊，他们的则和奶牛的相似）。非反刍动物并不能够从植物的坚硬部分提取出很多能量；不管怎样，能有这些能量已经不错了，因为这些是相对于食物是以一个非常快的速度进入肠胃的情况产生的。因此，当只有供应不足的质量低劣的食物时，角马，转角牛羚和小羚羊享有了优势。因为他们是反刍动物，而反刍动物的胃部含有能够分解食物坚硬部分的微生物的特殊结构（瘤胃）。食物只很慢的在反刍动物的肠胃里传递，因为反刍的过程—消化坚硬的部分—需要一定时间。反刍动物不断地将胃里的食物返回嘴里继续咀嚼（这就是奶牛在“反刍”时所做的）。只有当食物在经过咀嚼和消化的过程变成近似液体的时候，它才可能通过瘤胃并进入和通过肠胃。比较大的颗粒在被咀嚼成小块之前，是不能通过的。所以，当食物供不应求时，一个反刍动物可以比一个非反刍动物活的时间更长，因为它能从同样的食物中提取到更多的能量。这个差异部分的解释了塞伦盖蒂草食动物的饮食习惯。斑马选择的是有更多低质量食物的区域。它首先迁移到未被开垦的区域，并在继续迁移前，食用掉当地充足的低质量食物。斑马是一个新陈代谢很快的进食者，这一结论依据于它们的大量的排泄物都是那些没有被完全消化的食物。当角马（或其他反刍动物）到来时，斑马的牧草和踩踏已经把当地的植被进行耗损筛选了。所以当这些反刍动物开始行动时，它们吃的是植物较矮的叶状的部分。所有这些答案都符合了我们最开始提到的胃含量的差异。

另一方面的解释则是体型的大小。体型较大的动物相对于较小的需要更多的食物，而小型动物具有更高的代谢率。所以更小的动物可以居住在有少量食物的地方，如果这种食物是具有高能量的话。这就是为什么，具有最小体型的汤氏羚，可以以水果这样一个很有营养，但是对于支撑大型动物来说过于单薄的食物生存下去。相反，大斑马是居住在具有大量低质量茎杆的地方。

依次下来，食物选择的差异进而造成了迁移习性的不同。角马的迁移遵循的是当地的降雨类型。其他物种的做法也与其相似。但当一个新的地点被发现降水量充足时，哺乳动物以一定的先后顺序向此地迁徙的。较大的，不那么挑剔的进食者斑马最先移入；比较挑剔的稍小的角马第二个；汤氏羚，作为这些当中最小的物种，则是最后。就像斑马给角马，转角牛羚和汤氏羚的食物进行了筛选一样，后进来的物种是要依赖于前面物种给它们所做的准备的。

## Loie Fuller

The United States dancer Loie Fuller (1862–1928) found theatrical dance in the late nineteenth century artistically unfulfilling. She considered herself an artist rather than a mere entertainer, and she, in turn, attracted the notice of other artists.

Fuller devised a type of dance that focused on the shifting play of lights and colors on the voluminous skirts or draperies she wore, which she kept in constant motion principally through movements of her arms, sometimes extended with wands concealed under her costumes. She rejected the technical virtuosity of movement in ballet, the most prestigious form of theatrical dance at that time, perhaps because her formal dance training was minimal. Although her early theatrical career had included stints as an actress, she was not primarily interested in storytelling or expressing emotions through dance; the drama of her dancing emanated from her visual effects.

Although she discovered and introduced her art in the United States, she achieved her greatest glory in Paris, where she was engaged by the Folies Bergère in 1892 and soon became “La Loie,” the darling of Parisian audiences. Many of her dances represented elements or natural objects—Fire, the Lily, the Butterfly, and so on—and thus accorded well with the fashionable Art Nouveau style, which emphasized nature imagery and fluid, sinuous lines. Her dancing also attracted the attention of French poets and painters of the period, for it appealed to their liking for mystery, their belief in art for art’s sake, a nineteenth-century idea that art is valuable in itself rather than because it may have some moral or educational benefit, and their efforts to synthesize form and content.

Fuller had scientific leanings and constantly experimented with electrical lighting (which was then in its infancy), colored gels, slide projections, and other aspects of stage technology. She invented and patented special arrangements of mirrors and concocted chemical dyes for her draperies. Her interest in color and light paralleled the research of several artists of the period, notably the painter Seurat, famed for his Pointillist technique of creating a sense of shapes and light on canvas by applying extremely small dots of color rather than by painting lines. One of Fuller’s major inventions was underlighting, in which she stood on a pane of frosted glass illuminated from underneath. This was particularly effective in her Fire Dance (1895), performed to the music of Richard Wagner’s “Ride of the Valkyries.” The dance caught the eye of artist Henri de Toulouse-Lautrec, who depicted it in a lithograph.

As her technological expertise grew more sophisticated, so did the other aspects of her dances. Although she gave little thought to music in her earliest dances, she later used scores by Gluck, Beethoven, Schubert, Chopin, and Wagner, eventually graduating to Stravinsky, Fauré, Debussy, and Mussorgsky, composers who were then considered progressive. She began to address more ambitious themes in her dances such as The Sea, in which her dancers invisibly agitated a huge expanse of silk, played upon by colored lights. Always open to scientific and technological innovations, she befriended the scientists Marie and Pierre Curie upon their discovery of radium and created a Radium Dance, which simulated the phosphorescence of that element. She both appeared in films—then in an early stage of development—and made them herself; the hero of her fairy-tale film Le Lys de la Vie (1919) was played by René Clair, later a leading French film director.

At the Paris Exposition in 1900, she had her own theater, where, in addition to her own dances, she presented pantomimes by the Japanese actress Sada Yocco. She assembled an all-female company at this time and established a school around 1908, but neither survived her. Although she is remembered today chiefly for her innovations in stage lighting, her activities also touched Isadora Duncan and Ruth St.Denis, two other United States dancers who were experimenting with new types of dance. She sponsored Duncan’s first appearance in Europe. Her theater at the Paris Exposition was visited by St.Denis, who found new ideas about stagecraft in Fuller’s work and fresh sources for her art in Sada Yocco’s plays. In 1924 St.Denis paid tribute to Fuller with the duet Valse à la Loie.

## 洛伊富勒

Loie Fuller(1862-1928)作为一位美国的舞者，认为19世纪末的舞台式舞蹈缺乏艺术性。她把她自己定义为一位艺术家而不仅仅演艺人员，随之下来，她也得到了其他艺术家的关注。

Fuller设计了一种注重灯光变换和她所穿的大体积的裙子或布料的颜色的舞蹈，所以她的舞姿则主要体现在上肢动作，而有些时候她的服装的体积是需要用隐藏在下面的棍状物体来填充实现的。她没有采用在当时的舞台式舞蹈上声望很高的高技术含量的芭蕾动作，原因可能是她所接受的正式舞蹈培训太少了。虽然在她早期的舞台事业里体现了作为一名艺术家的一些约束，她的主要精力并没有放在通过舞蹈来传递故事或感情上，而是通过视觉效应散发出她舞蹈的戏剧性。

尽管她是在美国找到并呈现了她的艺术，她最大的成就在巴黎，在1892年她被Folies Bergere（一个巴黎剧院）所雇佣,而不久变成“La Loie”----巴黎观众的宠儿。因为她的很多舞蹈作品例如火，百合花，蝴蝶等等代表的都是一些元素或自然物体，所以它们与注重自然风景和流畅弯曲线条的时尚Art Nouveau的风格是一致的。她的舞蹈还吸引了当时法国的诗人和画家的注意，因为它符合他们对神秘色彩的喜好，他们对于艺术只为艺术产生的信仰----19世纪艺术被认为它的本身比它所带来的道德或教育利益更有价值，和他们对外形和内容的合成所做的研究努力。

Fuller本人倾向于科学，所以经常试用电气灯光（电灯在那个时候才刚刚面市），染色胶，投影片，和其他方面的舞台技术。她发明了将镜子进行特殊布置以及对帷幔调制化学染料的技术，并取得了专利。她对色彩和灯光的研究与当时几位艺术家相应，特别是在画布上以描绘极其细微的点而不是用线条来创造形状和光泽，而著名的点彩派画家Seurat。Fuller主要的发明之一是地面照明，意思是她站在一块毛玻璃上，而光是从下面照射上来的。这个发明尤其在她以Richard Wagner的“Ride of the Valkyries”作为背景音乐的作品火（1895）中起到了很大作用。这个舞蹈吸引了艺术家Henri de Toulouse-Lautrec的眼球，他把它在石版画中描绘了出来。

随着她的工艺技术变得更加成熟，也带动了她的舞蹈的其他方面。尽管在她在早期舞蹈作品中，没有花太多心思在音乐上，但随后她使用了Gluck, Beethoven, Schubert, Chopin,和Wagner的乐曲，最后则变成了采用在当时被认为进步的一些作曲家的曲子，像Stravinsky, Fauré, Debussy, 和Mussorgsky。她开始强调更有野心的主题，比如作品大海，在这个作品中舞者们在色光灯所创造的辽阔的隐形丝绸下摇摆。因为Fuller总是对科技创新抱有很开放的态度，她与科学家Marie和Pierre Curie在镭的研究中成为了朋友，并创造出了作品镭来模仿该元素的磷光。她也踏足了电影业----那个时候还处于早期发展中----她的电影都是自己制作拍摄的；在她的童话电影Le Lys de la Vie (1919)中饰演英雄角色的，是后来一名知名法国电影导演René Clair。

在1990年的巴黎展览会上，她得到了一个独立剧场，在那里，除了她自己的舞蹈，她还呈现了日本女演员Sada Yocco的哑剧。1908年左右，她成立了一个女子公司并建立了一所学校，但是哪个都没有成功。尽管她主要是被她所带来的舞台灯光革新所为人们熟知的，但她的事迹也与Isadora Duncan和Ruth St.Denis, 这两个当时尝试新型舞蹈的舞者有关。她赞助了Duncan在欧洲的首次亮相。St.Denis拜访了她在巴黎展览会的博物馆，他分别为Fuller的作品和她在Sada Yocco剧本的艺术作为找到了新的编剧想法和鲜活的来源。1924年，St.Denis对Fuller的双人表演Valse à la Loie表达了赞赏。

## Green Icebergs

Icebergs are massive blocks of ice, irregular in shape; they float with only about 12 percent of their mass above the sea surface. They are formed by glaciers—large rivers of ice that begin inland in the snows of Greenland, Antarctica, and Alaska—and move slowly toward the sea. The forward movement, the melting at the base of the glacier where it meets the ocean, and waves and tidal action cause blocks of ice to break off and float out to sea.

Icebergs are ordinarily blue to white, although they sometimes appear dark or opaque because they carry gravel and bits of rock. They may change color with changing light conditions and cloud cover, glowing pink or gold in the morning or evening light, but this color change is generally related to the low angle of the Sun above the horizon. However, travelers to Antarctica have repeatedly reported seeing green icebergs in the Weddell Sea and, more commonly, close to the Amery Ice Shelf in East Antarctica.

One explanation for green icebergs attributes their color to an optical illusion when blue ice is illuminated by a near-horizon red Sun, but green icebergs stand out among white and blue icebergs under a great variety of light conditions. Another suggestion is that the color might be related to ice with high levels of metallic compounds, including copper and iron. Recent expeditions have taken ice samples from green icebergs and ice cores—vertical, cylindrical ice samples reaching down to great depths—from the glacial ice shelves along the Antarctic continent. Analyses of these cores and samples provide a different solution to the problem.

The ice shelf cores, with a total length of 215 meters (705 feet), were long enough to penetrate through glacial ice—which is formed from the compaction of snow and contains air bubbles—and to continue into the clear, bubble-free ice formed from seawater that freezes onto the bottom of the glacial ice. The properties of this clear sea ice were very similar to the ice from the green iceberg. The scientists concluded that green icebergs form when a two-layer block of shelf ice breaks away and capsizes (turns upside down), exposing the bubble-free shelf ice that was formed from seawater.

A green iceberg that stranded just west of the Amery Ice Shelf showed two distinct layers: bubbly blue-white ice and bubble-free green ice separated by a one-meter- long ice layer containing sediments. The green ice portion was textured by seawater erosion. Where cracks were present, the color was light green because of light scattering; where no cracks were present, the color was dark green. No air bubbles were present in the green ice, suggesting that the ice was not formed from the compression of snow but instead from the freezing of seawater. Large concentrations of single-celled organisms with green pigments (coloring substances) occur along the edges of the ice shelves in this region, and the seawater is rich in their decomposing organic material. The green iceberg did not contain large amounts of particles from these organisms, but the ice had accumulated dissolved organic matter from the seawater. It appears that unlike salt, dissolved organic substances are not excluded from the ice in the freezing process. Analysis shows that the dissolved organic material absorbs enough blue wavelengths from solar light to make the ice appear green.

Chemical evidence shows that platelets (minute flat portions) of ice form in the water and then accrete and stick to the bottom of the ice shelf to form a slush (partially melted snow). The slush is compacted by an unknown mechanism, and solid, bubblefree ice is formed from water high in soluble organic substances. When an iceberg separates from the ice shelf and capsizes, the green ice is exposed.

The Amery Ice Shelf appears to be uniquely suited to the production of green icebergs. Once detached from the ice shelf, these bergs drift in the currents and wind systems surrounding Antarctica and can be found scattered among Antarctica’s less colorful icebergs.

## 绿色冰山

冰山就是巨大的冰块，它们的形状各不规则；他们在海面上所呈现出来的部分大概只有总量的12%。冰山是由冰川----从格陵兰岛, 南极洲, 和阿拉斯加的内陆降雪开始积累成为大河中的冰----然后缓慢流入海洋。向前的移动，在进入海洋的时候冰川底部的融化，和波浪与潮汐变化造成了冰块的断裂从而漂浮在海上。

冰山的颜色一般是从蓝到白，虽然有时会因为他们带有砂砾和石块而显得颜色很深或不透明。在不同情况的光和云量下，它们的颜色呈现可能会随之不同，如在早晨和傍晚的阳光下所呈现的耀眼的粉色或金色，但这个颜色变化大致与太阳位于海平面上的低角度有关。不管怎样，总会有到南极洲的旅游者们报告说在Weddell Sea看到了绿冰山，南极洲东部Amery Ice Shelf的附近则更为常见。

对于绿冰山的颜色的一个解释是由于纯冰被接近海平面的太阳所照射而造成的错觉，但是绿冰山在很多不同状态的阳光下都能从白色和蓝色冰山中区分出来。另一个解释就是，它的颜色可能与冰里面所含高浓度的金属化合物有关，比如铜和铁。进来的探险队从南极洲的冰架上带回了一些绿色冰山和冰核的样本----到达深度的垂直圆柱型的冰的样本。对这些冰核和样本的分析给问题提供了一个不一样的解决方法。

215米长的冰架核已经足够用来穿透由压缩的雪组成，并含有气泡的流动冰，并随后穿透在流动冰的底部由冻结的海水形成的清透的没有气泡的冰。这个清透的冰的性质与绿冰山上的冰十分相似。科学家总结出，绿冰的构成是在两层的架冰分开并翻转过来时，暴露出的没有气泡的海水冰。

一个在Amery Ice Shelf西部滞留的绿冰山呈现出了两个明显的层：含有气泡的白蓝色冰，和没有气泡的绿色冰，它们中间是由1米长的带有沉积物的冰分隔开的。海水的侵蚀决定了绿色冰的质地。由于光的分散，裂痕处的颜色是浅绿的；而没有裂痕的地方是深绿色。绿色冰中是没有气泡的，因为它是由冻结的海水所构成，而不是压缩的雪。沿着这个地区冰架的边缘，可以发现，带有绿色色素的单细胞生物非常多，而且海水里面含有它们丰富的分解有机物质。绿冰山虽没有包含很多这些生物体的微粒，但从海水中所积累的分解有机物质还是很多的。不同于盐，分解有机物质并没有在结冰过程中被排除掉。分析表明，分解的有机物质会从太阳光中吸收足够的蓝波段，从而使冰呈现出绿色。

化学证据表明冰的小盘（微小的平面部分）是在水中构成，然后共生并附着在冰架底部形成一个slush （部分融化的雪）。Slush被一种未知的原理压缩成冰，而这种固体，没有气泡的冰形成于可溶解的有机物质多的水。当冰山从冰架上分离并翻转过来时，绿色冰便呈现出来了。

似乎只有Amery Ice Shelf唯一适合绿色冰山的产生。一旦脱离冰架，这些冰山就会在环绕南极洲的水流和气流系统中漂流，会散落在南极洲浅色冰山周围。

## Architecture

Architecture is the art and science of designing structures that organize and enclose space for practical and symbolic purposes. Because architecture grows out of human needs and aspirations, it clearly communicates cultural values. Of all the visual arts, architecture affects our lives most directly for it determines the character of the human environment in major ways.

Architecture is a three-dimensional form. It utilizes space, mass, texture, line, light, and color. To be architecture, a building must achieve a working harmony with a variety of elements. Humans instinctively seek structures that will shelter and enhance their way of life. It is the work of architects to create buildings that are not simply constructions but also offer inspiration and delight. Buildings contribute to human life when they provide shelter, enrich space, complement their site, suit the climate, and are economically feasible. The client who pays for the building and defines its function is an important member of the architectural team. The mediocre design of many contemporary buildings can be traced to both clients and architects.

In order for the structure to achieve the size and strength necessary to meet its purpose, architecture employs methods of support that, because they are based on physical laws, have changed little since people first discovered them-even while building materials have changed dramatically. The world’s architectural structures have also been devised in relation to the objective limitations of materials. Structures can be analyzed in terms of how they deal with downward forces created by gravity. They are designed to withstand the forces of compression (pushing together), tension (pulling apart), bending, or a combination of these in different parts of the structure.

Even development in architecture has been the result of major technological changes. Materials and methods of construction are integral parts of the design of architecture structures. In earlier times, it was necessary to design structural systems suitable for the materials that were available, such as wood, stone, brick. Today technology has progressed to the point where it is possible to invent new building materials to suit the type of structure desired. Enormous changes in materials and techniques of construction within the last few generations have made it possible to enclose space with much greater ease and speed and with a minimum of material. Progress in this area can be measured by the difference in weight between buildings built now and those of comparable size built one hundred years ago.

Modern architectural forms generally have three separate components comparable to elements of the human body; a supporting skeleton or frame, an outer skin enclosing the interior spaces, equipment, similar to the body’s vital organs and systems. The equipment includes plumbing, electrical wiring, hot water, and air-conditioning. Of course in early architecture—such as igloos and adobe structures—there was no such equipment, and the skeleton and skin were often one.

Much of the world’s great architecture has been constructed of stone because of its beauty, permanence, and availability. In the past, whole cities grew from the arduous task of cutting and piling stone upon. Some of the world’s finest stone architecture can be seen in the ruins of the ancient Inca city of Machu Picchu high in the eastern Andes Mountains of Peru. The doorways and windows are made possible by placing over the open spaces thick stone beams that support the weight from above. A structural invention had to be made before the physical limitations of stone could be overcome and new architectural forms could be created. That invention was the arch, a curved structure originally made of separate stone or brick segments. The arch was used by the early cultures of the Mediterranean area chiefly for underground drains, but it was the Romans who first developed and used the arch extensively in aboveground structures. Roman builders perfected the semicircular arch made of separate blocks of stone. As a method of spanning space, the arch can support greater weight than a horizontal beam. It works in compression to divert the weight above it out to the sides, where the weight is borne by the vertical elements on either side of the arch. The arch is among the many important structural breakthroughs that have characterized architecture throughout the centuries.

**建筑**

建筑是一门设计结构的艺术和科学，出于实用或象征的目的用结构来组织和包围空间。因为建筑源于人类的需求和愿望，同样也可以清楚地传达文化价值。在所有的视觉艺术中，建筑最直接地影响了我们的生活，因为它在很多方面决定了我们生存的环境特征。

建筑是一种利用空间、质量、纹理、线条、光线和颜色的三维立体形式。一幢建筑物必须实现各种要素的和谐搭配。人类本能地希望可以提供居住并且改善他们生活质量的建筑。建筑师们的创造出来的建筑物不单纯的是建筑物，还为人们带来了灵感和喜悦。建筑物为人类的生活提供了遮蔽处和丰富的空间、增加人们的活动场所、完善人们的居所、帮助人们适应气候的变化，同时在经济上也承受。建筑团队中，最重要的是那些为建筑支付建设费用并且设计其职能的人。许多当代建筑平庸的根源在于他们和建筑师。

建筑结构必须达到大小和强度的要求，以实现必要的建筑目的，因此建筑学上采用一些支撑的方法，这些方法都是以物理定律为基础的，尽管建筑材料已经发生了翻天覆地的变化，这些支撑的方法却自人们发现它们以来就鲜有变化。世界的建筑结构也因为克服材料限制的目的而发展起来。建筑师们在设计建筑结构的时候需要将重力对材料的影响考虑在内。通过结构设计使建筑不同部分能抵抗压力、拉力、弯曲力或混合的压力。

甚至建筑的发展也是由重大的技术变革造成的。材料和建设方法是建筑结构设计整体的组成部分。早期，人们必须设计结构系统来配合当前可用的材料，如木头、石头和砖。现今的技术已经发展到能够创造新的建筑材料来适应想要应用的建筑结构。近几代建筑材料和科技的巨大变化使得包围空间更加简单、快速，并且用更少的材料。在这一领域的进步可以用现在修建的建筑和100年前建造的同规模建筑之间的重量差异来衡量。

类似人类的身体结构，现代建筑可以划分为三个独立的部分：支撑骨架或框架、覆盖内部空间的外壳以及像人体内器官一样重要的设施。这些设施包括管道、电线、热水和空调。当然，在早期的圆顶建筑和土坯建筑中并没有这样的设施，皮肤和骨骼也往往是合在一起的。

世界上大多数伟大的建筑都是石料建筑，因为石料建筑不仅外形漂亮、持久耐用，而且石头随处可得。在过去，整个城市的建筑物都是从艰苦的石块切割和堆砌发展起来的。在秘鲁安第斯山脉东部的马丘比丘印加古城遗址，可以看到世界上最棒的石质建筑。在开阔的空间上放置厚石板来支撑上面的石头，使门和窗的修建成为可能。设计师们必须在克服石头的物理限制以及新建筑形式发展之前发明出建筑结构。这就是拱形结构，即最初由分段的石头或砖块构成的弧形结构。拱最初在地中海早期文化中用来建设地下水渠，但古罗马人最先开发和广泛的利用它作为地上建筑的结构。他们完善了由分段的石块组成的半圆形拱。作为跨越空间的一种方式，拱可以比水平横梁支撑更大的重量。它使得其上的压力转移到两侧，由两侧垂直的部分来承担压力。而拱只是近百年来众多重要建筑结构的突破之一。

## The Long-term Stability of Ecosystems

Plant communities assemble themselves flexibly, and their particular structure depends on the specific history of the area. Ecologists use the term “succession” to refer to the changes that happen in plant communities and ecosystems over time. The first community in a succession is called a pioneer community, while the long-lived community at the end of succession is called a climax community. Pioneer and successional plant communities are said to change over periods from 1 to 500 years. These changes—in plant numbers and the mix of species—are cumulative. Climax communities themselves change but over periods of time greater than about 500 years.

An ecologist who studies a pond today may well find it relatively unchanged in a year’s time. Individual fish may be replaced, but the number of fish will tend to be the same from one year to the next. We can say that the properties of an ecosystem are more stable than the individual organisms that compose the ecosystem.

At one time, ecologists believed that species diversity made ecosystems stable. They believed that the greater the diversity the more stable the ecosystem. Support for this idea came from the observation that long-lasting climax communities usually have more complex food webs and more species diversity than pioneer communities. Ecologists concluded that the apparent stability of climax ecosystems depended on their complexity. To take an extreme example, farmlands dominated by a single crop are so unstable that one year of bad weather or the invasion of a single pest can destroy the entire crop. In contrast, a complex climax community, such as a temperate forest, will tolerate considerable damage from weather to pests.

The question of ecosystem stability is complicated, however. The first problem is that ecologists do not all agree what “stability” means. Stability can be defined as simply lack of change. In that case, the climax community would be considered the most stable, since, by definition, it changes the least over time. Alternatively, stability can be defined as the speed with which an ecosystem returns to a particular form following a major disturbance, such as a fire. This kind of stability is also called resilience. In that case, climax communities would be the most fragile and the least stable, since they can require hundreds of years to return to the climax state.

Even the kind of stability defined as simple lack of change is not always associated with maximum diversity. At least in temperate zones, maximum diversity is often found in mid-successional stages, not in the climax community. Once a redwood forest matures, for example, the kinds of species and the number of individuals growing on the forest floor are reduced. In general, diversity, by itself, does not ensure stability. Mathematical models of ecosystems likewise suggest that diversity does not guaranteeecosystem stability—just the opposite, in fact. A more complicated system is, in general, more likely than a simple system to break down. A fifteen-speed racing bicycle is more likely to break down than a child’s tricycle.

Ecologists are especially interested to know what factors contribute to the resilience of communities because climax communities all over the world are being severely damaged or destroyed by human activities.The destruction caused by the volcanic explosion of Mount St.Helens, in the northwestern United States, for example, pales in comparison to the destruction caused by humans. We need to know what aspects of a community are most important to the community’s resistance to destruction, as well as its recovery.

Many ecologists now think that the relative long-term stability of climax communities comes not from diversity but from the “patchiness” of the environment, an environment that varies from place to place supports more kinds of organisms than an environment that is uniform. A local population that goes extinct is quickly replaced by immigrants from an adjacent community. Even if the new population is of a different species, it can approximately fill the niche vacated by the extinct population and keep the food web intact.

## 生态系统的长期稳定

植物群体可以自由地聚集，他们特殊的结构取决于聚集区域的具体历史。生态学家使用“演替”来诠释植物群落和生态系统随着时间推移所发生的变化。演替中的第一个群落被称作先锋群落，而处于演替最后那个长期生存的群落被称为顶极群落。先锋群落和紧接着的植物群落的变化周期是从1到500年不等。植物数量和混合种类数量的变化是慢慢积累的。顶极群落本身也改变，但其变化周期超过500年。

现代一个研究池塘的生态学会发现池塘在一年当中相对而言是不变的。个别鱼类可能被替换，但一年一年鱼的总数都趋于一致。也就是说，生态系统自身的性质比组成生态系统的单个生物体更为稳定。

生态学家们一度认为物种的多样性使生态系统稳定。生态系统物种越多样则生态系统越稳定。通过观察得出的结论支持了这个观点，长期持久的顶极群落通常要比先锋群落具备更为复杂的食物网和更多的物种。生态学家家们得出的结论是：顶点生态系统的稳定性明显取决于他们的复杂化程度。举个极端的例子，在单一作物的农田中，一年的恶劣天气或单一害虫的入侵就可以摧毁所有作物。与此相反，在一个复杂的顶极群落里，如温带森林，他们便可以抵御来自气候和害虫的入侵。

不管怎样，生态系统稳定性的问题非常复杂。首先，不是所有的生态学家都赞同“稳定”的含义。稳定性可以简单地定义为缺乏变化。如果是这样的话，顶极群落将被视为最稳定的，因为根据定义，他们随着时间推移而变化是最少。另外，稳定性也可以界定为生态系统在经历了严重破坏之后回复原貌的速度，比如火灾。这种稳定性也被称作弹性。在这种情况下，顶极群落将是最脆弱和最不稳定的，因为他们可能需要数百年时间才能恢复到顶点状态。

即使是这种被定义为简单地缺乏变化的稳定性并非总是与最多样的物种联系起来。至少在温带地区，会经常在演替过程中发现最多物种，而不是在顶极群落中。例如，红树林一旦成熟，其中的物种数量以及单个物种的数量都会减少。总的来说，多样性本身并不能保证稳定性。生态系统的数学模型也可以得出同样的结论。一般来说，一个更复杂的系统可能比一个简单的系统更容易被破坏。一个十五速的赛车比一个孩子的三轮车更容易损坏。

生态学家们更想弄清楚到底哪些因素有助于促成群落的恢复，因为世界各地的顶极群落都因为人类活动而遭受到严重的损坏或毁坏。就像美国西北部圣海伦火山的猛烈喷发所造成的破坏，在人类活动对环境造成的的破坏面前也相形见绌。我们必须了解对群落抵抗破坏和恢复来说哪些是最重要的。

现在的很多生态学家们认为，顶极群落相对长期的稳定性并非来于自多样性，而是来自环境的“补缀”，随处变化的环境比统一的环境更有利于多种有机体的生存。当地物种灭亡后，马上就会被相邻群落的移民取代。即便是另一种不同的物种，他们也可以填补那些已灭绝生物的空缺，并保持食物网的完整。

## Depletion of the Ogallala Aquifer

The vast grasslands of the High Plains in the central United States were settled by farmers and ranchers in the 1880’s. This region has a semiarid climate, and for 50 years after its settlement, it supported a low-intensity agricultural economy of cattle ranching and wheat farming. In the early twentieth century, however, it was discovered that much of the High Plains was underlain by a huge aquifer (a rock layer containing large quantities of groundwater). This aquifer was named the Ogallala aquifer after the Ogallala Sioux Indians, who once inhabited the region.

The Ogallala aquifer is a sandstone formation that underlies some 583,000 square kilometers of land extending from northwestern Texas to southern South Dakota. Water from rains and melting snows has been accumulating in the Ogallala for the past 30,000 years. Estimates indicate that the aquifer contains enough water to fill Lake Huron, but unfortunately, under the semiarid climatic conditions that presently exist in the region, rates of addition to the aquifer are minimal, amounting to about half a centimeter a year.

The first wells were drilled into the Ogallala during the drought years of the early 1930’s. The ensuing rapid expansion of irrigation agriculture, especially from the 1950’s onward, transformed the economy of the region. More than 100,000 wells now tap the Ogallala. Modern irrigation devices, each capable of spraying 4.5 million liters of water a day, have produced a landscape dominated by geometric patterns of circular green islands of crops. Ogallala water has enabled the High Plains region to supply significant amounts of the cotton, sorghum, wheat, and corn grown in the United States. In addition, 40 percent of American grain-fed beef cattle are fattened here.

This unprecedented development of a finite groundwater resource with an almost negligible natural recharge rate—that is, virtually no natural water source to replenish the water supply—has caused water tables in the region to fall drastically. In the 1930’s, wells encountered plentiful water at a depth of about 15 meters; currently, they must be dug to depths of 45 to 60 meters or more. In places, the water table is declining at a rate of a meter a year, necessitating the periodic deepening of wells and the use of ever-more-powerful pumps. It is estimated that at current withdrawal rates, much of the aquifer will run dry within 40 years. The situation is most critical in Texas, where the climate is driest, the greatest amount of water is being pumped, and the aquifer contains the least water. It is projected that the remaining Ogallala water will, by the year 2030, support only 35 to 40 percent of the irrigated acreage in Texas that is supported in 1980.

The reaction of farmers to the inevitable depletion of the Ogallala varies. Many have been attempting to conserve water by irrigating less frequently or by switching to crops that require less water.Other, however, have adopted the philosophy that it is best to use the water while it is still economically profitable to do so and to concentrate on high-value crops such as cotton.The incentive of the farmers who wish to conserve water is reduced by their knowledge that many of their neighbors are profiting by using great amounts of water, and in the process are drawing down the entire region’s water supplies.

In the face of the upcoming water supply crisis, a number of grandiose schemes have been developed to transport vast quantities of water by canal or pipeline from the Mississippi, the Missouri, or the Arkansas rivers. Unfortunately, the cost of water obtained through any of these schemes would increase pumping costs at least tenfold, making the cost of irrigated agricultural products from the region uncompetitive on the national and international markets. Somewhat more promising have been recent experiments for releasing capillary water (water in the soil) above the water table by injecting compressed air into the ground. Even if this process proves successful, however, it would almost triple water costs. Genetic engineering also may provide a partial solution, as new strains of drought-resistant crops continue to be developed. Whatever the final answer to the water crisis may be, it is evident that within the High Plains, irrigation water will never again be the abundant, inexpensive resource it was during the agricultural boom years of the mid-twentieth century.

## 奥加拉拉蓄水层的枯竭

19世纪80年代，在美国中部北美大平原的广阔草原上定居着农民和农场主们。这里有着半干旱的气候，在人们定居50年后，它支撑了一个以畜牧业和小麦种植为主的低密度农业经济。然而，在20世纪初，人们发现北美大平原的下面是巨大的蓄水层（含有大量地下水的岩层）。这个蓄水层因曾经在这里定居过的奥加拉拉苏族印第安人而得名，被称作奥加拉拉蓄水层。

奥加拉拉蓄水层属于砂岩结构，在从德克萨斯州西北到南达科塔州的地下绵延了583000平方公里。雨水和融雪自30000年前便开始在奥加拉拉蓄积。据估计，奥加拉拉蓄水层的含水量足以填满休伦湖，但不幸的是，在目前该地区半干旱的气候条件下，奥加拉拉蓄水层的蓄水能力极低，每年仅半厘米左右。

20世纪30年代初，奥加拉拉正处于干旱时期，人们打出了第一口井。灌溉农业的迅速扩张，特别是20世纪50年代之后，改变了这一地区的经济。目前人们已经在奥加拉拉地区共开凿了100000多口井。日喷水量达到4500000升的现代灌溉设备，形成了一个圆形绿岛作物为主的景观。奥加拉拉蓄水层支撑了北美大平原地区美国棉花、高粱、小麦、玉米的灌溉需求。此外，美国百分之四十谷饲养的肉牛在这里被育肥。

考虑到几乎没有补充率（实质上没有自然水资源进行补充），这种有限地下水资源前所未有的发展已经引起了该地区地下水位的急剧下降。在20世纪30年代，井下15米就有丰富的水资源，而现在，必须挖掘到45米到60米甚至更深的地方才行。有的地方地下水位的下降速度甚至达到了每年1米，迫使人们周期性的加深水井并使用更有力的的水泵。按现今的下降速度来估计，大部分地下蓄水将在40年内耗尽。这种现象在气候最干旱的德克萨斯州尤为严重。大量的水被从地下抽起，蓄水层含水量最少。据估计，到2030年，德克萨斯州余下的奥加拉拉含水只能支持1980年灌溉面积的35%到40%。

农民们对无法避免的奥加拉拉蓄水层枯竭的反应各不相同。很多人已经开始尝试通过降低灌溉频率或者改种需水较少的庄稼来节约水资源。而另外一些人却抱着趁水资源还能产生经济效益就应抓紧利用的想法，继续种植高价值的棉花等农作物。当那些想节水的农民得知邻居们通过大量耗水的种植而盈利的时候，他们的热情降低了，从而导致了整个区域的供水量的减少。

在即将到来的水资源供应危机面前，人们提出了一些宏伟的供水计划，比如将密西西比河、密苏里河或者阿肯色河的水通过运河或管道运到需要用水的地方。不幸的是，通过以上任何一种方式获得水资源都会将抽水的成本提高十倍以上，进而导致这一地区的灌溉农产品成本在国内和国际市场上都毫无竞争力。最近一些有希望获得成功的试验试图通过向土壤中注入压力，释放水层上方土壤中的毛细管水。即使这样行之有效，抽水成本会变到原来的三倍。基因工程也会通过继续研发抗旱作物新品种，帮助解决部分难题。无论这次水资源危机的最终结果如何，显然，北美大平原地区灌溉水资源再也不会像20世纪中期农业繁荣时期的那样充足并且廉价了。