# ARCHITECTURAL Material & Texture II

# 建筑材料与肌理 II

凤凰空间·华南事业部　编
刘宏志　策划

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# Preface

## Surface Novelty

In his 1976 book *The Selfish Gene* evolutionary biologist and author Richard Dawkins speculated that all living organisms, from single-cell life forms to the infinitely more complex human body, could be thought of as "survival machines" – vast thriving colonies of information-rich genes whose sole purpose is to insure the continuation of its own genetic lineage. Whether stationary and designed to take advantage of solar rays via photosynthetic capacities in rooted plant species, or muscular and agile for nutrient-seeking animal life, all biotic matter has an imperative to evolve in order to keep the genes replicating healthily and perpetually. These mutations cause the eventual rise of adaptive traits, including novel abilities to act and react in defense for survival, or to seek and successfully attract mates, and are field-tested developments aimed to provide a long lasting genetic safe haven. Since the outside environment is not static but in continual flux through a barrage of changing circumstances, it is through non-stop recursive novelty that "survival machines" are able to meet new challenges and secure a productive biotic heritage.

A demonstration of surface-based novelty can be found within the outer membrane of the triggerfish (balistapus undulatus), a tropical fish populating coral reef habitats in the Indo-Pacific. This fish has in effect two mouths: one is its actual mouth for eating, and the other is an enlarged false mouth made entirely of pigment. Though superficial, this second mouth provides a very real and efficient means of defense: to predators, it communicates, "I have a large mouth and I will eat you." Its material and pattern novelty demonstrates a rather intelligent economy of means in evolutionary terms: the scaly surface has hybridized into a visually convincing virtual mouth, without the need for actual structure. This anthropomorphized lie (patterns don' t technically "lie", they are simply patterns) helps to insure the security and ongoing succession of the triggerfish gene pool, and is not an object of ornamental excess, but one of extreme functional efficiency. Here we can see an interesting case of "gene colony smarts" – it is presumably easier to evolve a pigment-based false mouth rather than to reconfigure the bones and musculature into an actual large one (if not needed for food intake).

What can be learned from gene colonies, fish patterns, and superficial effects? It is not a coincidence that the exterior surfaces of buildings today are commonly referred to as "skins" (typically understood as the outer sensing organ of an animal or person). Yet, it is through a broader examination of novelty - something new or unusual in an interesting way – that we can gain additional insight into one of the most radically evolving conditions in building tectonics today, the outer membrane of architecture. Contemporary building skins come very close to achieving biotic similarities. Twentieth century French philosopher Michel Serres likens our own human skin to a paradoxical wicker basket: it holds all of our internal liquids and organs intact, yet leaks continually like a sieve. While envelope systems have addressed fluids and breathable porosities (air exchange) for centuries, new layers of metabolic exchange are more frequently wrapping our buildings. This complex integration now readily converts and stores energy in the form of sophisticated photovoltaic solar panels, green roofs for internal energy conservation, and rainwater containment systems, etc. Like plants, buildings will more frequently soak up local "nutrients" in order to thrive and survive amongst stiff competition for energy.

In tandem the robust yet responsive outer building layer will continue to be one of the primary tactics of envelopes, especially as climates rapidly change. As anecdotal proof author Alan Weisman in *The World Without Us* offers a most effective way of demolishing a wooden barn without tools: puncture a small hole into its roof and revisit it after a number of years. The unstoppable entropic forces of natural weathering and biotic decay are sure to undermine its architectural solidity into a rubbish pile of decomposed matter. Yet, most large buildings today have the opposite problem: materials are often hybrid polymers whose chemical make-up will not allow for manageable breakdown and regeneration in the long run. Not readily recyclable, these composites may insure a building' s usefulness in the short term through material stability, but contradict one of the central tenets of evolutionary success – do not grow your colony to a scale where nutrient supply (i.e. available resources) cannot be sustained. In other words, do not eat yourself out of existence! As we can see, it will be through new forms of tectonic novelty extending beyond day-to-day weather resistance that the long-term success of our built environment relies.

While we might continue to draw behavioral comparisons between organic and inorganic skins, a critical limitation arises when we position the role of novelty simply as a means to guide a linear process of problem solving. Most important is the fact that organic evolution is not particularly streamlined, but moves haphazardly through a bottom-up, out-of-control process of trial and error. When something works, go with it for as long as possible. If not, then move on. If an image-based virtual mouth works well in fending off predators (and most likely attracting mates) for the triggerfish, then superficiality will trump the "real" contesting one of the central axioms of modernism, where form that follows function was to be the only viable option. Here, there' s function without the necessity for form.

Architectural skins today operate in a changing, cross-disciplinary territory where utility, tectonics, and effect integrate in profoundly changing ways. Being extroverted, building envelopes emotionally attract, perceptually stimulate, and intellectually challenge us to find meaning in our surroundings. In doing so, building skins occupy a circuitous terrain that far outweighs the more straightforward (yet no less difficult) task of resisting weathering. This "beautiful strangeness" – often based in novel applications and material transformations – provides an evolutionary link that runs deep.

Thom Faulders / Faulders Studio
San Francisco 2012

# 序言

## 从表皮进化到建筑应用

著名的进化论生物学家兼作家理查德·道金斯曾在其于1976年出版的《自私的基因》一书中提出，所有的生物体，从单细胞生命形式到结构繁复的人类躯体，都可以被视为“生存机器”，这是一种数目庞大的、不断繁衍着的多信息基因群，其唯一目的是确保自身遗传谱系的延续。所有的生物，无论是那些扎根于大地上的、通过光合作用利用太阳光能来维持生命的植物，还是那些强壮、敏捷、善于捕食的动物，为了使其基因一代代健康而持久地复制下去，都必须不断地进化自身。这些基因的突变最终导致了生物适应性的出现，包括为了生存而作出的行动和反应能力，以及寻找或吸引配偶的能力，而这些能力都是为了创造出长久的基因遗传环境而在不断的实践中进化出来的。由于外部环境不是静止不变，而是瞬息万变的，因此，“生存机器”能够通过新事物的循环出现，不断迎接新的挑战，并保证自身的生物遗传信息的有效性。

在这里，我们以引金鱼的外膜为例，看看生物表皮的进化。引金鱼（又称“黄纹炮弹”）是一种栖息于印度洋—太平洋地区珊瑚礁中的热带鱼。这种鱼看起来有两张嘴巴，一张是真的用来进食的，而另一张则是完全由其身上的色素放大而成的假嘴。尽管第二张嘴是假的，但是它却起到了一种非常真实且有效的防御作用。比如说，当引金鱼碰到捕食者的时候，它会利用这第二张嘴传递出一种“我有一个大口，我会吃了你”的信息。它的构成物质和图案以一种新颖的方式向人们展示了物种进化过程中的智慧：无需任何实体组织结构，布满鳞片的表皮就能构成一个足够以假乱真的虚拟口。这种充满人格化的谎言（尽管图案本身只是图案，不会真的“说谎”）有助于确保引金鱼基因库的安全性和传承性，它不是一种多余的装饰品，而是一个极具功能性的高效防御系统。在这里，我们看到了一个有趣的“基因群智慧”案例，那就是，若非出于进食的需要，与其通过重构自身的骨骼和肌肉来塑造一个真实的大口，还不如虚拟一个由色素组成的假口来得更容易些。

从这些基因群、鱼纹、表皮效果中，我们可以学到什么呢？事实上，人们现在将建筑物的外表面称为“表皮”（一般是指动物或人体的外部感觉器官）并不是一个巧合，而是通过对那些新奇的或不寻常的事物的广泛调查和研究从而获得的一种对现代建筑构造中最根本的进化部件之一——建筑外膜——的另一种深刻理解。当代建筑表皮都在不断地向生物共性靠拢。20世纪法国哲学家米歇尔·赛尔大胆地把人体的皮肤比喻成一个充满矛盾性的柳条筐，它能把我们体内所有的液体和器官都完整无损地包裹其中，却像一个筛子一样具有外透性。尽管几个世纪以来，围护系统已经解决了建筑流体和透气性（空气交换）问题，但我们还是采用了更多具有生物新陈代谢性能的新型表皮来包裹我们的建筑物。现在，这种复杂的集成体能以设计巧妙的太阳能光伏电池板、节能的绿色屋顶、雨水回收系统等形式，轻易地对能量进行转换并储蓄起来。就像那些为了能在资源竞争激烈的环境中生存下来并茁壮成长的植物一样，建筑物会更多地利用和吸收当地的资源，以充实自身，从而在高楼林立的大都市中找到自己的一席之地，彰显其独特的美感。

紧接着，一个稳固而具有强适应性的建筑外层将会成为建筑围护其中一个主要的设计，尤其是随着气候的迅速改变。在《没有我们的世界》一书中，轶闻证据作家艾伦·韦斯曼提供了一种无需工具就可拆卸木制谷仓的最有效方法：在其屋顶穿刺了一个小孔，然后于数年后故地重游，我们就会发现，由于无法阻挡的自然风化熵力和生物腐化的共同作用，建筑的实体已经遭到严重的破坏，分解成一堆垃圾了。然而，今天的大多数大型建筑物的建造方法却是背道而驰的，建筑师在建造过程中并没有考虑到建筑材料的拆卸或分解问题，大量采用那些长期不能分解及再生的杂化聚合物材料，极不利于回收利用。也许，这些复合材料可依靠其稳定性在短期内保证建筑物的功用，但是，这种做法却是极不可取的，因为它违背了进化论中的一个中心论点——自然环境所提供的生存资源是有限的，任何一种生物的繁殖以及种群的扩张，都以环境的承受能力为限，透支环境的承受能力将导致种群的灭绝。这就是为什么生物体永远都不会在不能持续提供养分供应（即可用资源）的地方发展自己的种群。换句话说，如果我们只顾眼前利益，透支了子孙后代的环境与未来，那么等待我们的就将会是种群的消亡！因此，在不久的将来，随着各种创新型构造形式日新月异的发展，建筑材料的耐候性将会成为建筑环境一个能长期赖以生存的法宝。

然而，当我们把注意力集中在对生物表皮和非生物表皮之间的行为进行比较的时候，一个关键性的限制因素出现了，使得我们不能把创新仅仅作为一种解决问题的向导来看待。一个至关重要的事实就是：生物进化的过程并不是呈线性单向快速地往前发展的，而是自下而上、充满了偶然性与突发性的，还不受控制，在此过程中，新的特性不断地产生出来，然后历经自然环境的反复考验，实现优胜劣汰：当某种特性对生物体有用的时候，它就会被长久地保留下来，直到失去价值并逐渐退化；相反地，当某种性能不符合生物体的生存需要时，它就必然会被淘汰，而生物体则将继续进化下去。在此我们不如先回顾一下现代主义中形式与功能之间的辩证关系，现代主义的设计原则之一就是“形式必须服从功能”，但根据刚才阐述的进化论，我们再来看看引金鱼这个例子：对于这种生物来说，如果一个形式上的“假口”能有效地抵御捕食者，或者说很大程度上起到吸引配偶的作用的话，那么这个“假口”就会远胜于“真口”。从这个例子中我们可以看出：形式不必服从于功能。

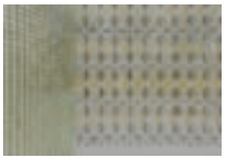
今天，建筑表皮正在一个不断变化的跨学科领域中发展着，其功能、构造和效果也在以一种不断变化的方法结合在一起。作为一种外部的围护结构，建筑表皮能起到吸引注意力、刺激视觉，并引导人们去关注建筑与环境之间关系的作用。在这种情况下，比起简单直接地（尽管难度相当）研究材料的耐候性，建筑表皮的研究和设计就显得更为艰难曲折了。而这种通常以新式应用和物质变换为基础的“优美而奇特的构筑物”，恰恰为建筑和生物进化之间提供了一种深层次的联系。

Thom Faulders / Faulders Studio
2012年写于美国旧金山

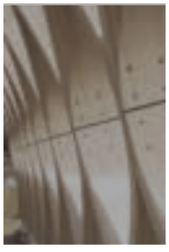
# 材料与肌理
# Material & Texture


Texture Structure
肌理构造
008-079

Material Application
材料运用
038-335


040-079
Metal | Material & Texture
金属 I 外墙+内墙+空间隔断

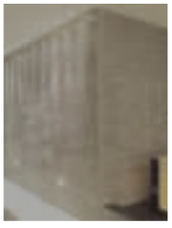

080-149
Wood | Material & Texture
木材 I 外墙+内墙+空间隔断



150-199
Composite material | Material & Texture
复合材料 I 外墙+内墙+空间隔断



200-241
Glass | Material & Texture
玻璃 I 外墙+内墙+空间隔断


242-261
Stone | Material & Texture
石材 I 外墙+内墙+空间隔断



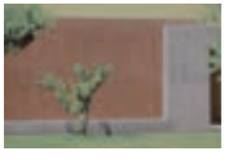
262-281
Concrete | Material & Texture
混凝土 I 外墙+内墙+空间隔断



282-299
Brick | Material & Texture
砖 I 外墙+内墙



300-311
Ceramic | Material & Texture
陶瓷 I 外墙+内墙+空间隔断


312-319
Coating | Material & Texture
涂料 I 外墙+内墙+空间隔断



320-335
Other
其他

# Material & Texture

The texture is the surface form of the materials, and it represents the characteristic of the material surface and reflects the organization of the material. In other words, the surface of any materials has its own texture, and this texture is the most direct medium for us to learn the material. Thus, the texture is the primary factor in the understanding of materials and the essence of researching the organization of the material in the form of visual perception. Therefore, the texture of the building is not only a key factor in visual performance of a building, but also the direct expression of the tissue morphology.

What exactly is the building skin texture? Early 20th century, Le Corbusier put forward "free plane" and "horizontal window" in Towards a New Architecture, which liberates the exterior walls of the building and makes it a "skin" instead of a s retaining wall, and emphasizes its possibility of performance. By abstracting the building into the "skin" and "bone", it is Mies van der Rohe who makes the retaining wall a "skin", not a volume. He stresses the relationship through fine nodes and processing, and lays the foundation for self-expression of the building skin. The post-modernist architects further believe that the building can have two layers, the innermost layer of which solves functional problems and the outside layer of which solves the problem of appearance in the form.

In order to achieve the performance of the texture, some of the designers and owners deliberately stripped the stucco surface of the building to show the mottled brick wall and the rust stains of pillar. In order to create a unique texture, some of them even invest a lot of energy and fun to explore the abandoned leaders, the load floors, or dilapidated chairs on the second hand market. Some designers choose to change the original materials to form a new texture by processing. Finnish architect Juhani Parra Smarr said, "the building has become an instant visual impression of the art form, and lead to a severe sensory-poor." He believes that any meaningful architectural experience is multiple-perceptional, and the experience and sensory are interaction. Texture can arouse the curiosity of people. The real art stimulates the idea of our touch perception, which is the extension of the life True architectural works will evoke a similar

肌理是客观存在的物质的表面形式，它代表材料表面的质感，体现物质属性的形态。换句话说，任何物质表面都有它自身的肌理形式存在，而这种肌理形式的存在，又是我们认识这种物质的最直接的媒介。由此可见，物质的肌理形式是认识物质的首要因素，也是视觉中研究肌理形态的实质。因此，建筑的肌理不仅是建筑视觉表现的关键因素，也是其构造组织形态的直接体现。

建筑的表皮肌理为何物？20世纪初，柯布西耶在《走向新建筑》中提出的“自由平面”、“横向长窗”将建筑外墙解放出来，使建筑的围护体作为“表皮”，强调了其表现的可能。真正把建筑的围护体作为“表皮”（而非体积）进行表现的是密斯·凡德罗，他把建筑抽象为“皮”与“骨”的关系，并通过精致的节点和精细的加工来加以强调，为建筑表皮的自我表现奠定了基础。后现代主义建筑师进一步认为，建筑可以有两层表皮，里面的一层解决功能性问题，外面的一层解决外观形式问题。

为了追求肌理的表现，一些设计师和业主刻意剥去了建筑表面的粉刷面层，以显现砖墙的斑驳和柱身的锈渍，甚至投入极大的精力和乐趣在二手市场上发掘废弃的龙头、载重地板和破烂不堪的椅子，试图营造出独特的肌理。还有的设计师把原有的材料经过处理，使其形成一种新的肌理。自称为感官性极少主义的芬兰建筑师尤哈尼·帕拉斯马指出，“如今建筑已经变成一种瞬间视觉印象的艺术形式，导致了严重的感官贫乏”。他认为任何有意义的建筑体验都是可多重感知的，并且强调这种体验的同时性和感官的交互作用。肌理可以唤起人们摩挲的欲望。真正的艺术刺激我们触摸的设想知觉，而这种刺激正是生命的扩展，真正的建筑作品也会唤起类似的强化我们自身体验的设想触摸知觉。

通过各种独特的肌理，建筑师使工业制造的工艺、形式与风格同时蕴涵于建筑表皮中，使建筑既体现了擅长于简单几何形体的高精度加工以及工业制造工艺的平直、光洁和准确复制，又体现了高度的艺术性、时代性和民族特色。

# Texture Structure

strengthening of our own experience the idea of touch perception.

By different kinds of unique textures, architects fuse the craft, form and style of the industrial manufacturing into the building skin, which makes the building not only in precision machining of simple geometry, and the straightness, smoothness and accurate replication of industrial manufacturing process, but also a high degree of artistic, contemporary and ethnic characteristics.

In some cases, as a form of forms, texture is more "form" than forms, which requires us to change the form into texture, to shape the architectural image from the point of a texture rather than from the form itself. Take loft style for example, it respects the existence nature of the building shell and exposes the original architectural features and materials, and contains a rich texture in the "minimal" decoration. Therefore, we see the bare brick walls, mottled concrete beams and slab, rusty pipes, hydrants and equipment, of course, we can see some new "insert object", such as chrome-plated steel and glass furniture.

在某些情况下，作为形式系列的肌理比形式自身更“形式”。这就要求我们把形式转化为肌理，从肌理的角度而非从形式本身来塑造建筑形象。以Loft 风格为例，它尊重建筑壳体的存在性质，使建筑原有的特征和材料裸露地保留下来，在装饰“极少”之中包含着丰富的肌理。于是我们看到了裸露的砖墙，斑驳的混凝土梁和楼板，生锈的管道、龙头和设备，当然我们还能看到一些新的“插入物体”，比如镀铬钢管和玻璃的家具等。“形式”作为肌理的载体，设计师们最为关注的不是其“造型”，而是这众多物件的材质之间和新旧之间的肌理的对比。

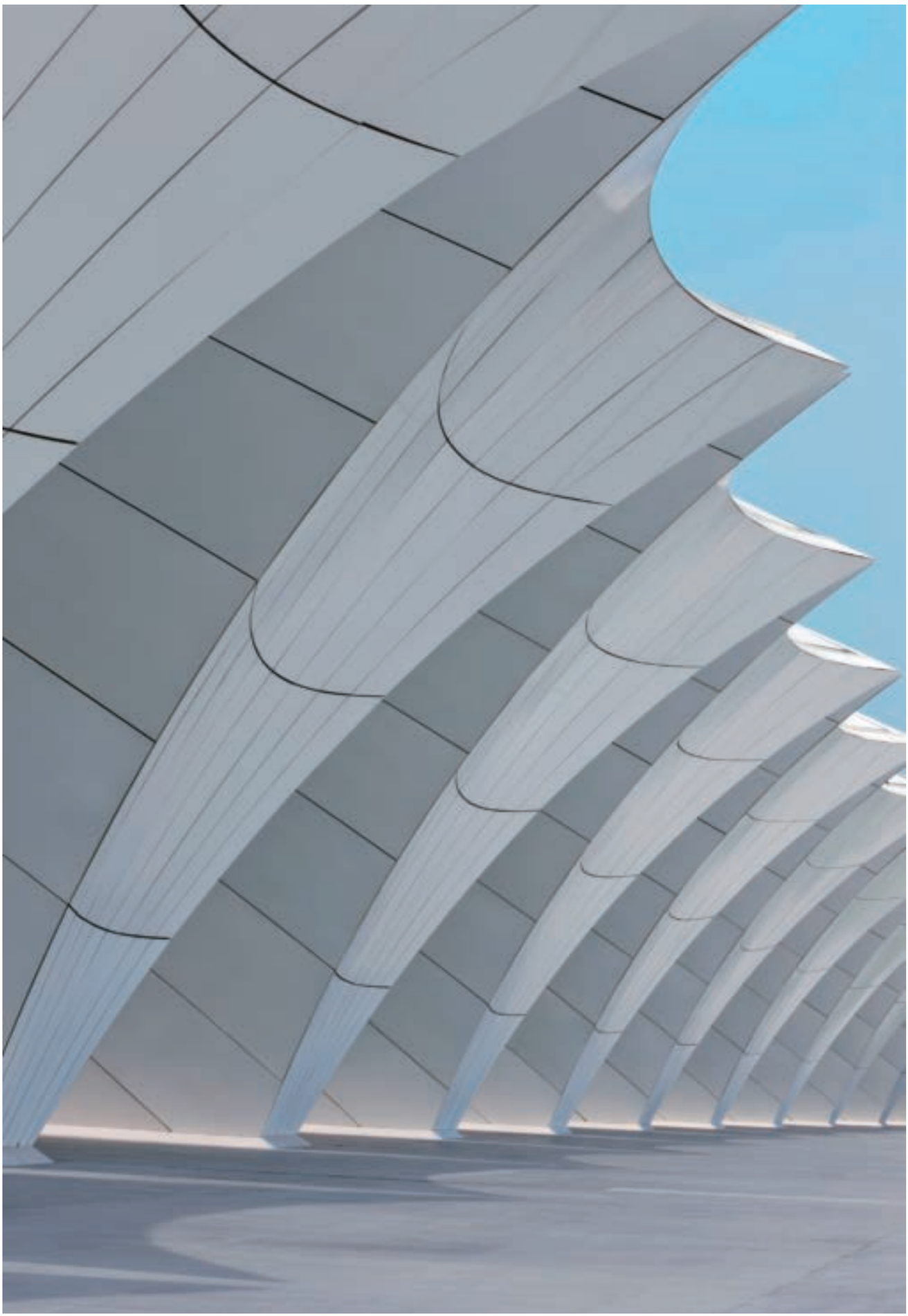
在解构主义或当前一些前卫作品甚至商业建筑中，墙体“飞出”建筑已经成为一种重要的主体表现手法，甚至是一种潮流。在追求纯净、抽象、极简风格的观念的驱使下，建筑师对于体量、造型等传统形式要素的关注正逐渐转向对建筑围护体自身的关注，而建筑的围护体则从对建筑雕塑感的表达的传统使命中逐渐回归其自身——建筑的表皮中。

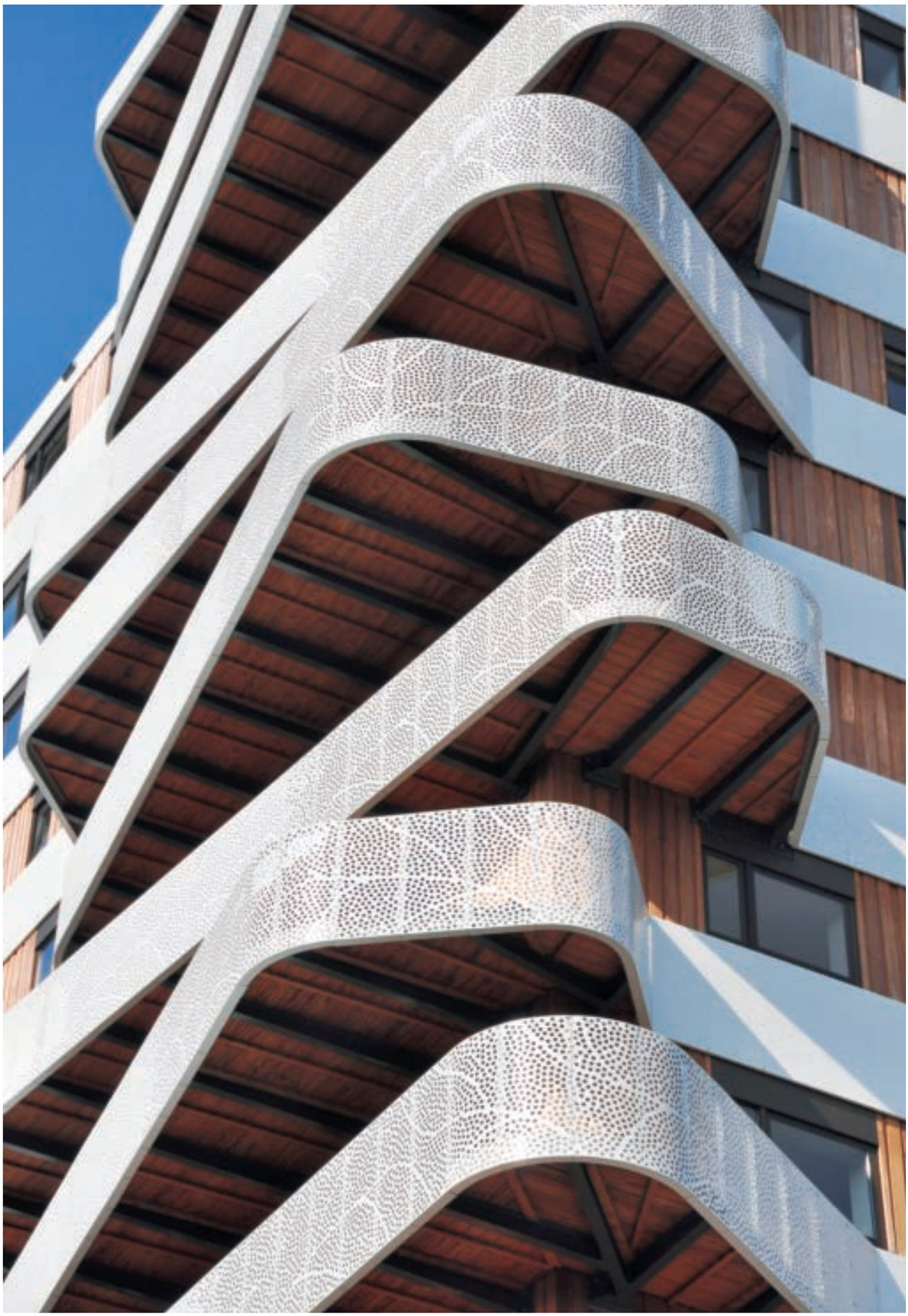
"Form", as the carrier of the texture, the most concern of designers is not its "style", but the contrast of different old and the new materials .

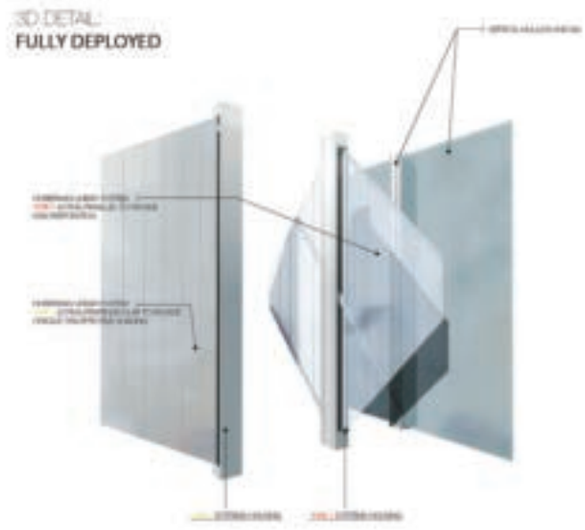
In deconstruction or some current avant-garde works, even commercial buildings, the buildings with flying-out walls have become an important practice, and even a trend. Driven by the concept of pure, abstract, minimalist style, the architects' attention is gradually shifting from the volume, shape and other traditional forms of elements to the building' s durability. The buildings' objective of expressing the sense sculpture is also gradually returning to their own surface.

Logically, as the basic properties of the epidermis, texture is bound to become a theme of the performance of the building form. With the rise of the intelligent and ecological building, the building' s durability is more prominent as the property and role of the epidermis. It is no longer a simple epidermis, but further a "skin" of the building, and becomes an energy and material exchanging interface of the building and external environment.

从逻辑上可以说，肌理作为表皮的基本属性将必然会成为建筑形式表现的一个主题。随着智能和生态建筑的兴起，建筑围护体作为表皮的属性和作用更为突出。建筑的围护体已经不再是单纯的表皮，而是更进一步地作为建筑的“皮肤”，成为建筑与外界环境进行能量和物质交换的界面。



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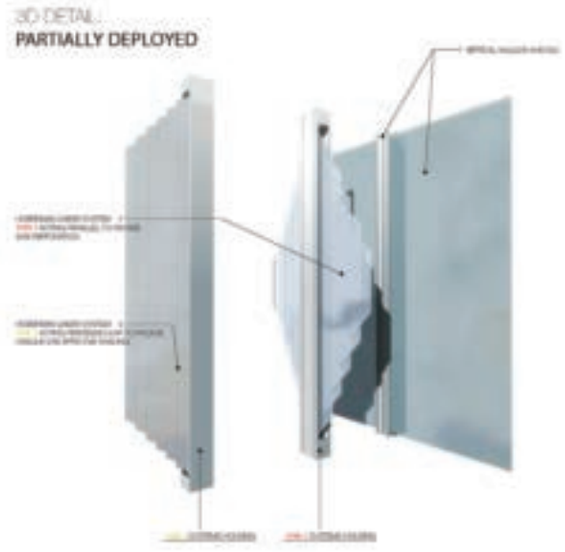
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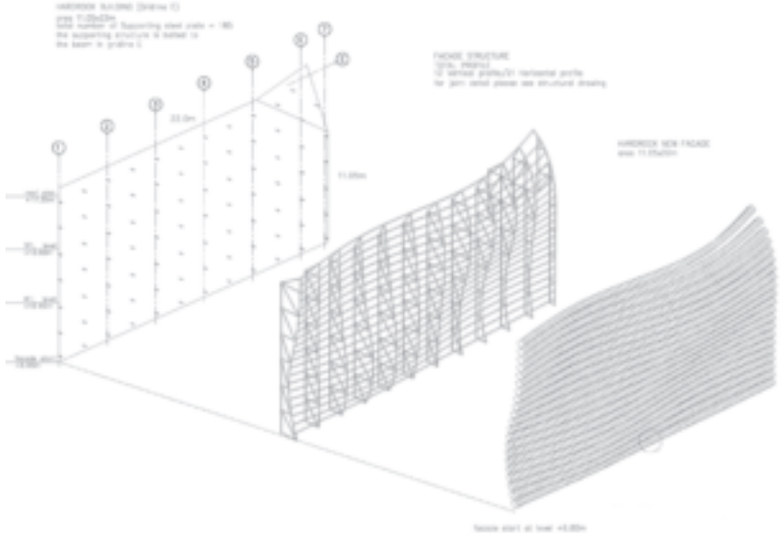

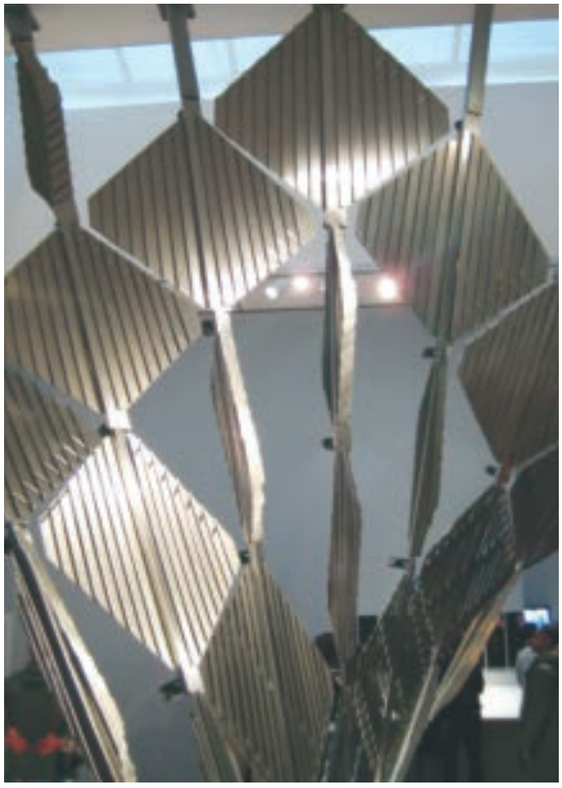

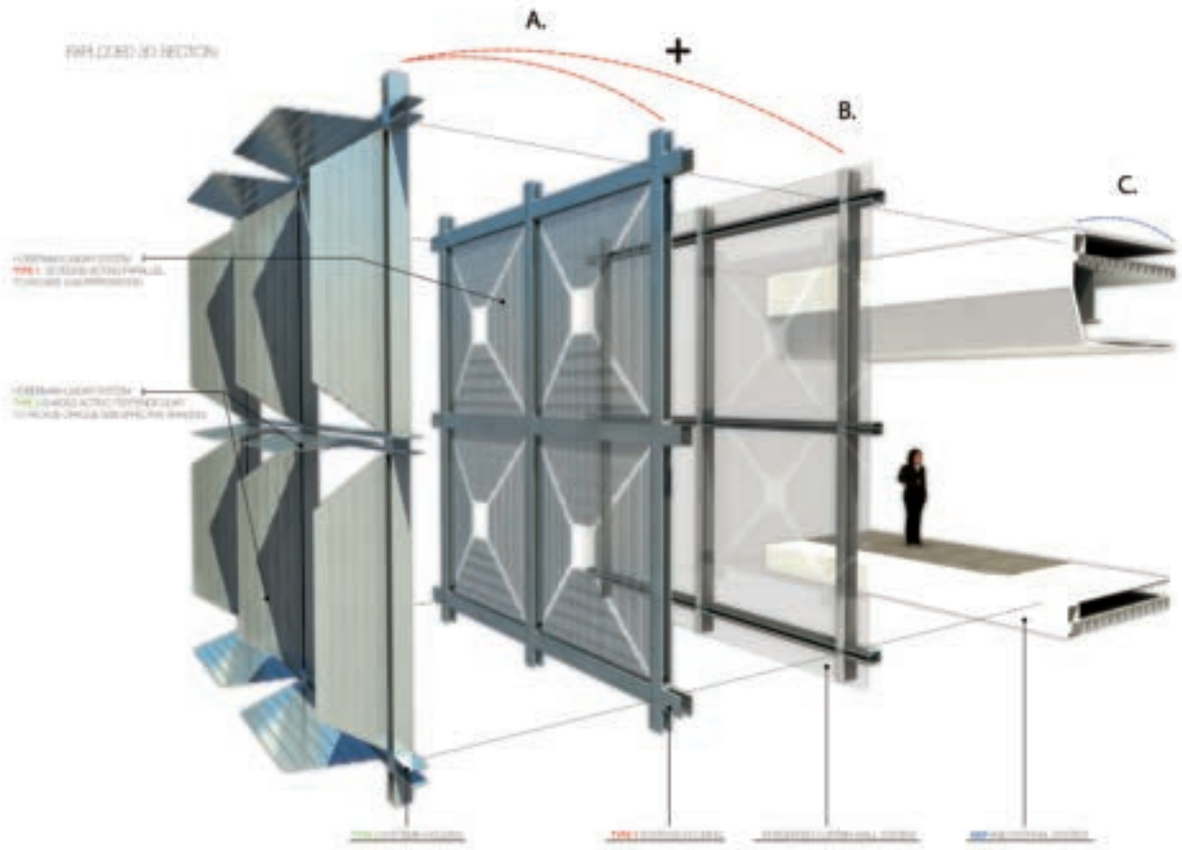


**THREE PART SYSTEM**

The Helio Trace system includes kinetic shades, the building enclosure system and the internal mechanical system. The kinetic shades are oriented on the exterior of the curtain wall package all of which comprise a highly efficient building envelope. The internal chilled ceiling panels reduce the volume of required outside air, resulting in improved HVAC efficiency. Daylight harvesting allows for reductions in electrical lighting and associated heat production. On an annual basis, the combined system provides an effective shading level of 78% and reduces peak solar gains by 61%.

SYSTEM LAYERS:

A.

B.

C.

A + B C

**SYSTEM MODULE AND SIZE:**

The design strove to minimize the presence of the articulated shade, its mechanisms and its housing as much as possible. This was aided by the refined and economically engineered linear system, which packages a large shade in a relatively small housing when retracted. In addition to working to minimize the size assembly, size we offset any unbalance clutter of the retracted shades by maximizing the glazing unit size.