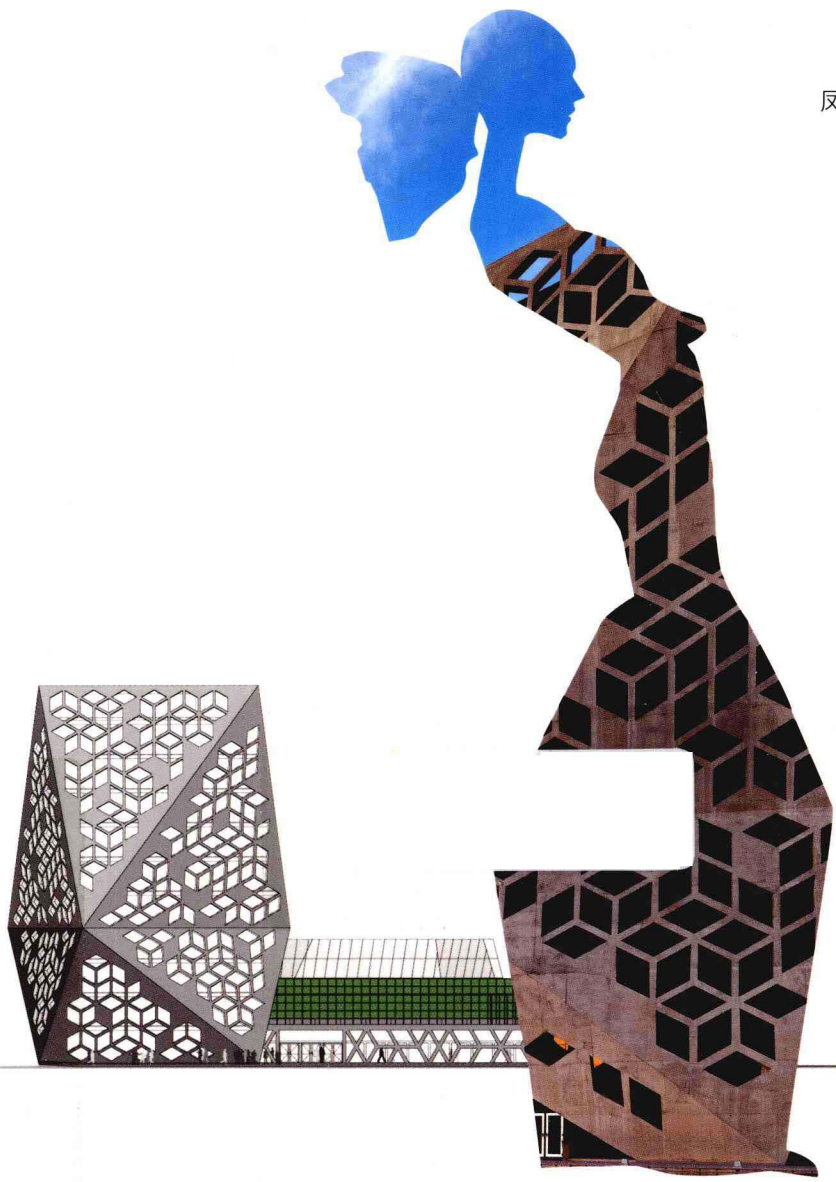
建筑“时装”定制

FASHION IN ARCHITECTURE

混凝土

CONCRETE

凤凰空间·北京 编



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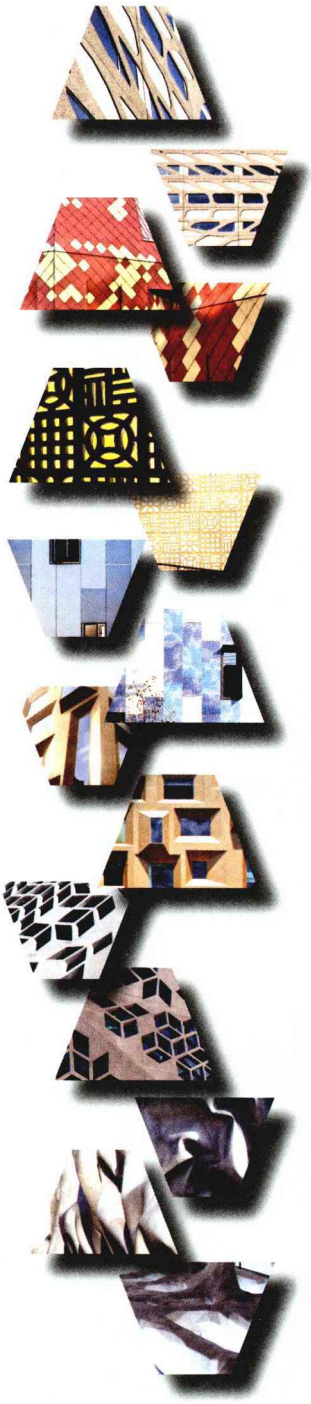

前 言
PREFACE

■ 关于混凝土，可追溯到古代。古罗马人将火山灰混合石灰、砂制成的天然混凝土用于建筑中。

■ 1824 年，英国建筑工人约瑟夫·阿斯普丁发明了波特兰水泥并获得专利。

■ 法国园艺家约瑟夫·莫尼埃发明了钢筋混凝土，并于 1867 年获得专利。1875—1877 年，他主持建造了第一座人行钢筋混凝土桥。

■ 1900 年，万国博览会上展示了钢筋混凝土在很多方面的应用，在建材领域引起了一场革命。

■ 1918 年，达夫·艾布拉姆斯发表了著名的计算混凝土强度的水灰比理论。钢筋混凝土开始成为改变这个世界景观的重要材料。

■ 如今，材料、技术、设备、工艺不断地推陈出新，混凝土作为建筑中的无冕之王，在建筑立面中的运用也不甘落后。近年来，世界各地涌现出精彩纷呈的独具混凝土魅力的特色建筑。

■ The history of concrete can be traced back to ancient times. The ancient Romans used natural concrete combined of lime, pozzolan ash, sand and gravel in buildings.

■ In 1824, a British stone mason, Joseph Aspdin invented Portland cement and obtained a patent.

■ Reinforced concrete was invented by a French gardener, Joseph Monier, who received a patent in 1867.

■ At the World Exposition of 1900, the extensive utilization of concrete brought an innovation in the field of construction material

■ In 1918, Duff Abrams published a well-known computational theory of water-cement ratio to determine the concrete strength. Reinforced concrete became an important material to change the world landscape.

■ With the development of new material, technique, equipment and technology, concrete has become a universal dominant construction material, and also applied in the façade of architecture. In recent years, a huge number of significant concrete architecture were created worldwide.

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第一部分 PART 1

建筑混凝土“时装”历史

HISTORY OF CONCRETE "FASHION" IN ARCHITECTURE

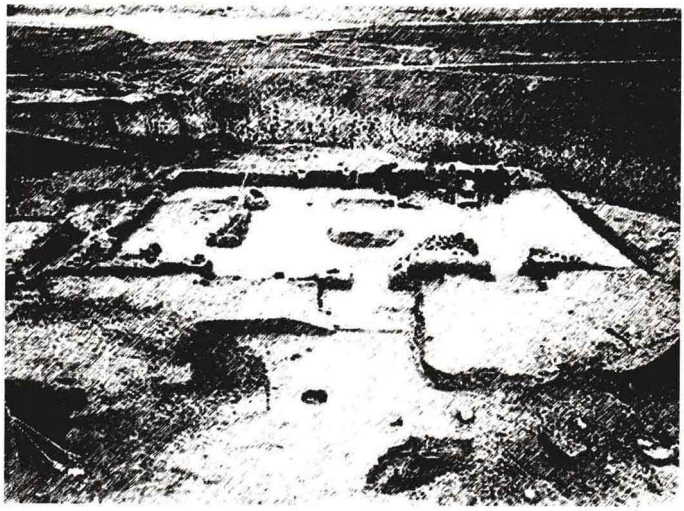
在这里，我们一起来回顾一下建筑中混凝土立面设计的历史，带领大家穿越时空，共同领略建筑“时装”的美，领略建筑“时装”设计师们的别具匠心，体味带有混凝土质感的建筑奇观。

Here, let's look back over the history of concrete façade in architecture, appreciate the magnificent concrete "fashion" and the creativeness of architects, and enjoy the concrete architecture wonders across time and space.

1. 古代

混凝土在世界范围内被广泛地应用。中国甘肃省大地湾发现了古代混凝土的遗迹。尽管这所住宅遗迹距今已有5000年，但人们却精确地发现在地板中使用了类混凝土的材料。这里要先明确一下混凝土的定义，一般来说，由水、水泥、细骨料（砂）、粗骨料（砂石）混合而成的建筑材料被称为混凝土。在遗址中，也发现了可以烧制水泥的窑。这些水泥可能是由以碳酸钙与黏土为主要成分的料姜石制成的。

正式将混凝土作为建筑材料的是古代罗马人。他们用火山灰混合石灰、砂制成的天然混凝土用于建筑中，建造了街道、桥梁、神殿、礼堂、广场等各种各样的建筑物。据说直到罗马帝国为止，这些社会基础设施都在持续地受到维护。正是因为古代混凝土能让建筑物更加坚固、雄伟，所以这样的成就在今天看来也是令人钦佩的。也正因为这些建筑，才支撑起了强大的古代罗马文明。即使到了今天，我们仍然还在使用“罗马非一朝一夕建成”和“条条大路通罗马”这样的谚语。



大地湾古代混凝土遗址，中国，甘肃 Ancient Concerete Site at Dadi Bay, Gansu, China

1. ANCIENT

Concrete has found very wide application worldwide in construction field. Ancient concrete site was found in Dadi Ba in Gansu, China. Though this Dadi Bay Relic site has a history of 5000 years, it is found that concrete was used for floors. Here, we first give a clear definition of concrete. Generally speaking, concrete is a composite construction material made primarily with water, cement, sand and gravel. A kiln used to fire cement was also found in the Dadi Bay Relic site. The concrete is probably made from ginger-like rock whose main components are calcium carbonate and clay.

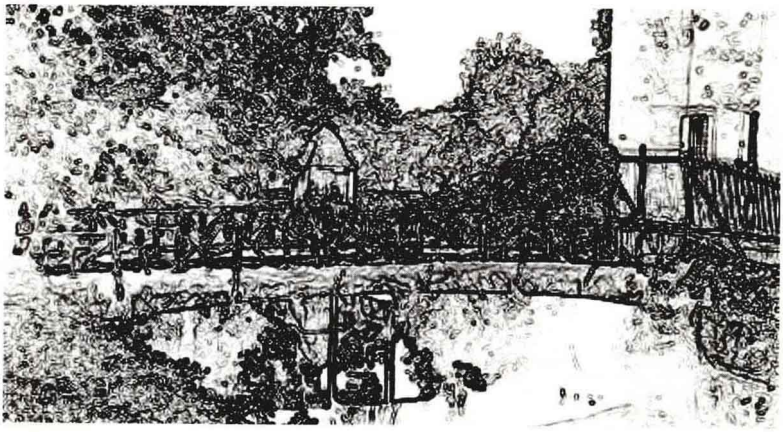
Concrete was formally used as construction material in ancient Rome. The ancient Romans used natural concrete combined of lime, pozzolan ash, sand and gravel in various constructions, such as streets, bridges, temple, auditorium, forum, etc. It's said that these infrastructures were still under maintenance until the Roman Empire. Concrete made the constructions more stately and grand, and these achievements are still impressive today. It's these constructions that support the ancient Roman civilization. Until today, we still use the proverbs, such as "Rome wasn't built in a day" and "All roads lead to Rome".

2. 近代

1824 年，英国建筑工人约瑟夫·阿斯普丁发明了波特兰水泥并获得专利。由于用它配制成的混凝土具有工程所需要的强度和耐久性，而且操作简单、原料易得、造价较低，特别是能耗较低，因而用途极为广泛。

钢筋混凝土是现代常用的建筑结构材料，由法国园艺家约瑟夫·莫尼埃发明，并于 1867 年获得专利。1875 年，莫尼埃主持建造了世界上首座钢筋混凝土大桥。法国工程师埃纳比克在 1867 年的巴黎博览会上看到莫尼埃用铁丝网和混凝土制作的花盆、浴盆和水箱后受到启发，于是设法把这种材料应用于房屋建筑上。1879 年，埃纳比克开始制造钢筋混凝土楼板，开发了一套由钢筋箍和纵向杆加固的混凝土结构梁构成的建筑体系，并于 1892 年获得专利。1884 年，德国建筑公司购买了莫尼埃的专利，进行了第一批钢筋混凝土的科学实验，研究了钢筋混凝土的强度、耐火能力以及钢筋与混凝土的黏结力。

1887 年，德国工程师科伦首先发表了钢筋混凝土的计算方法；英国人威尔森申请了钢筋混凝土板专利；美国人海厄特对混凝土横梁进行了实验。1900 年，万国博览会上展示了钢筋混凝土在很多方面的应用，特别是在建材领域引起了一场革命。

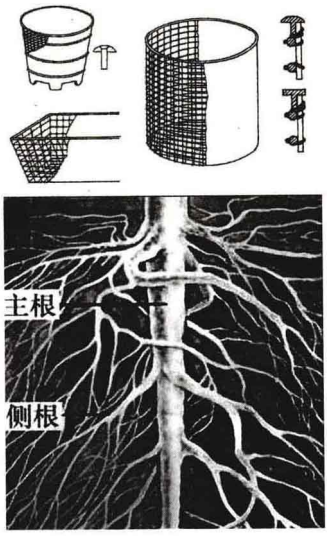


约瑟夫·莫尼埃主持建造的首座钢筋混凝土桥，法国
The First Reinforced Concrete Bridge Designed by Joseph Monier, France

2. MODERN

In 1824, a British stone mason, Joseph Aspdin invented Portland cement and obtained a patent. Since the concrete mixed of Portland cement has the properties of high strength and durability which are needed in construction. And it has the advantages of simple operation, easy obtainment of the raw material, low cost and low energy consumption, so it has wild application.

Reinforcement concrete is wildly used architectural constructional material. It was invented by a French gardener, Joseph Monier, who received a patent in 1867. In 1875, Monier designed the first reinforced concrete bridge at the Castle of Chazelett, France. François Hennébique, a French engineer, saw Monier's reinforced concrete flowerpots, tubs and tanks at the 1867 Paris Exposition, and began experimenting with ways to apply this new material to building construction. He began with reinforced-concrete floor slabs in 1879, and later developed as a set of building the structure of reinforced concrete beams reinforced hoop and longitudinal rod, patented in 1892, using structural beams of concrete reinforced with stirrups and longitudinal bars designed to resist the tensile forces. In 1884, German construction company bought Monier's patent, and conducted the first scientific experiment of reinforced concrete, studying the strength and the fire resistance of reinforced concrete, and its bond strength between bars and concrete.



约瑟夫·莫尼埃发明了“钢筋混凝土”，其灵感来自植物的根系。
Inspired by plant roots, Joseph Monier invented the reinforced concrete.

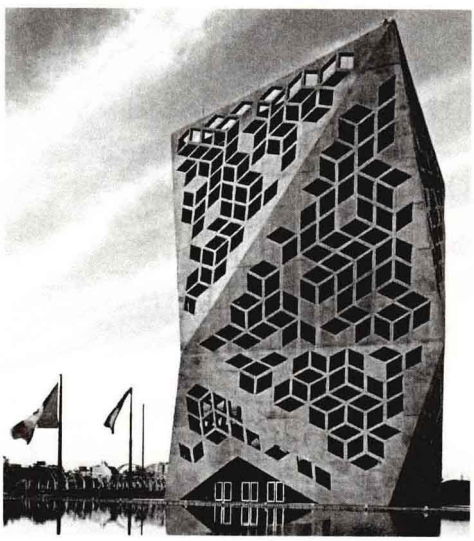
In 1887, German engineer Cologne first published the method of calculation of the reinforced concrete; Englishman Wilson applied for a reinforced concrete slab patent; an American, Hyatt carried out experiments on beams. At the World Exposition of 1900, the extensive utilization of concrete brought an innovation in the field of construction material. At World's Fair of 1900, the extensive utilization of concrete brought an innovation in construction material field.

3．现代

1918 年，达夫·艾布拉姆斯发表了著名的计算混凝土强度的水灰比理论。于是，钢筋混凝土开始成为改变这个世界景观的重要材料。此后，便相继出现了轻集料混凝土、加气混凝土以及其他类型的混凝土，各种混凝土外加剂也开始被广泛使用。

自 20 世纪 60 年代以来，混凝土领域中有了高效减水剂，随之相应的出现了流态混凝土这一种类。同时，高分子材料也进入到混凝土材料领域中来，出现了聚合物混凝土。此外，多种纤维被用于分散配筋的纤维混凝土也相继出现。如今，现代测试技术也越来越多地应用于混凝土材料科学的研究当中。材料、技术、设备以及工艺都在不断地推陈出新，使得混凝土早已成为建材中的无冕之王。

本书将注意力更多地凝聚在混凝土材料在建筑立面上的应用。如何利用混凝土本身的可塑性赋予建筑崭新的风貌，属于“新混凝土”的应用范畴。本书收集了国际上以混凝土为建筑材料的新设计、新运用的建筑案例，为读者奉上一场靓丽非凡的“混凝土建筑时装秀”。



两百年纪念市政中心，阿根廷，科尔多瓦
Bicentennial Civic Center, Córdoba, Argentina

3. CONTEMPORARY

In 1918, Duff Abrams published a well-known computational theory of water-cement ratio to determine the concrete strength. Reinforced concrete became an important material to change the world landscape. Later, lightweight aggregate concrete, aerated concrete and other types of concrete, as well as a variety of concrete admixtures have begun to be wildly used.

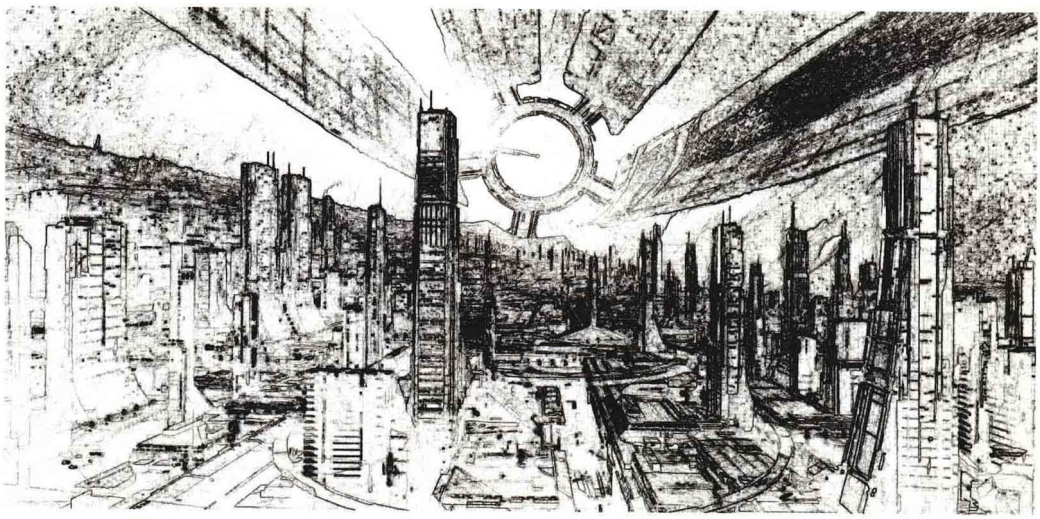
Since the 1960s, the water-reducing agent has been used at mixing for casting concrete, and the flowing concrete has been created. Then, polymer material has appeared in the field of concrete materials, and polymer concrete has been created. Besides, fiber reinforced concrete which uses a variety of fibers for dispersion of reinforcement. Today, modern testing techniques are also increasingly used in the study of concrete materials. With the development of new material, technique, equipment and technology, concrete has become a universal dominant construction material.

This book put more focus on the application of concrete in building façade. It is the application of new concrete to give the building a new look by using the flexibility of concrete. In this book, we collected the latest architecture projects in the world with new application and design of concrete, presenting the readers with a gorgeous fashion show of concrete architecture.

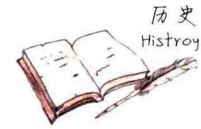
4．未来

随着现代材料科学的不断进步，作为最主要的建筑材料之一的混凝土已逐渐向高强度、高性能、多功能和智能化发展，用它建造的混凝土结构也趋于大型化和复杂化。绿色高性能混凝土是未来混凝土的发展趋势，可实现高效可循环利用。

混凝土已经融入我们的生活，无时无刻不在影响着我们的今天。从混凝土的发展状况可以看出，混凝土是一种充满生命力的建筑材料，正在以令人瞠目的速度发展着，为未来的建筑创造无限的空间和可能。



科幻中的未来月球城市 Moon City in Science Fiction



4. FUTURE

With the continuous development of modern materials science, concrete, as one of the most important construction materials, is gradually developing towards high-strength, high-performance, multi-function and intellectualized feature. Concrete structure also tends to be large-scale and complicated. In the future, high-performance green concrete will become the future trend of concrete, and the construction should make effective and circular use of it.

Concrete plays a vital part in our daily lives, and it affects us in every corner. From its development status, we find that concrete is a construction material full of vitality. And it is developing in a quick speed, creating infinite space and possibility for the future architecture.

第二部分 PART 2

建筑混凝土“时装”案例

CASES OF CONCRETE "FASHION" IN ARCHITECTURE

在这里，我们将注意力更多地凝聚在混凝土材料在建筑立面上的应用。如何利用混凝土本身的可塑性赋予建筑崭新的风貌，属于“新混凝土”的应用范畴。本书收集了国际上以混凝土为建筑材料的新设计、新运用的建筑案例，为读者奉上一场靓丽非凡的“混凝土建筑时装秀”。

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