

Official 02

Passage 01

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.

建筑是一门出于实用和象征的双重目的，通过组织和利用空间来实现设计结构的艺术和科学。。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。

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.

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，同时在经济上也可承受。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功能的人，许多当代建筑平庸的根源在于客户和建筑师双反。

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.

为了达到建筑的目的，一定的大小和强度是必须的。尽管建筑材料已经发生了翻天覆地的变化，建筑采用的各种支撑方法自从人们发现它们以来鲜有改变，因为这些方法都建立在物理

定律的基础上。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。

Every development in architecture has been the result of major technological changes. Materials and methods of construction are integral parts of the design of architectural structures. In earlier times it was necessary to design structural systems suitable for the materials that were available, such as wood, stone, or 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.

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。

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, and 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.

类似人类的主体结构，现代建筑可以划分为三个独立的部分：支撑骨架或框架、围住内部空间的外壳以及像人体内部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。

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 stone. 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.

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。拱形结构只是近百年来众多重要建筑结构的突破之一。

Passage 02

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 1880s. 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.

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场主们和牧场主们。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大部地下是巨大的蓄水层（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。

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.

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南部的地下绵延了 58.3 万平方公里。雨水和融雪自 3 万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。

The first wells were drilled into the Ogallala during the drought years of the early 1930s. The ensuing rapid expansion of irrigation agriculture, especially from the 1950s 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.

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 10 万多口井。日喷水量达到 450 万升的现代灌溉设备，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棉花、高粱、小麦、玉米的灌溉需求。此外，美国 40% 谷饲养的肉牛在这里被育肥。

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 1930s, 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.

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%。

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. Others, 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.

农场主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。当那些想节水的农场主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。

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.

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 10 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失去竞争力。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 3 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。

Passage 02

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.

植物群体可以自由地聚集，它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。

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.

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，但年复一年鱼的总数都趋于一致。也就是说，一个生态系统自身的属性要比由单一生物体组成的生态系统更稳定。

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.

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干扰和入侵。

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.

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得最少。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。

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 guarantee ecosystem 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.

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，红杉树林一旦成熟，其中的物种数量以及单个物种的数量都会减少。一般来说，多样性本身并不能保证稳定性（事实上正相反），生态系统的数学模型也可以得出同样的结论。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）。

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.

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。

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.

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自于多样性，而是来自环境的“补缀”，随处变化的环境比始终如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。