建筑实场系列丛书 No.35

灰色建筑中的绿色自然：

混合型建筑设计

Green in Grey

Architecture in Hybrid Mode

汉英对照

（韩语版第371期）

韩国C3出版公社 | 编

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只要人类在寻求建筑物的庇护，大自然就会是建筑设计的主要背景。无论是原始茅屋中蕴含的风水（宇宙）论，还是古典装饰遵循的自然规律，都显示出“自然”便是本真，亦或是完美。尽管人类致力于从不可脱离干系的“自然”家园中逃脱出来，但是大自然仍保持着它与人类的联系，尽管有些与人类智慧提出的要求相悖。在工业时代，技术被定义为违背自然的人造产物，这个过程和结果便造就了现在的世界，一个人类用短期的获利——经济利益，来证明自己存在的世界。这就像是现实生活中的巴氏消毒法[1]，即人类与细菌的战争，视自然为潜在的不健康因素。于是，人工技巧成为了一种新的设计准则，自然便被改造成公园、动物园、建筑群和其他类似的人类成就。

直到21世纪初，这一切发生了显著的变化。碳排放导致的温室效应、森林乱砍滥伐、物种灭绝等问题，被认为与反人类的直接犯罪行为一样严重。在现今发达社会，这些环境问题对人类的影响是毋庸置疑的，而对于这些环境问题的呼吁，如同经济利益问题，也不容忽视。

在当今时代，科技并非授予人类驾驭自然的权力，而是帮助重建人与自然的共生条件，而这需要更高层次上的战略。建筑物本身爱莫能助，建筑只能以人类期许的新的形式呈现。现在的建筑，既没有失去可以让人身心愉快的自然元素，又拥有强大的混合式机器的能力，利用自然科学和人工技术的融合，创造出可以自给自足的居所，重新带来微观和宏观的气候变化，提供富有矿物质的天然氧吧环境。最重要的是，这样的建筑可以成为未来建筑设计的原型，在设计中引入更多的变化元素，比如最明了却也最具有野心的设计理念，即重建城市生态环境，超越城乡区划，模糊城乡边界，融合人工与自然。

Nature has served as a prime reference as long as man has tried to shelter himself in building. From the cosmology of the primitive hut to the natural order of classical ornament, to be “natural” would practically mean to be true, or ideal. As humanity tried to emancipate itself from the inevitability of its “natural” habitat, nature still remained relevant even in the form of something opposite to which the human intellect would make its claim. In the industrial era technology is defined the artificial in defiance of the natural. The quantification of processes and outcomes created a universe where man established his presence with short-term gain – e.g. financial profit. Similarly the “pasteurization” of everyday life[1], namely humanity’s battles against germs, saw nature as something potentially unhealthy. Artifice became the new norm, and nature was to be tamed in the form of parks, zoos, collections, and other similar human achievements.

By the dawn of the twenty-first century things have resolutely changed. For one thing, issues like global warming through carbon emissions, deforestation, the extinction of species, etc. are considered as critical as direct crimes against humanity, their impact hardly being disputed and their appeal as topics of interest hardly being neglected by advanced societies.

In our day it seems as if technology is used not to empower man over nature but to re-establish the terms of their symbiosis. While this involves strategies on a hugely larger level, architecture cannot help but position itself in the new norm. Without forfeiting the pleasurable aspect of nature, buildings nowadays stand as powerful hybrid machines, utilizing nature and its ways in fusion with man-made technology to create self-sustaining habitats, micro- and macro- climate regenerators, and powerful containers of minimal energy footprint. Most importantly they stand as prototypes, one building serving as a model for a wider adaptation, with the most apparent – as well as ambitious – scope of negotiating the terms of a new urban ecology, transcending divisions and blurring the lines between urban and rural, man-made and natural. Ultimately this becomes a problem of awareness, and the buildings in our survey are exemplar at exactly that aspect.

科学与生物多样性小学_Primary School for Sciences and Biodiversity/Chartier Dalix Architects
巴黎东区科学与技术区_East Paris Scientific and Technical Pole/Jean-Philippe Pargade Architecte
植被25建筑_25 Green/Luciano Pia
绿化改造_Green Renovation/Vo Trong Nghia Architects
猎鹰总部二期_Falcón Headquarters 2/Rojkind Arquitectos + Gabriela Etchegaray
Point 92建筑_Point 92/ZLG Design
垂直森林_Vertical Forest/Boeri Studio

灰色建筑中的绿色自然：混合型建筑设计
Green in Grey: Architecture in Hybrid Mode/Angelos Psilopoulos

对棍，1820–1823，Francisco Goya
Fight with Cudgels, 1820–1823, Francisco Goya

建筑师一直着迷于大自然的魅力，Vitruvius在其著作《建筑十书》[2]中全面阐述了大自然在建筑中的重要角色，比如运用自然的风向、气候、土壤和水源，都可以在建筑中起到重要的作用。同样，大自然也提供了理想背景，就像是个鬼斧神工的建筑师，将人类的居所变成了大自然中的基本的元素。尽管如此，人类一直在孜孜不倦地提高其基本要求，从功能实用性到艺术美学。而在这方面，人类似乎是在逆自然而行，人类不再视大自然为必要条件，而将自然理解为一种可以被改造成人类可适的环境，而人类的这一切努力，最终只不过是幻想而已。

建筑学与大自然的互动形式，就如同在历史进程中人类话语赋予建筑的意义一样多样化。[3]Sörlin[4]界定了自然在建筑学中的作用，或是作为建筑中的构成要素，亦或是建筑中的装饰主题：从流动空间和曲线表面，到动物和植物，螺旋结构和藤蔓花式，到系统的建筑理念，即功能性建筑（如公园或动物园），或是原型的背景（如经典几何图案的"自然"法则，或是天圆地方宇宙论决定的圆形的帐篷、茅屋或蒙古包）。即便如此，建筑学还是不能视自然于不顾，单纯追求"纯粹概念空间"，而全然依赖人类智慧，背离建筑与自然共存的理念。从广场设计或轴向布局，到基于程序生成的设计原理，建筑学探究的不仅是单纯模仿自然，而是分析并利用自然规律，从而建立人类理想的与自然共生的空间。

这些就如同是一枚硬币，自然是硬币的核心，而人类的活动则是刻在硬币表面上雕花。因为自然科学博大精深，因此大自然对人类如何运作不屑一顾。自然尽力维持着其内部的精确平衡，无论人类如何表现自我，来维持其地位。Michel Serres的《自然契约》[5]的开篇，描绘了Goya的一幅画，画中是"两个陷在流沙中的人，他们手持棍棒在争斗"。在构图上，Goya将这两个人放在画的正中央，"这两个人的膝盖已经深陷在淤泥中，而且他们每动一下，就会陷得更深一些，最终，他们将葬身于淤泥之中。他们下陷的速度取决于他们斗争的激烈程度：斗争越激烈，动作越

Architect has always been fascinated with nature. Vitruvius has written extensively in *De Architectura*[2] about the fundamental role nature plays in architecture, mastery of winds, climate, soils and water being the very condition for the act of building. In quite similar terms, nature has provided for archetypical references, being itself "a builder" of sorts, in as much as the act of shelter becoming a most fundamental part of architecture. Nevertheless man has strived to elevate his base needs, covering a range from utility to the very extreme of aesthetic appreciation. In this position man can be thought of counteracting to the inevitability of nature; he no longer thinks of it as a necessary condition but rather as a context that can be formulated to suit his survival needs, then his endeavors, become ultimately his fantasies.

In these terms architecture has responded to nature in ways as numerous as the meanings that were assigned to it in the history of human discourse[3]. Sörlin[4] basically distinguishes nature in architecture for its role either as a formative element or a decorative theme: from flowing spaces and curving surfaces, to animals and satyrs, helixes and vines, to the very programmatic principle of architecture, namely a function(e.g. a garden or a zoo) or an archetypical reference (e.g. the "natural" principles of classical geometry or the cosmological reflection in the round shape of a camp, hut, or yurt). In this context one can also not escape the mirror claim for a "purely conceptual space", one that negates the necessity for reference to nature, a sort of counter-juxtaposition to the founding principle by means of human genius. Covering a range from square form or axial arrangements to the empowerment of generative design principles based on programming, architecture thus sought not to imitate nature but to analyze its rules and supersede it, looking to create coherent universes that appeal to the ideal of human achievement.

Still, these are aspects of the same coin; only, nature should be thought of as the substance of this coin, while human activity is merely engraving its sides. As the natural sciences know too well, nature is largely indifferent to human activity. The former will remain consistent to sustain its elaborate equilibrium regardless of the various narratives that man assumes trying to maintain his position in the picture. In the opening chapter of his book "The Natural Contract"[5] Michel Serres evokes a painting by Goya where "[a] pair of enemies brandish sticks [are] fighting in the midst of a patch of quicksand". While the composition of the painting puts the duel of the two men center stage, Goya "has plunged the du-

照片提供：©Luc Boegly

巴黎东区科学与技术区，马恩拉瓦莱，法国
East Paris Scientific and Technical Pole in Marne-la-Vallée, France

野蛮，他们下陷的速度就越快。交战中的两个人并没有意识到他们即将陷入深渊，而作为旁观者的我们，却看得清清楚楚。"[6]

Serres接下来便提出关于这幅画的"一般性问题"：两个人中谁会死？谁会赢？这时最好问问作为旁观者的自己，我们站在什么角度去看这幅画里挣扎的两个人的，更重要的是，我们如何看待这个问题。现在，全球变暖、工业污染、两极冰川融化等环境问题都已成为公众关注焦点，1993年讨论会中迫在眉睫的环境问题已然成为严酷的现实。在建筑学领域中，全新评价建筑样式、城市规划和土地管理的方法已然出现。现在，重中之重是何谓"可持续发展"[7]。这个概念主张保持平衡的概念，弱化工业社会中过度商品制造（这也可能是不得已而为之？）。可能这会是21世纪的一个新起点，在结果被迅速资本化之前，首先建立起系统的思想纲领。尽管建筑仍然代表了"具有可持续发展原则的空间"[8]，但新型建筑却致力于创建一个交互界面，将人类的期许和人类以更广阔的全球化视角解读的自然环境完美结合。

我们调查中的案例都是"混合型"的建筑。这些建筑超出了利用"自然"作为形式参考或装饰的做法，建筑师将自然元素与人造材料相结合，从而营造一种自然氛围和自然景观，或设计出能够调节气候的装置。同时，案例中的建筑物还具有更广泛的影响，它们将引领未来建筑学的发展潮流，其影响也可以从经典的建筑案例中感知，即让观众能够学习并坚信自己承担的社会责任，要在全球背景下来考虑。混合型建筑超越了城市与乡村、景观与建筑、强势与弱势的界限——就如同打破了Serres画中两个决斗者的对立关系，从而打造了一种微观生态系统。被赞誉为"引以为荣""梦幻之地""醍醐灌顶"的新型建筑，这些建筑重塑城市环境，重新规划了破败的环境所带来的紧张关系。

Chartier Dalix建筑师事务所设计的科学与生物多样性小学位于城市区域的狭窄且独立的地块中，这座学校将自然景观引入城市，同时自然景

elists knee-deep in the mud. With every move they make, a slimy hole swallows them up, so that they are gradually burying themselves together. How quickly depends on how aggressive they are: the more heated the struggle, the more violent their movements become and faster they sink in. The belligerents don't notice the abyss they're rushing into; from the outside, however, we see it clearly."[6]

Further on the chapter Serres suggests that the "usual question" is who will die, and who will win. Better ask yourselves, where are we standing as we're reading this passage and –more importantly– how. By the time subjects like global warming, industrial pollution, and the melting of polar ice became central to public awareness, and this argument of 1993 becomes a matter of pressing reality. In the realm of architecture, a new way of looking at buildings, city planning and land management in general have emerged. The principal focus now is on what was termed "a sustainable course of development"[7], a concept that is founded on establishing equilibrium rather than on the ever-growing commodification of processes and artifacts our industrial society (unwillingly?) put first place. Perhaps this marks a new point of departure for the twenty-first century, establishing programmatic thinking before an outcome that is immediately capitalized. In spite of an architecture that still stands "remarkably void of sustainable principles"[8], new buildings aim to act as an interface between human aspiration and "natural" adaptation to a wider, more global understanding of their environment.

The cases we examine in our survey may be seen as "hybrids". Extending beyond the utilization of "nature" as formal reference or ornament, they aim to fuse it with man-made materials in order to design atmospheres, landscapes, or machines that manipulate the climate of a place. Furthermore they submit entities that bring impact on a wider scale, taking part in an architectural trend of greater significance, its impact being perceivable in paradigm; namely in terms of educating an unsuspecting audience on the benefits – and also the responsibility – of thinking in a more global context. This hybrid architecture transcends dichotomies between city and country, landscape and building, major and minor – Serres' duelists. It produces micro-ecologies. Descriptions such as "places to be proud of", "places to dream", "places that teach", places act as urban regenerators or repurpose the tensions of a failing environment.

The Primary School for Sciences and Biodiversity by Chartier Dalix

照片提供：©Jaime Navarro

猎鹰总部二期，墨西哥城，墨西哥
Falcón Headquarters 2 in Mexico City, Mexico

照片提供：©Daniele Zacchi

垂直森林，米兰，意大利
Vertical Forest in Milan, Italy

观对城市起到保护的作用。学校由一层石材立面覆盖，建筑内包含多层环境系统，将绿色植物与钢筋水泥完美融合。学校的目的是寓教于乐，将诗情画意与教书育人和自然再次结合。作为学校，它将生态多样性带回到城市环境的中心。从整体上看，人们最终使建筑充满了生机与活力。在校的孩子们会在其中发挥他们的潜能，而当地的居民，因这座建筑的功能和强烈的存在感，把这所学校当作“社会枢纽”。总而言之，这所学校就像是一个自给自足的生态系统，具有强大的教育功能，植根于城市的中心。

Jean-Philippe Pargade建筑设计事务所设计的巴黎东区科学与技术区，是另一个将人工空间的塑造融入自然景观的外形的建筑典范。采用法国传统的桥梁施工技术[9]，建筑将大跨度的绿色屋顶之下的空间最大化，并将建成的表皮融入到人工建成的“自然”水平线内。这个项目体现了环保意识，致力于被动节能技术，实现最节能的方案。绿色屋顶以一种最根本的语言形式，将场地内各分散的结构统一在一起，既实现了丰富的视觉效果，又提供了功能性休闲空间。

Rojkind建筑事务所和Gabriela Etchegaray事务所设计的猎鹰总部二期，位于墨西哥城的绿色庭院，是为了补充猎鹰总部一期办公区而修建，与一期建筑反向而建。这两座建筑都把自然元素有机融入到一个有独特设计理念的混合式形式中。猎鹰一期的黄色玻璃盒子结构的表面映射着自然，自然也成为室内能够观赏得到的散碎风景。猎鹰二期则略有不同，从理念上来讲就是一期花园的一个延续，用一个透明玻璃幕墙罩住形成一处内部空间，幕墙采用510多个组合式的盆栽进行线性装饰。在建筑内部，这些盆栽起到了遮阳伞的作用，而在建筑外部，这些盆栽主要作为建筑周围茂密的花丛的视觉延续。这两座建筑都将自然元素融入其中，作为中介，在无形中对整体体验起到重要的作用。猎鹰二期也是一个充满生机的有机体，时间会改变它的容貌，相比猎鹰一期黄色玻璃盒子的耀

Architects is set in an urban enclave that “stands apart”, introducing a natural landscape into the city at the same time it is protecting it. Wrapped by a stone facade the building encompasses a multi-layered environment in which greenery and concrete are blended in shared terms. As a school, it aims to reconnect poetry and education with nature; as a feat of architecture, it aims to reintroduce biodiversity to the heart of its urban context. As a whole, people ultimately animate it. Local children will “go to fulfill their potential” while local residents will use it as “a social hub”, as the building’s very function and presence will ensure it. All in all it looks to act as a fully blown ecosystem, planted in the heart of the city, educative in purpose.

East Paris Scientific and Technical Pole by Jean-Philippe Pargade Architecte is another building that draws from the idea of shaping artificial space into the form of a natural landscape. Using techniques from the construction of bridges – a very French legacy[9]– it maximizes space under its long-spanning green roof and dissolves the built envelope into an artificially “natural” horizon. The project is environmentally conscious, engaging passive energy saving technologies and techniques to establish a minimum energy footprint. In a gesture of a very fundamental architectural language, the green roof unifies the disperse structures on the site, offering both a rich visual stimulus and a functional recreation area.

Falcón Headquarters 2 by Rojkind Arquitectos and Gabriela Etchegaray is a complement and at the same time a reverse mirror to the company’s first installment of office space on a green courtyard in Mexico City. Both of the buildings fuse the natural into a hybrid form of distinctive conceptual merit. In Falcón 1, nature can be seen as a reflection on the yellow glass surfaces of its box-shaped outer shell as well as a series of fragmented views from the inside. In subtle contrast, the Falcón 2 was “conceptualized as an extension of the garden itself”, defining its interior volume with a transparent glass curtain wall that is distinctively marked by no less than 510 modular planters in linear shape. These planters serve as sunshades from the inside, yet they function prominently from the outside as a visual extension of the dense flora that surrounds the building. Both of the two buildings’ exercises integrate the natural element as an intermediate interface, almost in intangible yet fundamental to the overall experience. Still, Falcón 2 does not fail to also act as a living organism, growing and changing its face in the passing of time, establishing presence by hiding rather than standing out as its yellow glass box counterpart does.

照片提供：©Beppe Giardino

植被25建筑，托里诺，意大利
25 Green in Torino, Italy

眼，它显得更加隐蔽和低调。

Luciano Pia设计的植被25建筑，毫无疑问是建筑界的一个异类。这种建筑利用叙述性，而非外形来唤起一种奇妙的体验。其功能理念非常简单：Pia想通过在住宅单元和街道之间建造一个过滤器，来形成"一个内外之间的平坦的过渡区"。通过设计，这个过滤器的目的是实现室内外的新陈代谢；钢梁、桁架和支柱组成的三维框架成为一系列嵌入构件（包括曲形阳台以及最重要的植物）的支撑框架。人工与自然的融合，不仅仅是位置上并置在一起，还要实现形式上的融合。支柱变成金属桁架，将公寓转变为融于森林的三座房屋和阳台，且带有超大号的花盆，而这些花盆用来种植一些树木，而不仅仅的是装饰性绿植。进入到这座复杂的结构犹如进入一座乐园，使人们回忆起儿时时光。同时，建筑也在默默地发挥控制微气候和宏观气候的作用，节约能源，在原有的城市工业区中建立生物多样性。尽管Pia并非一直使用夸张的建筑语言，但植被25建筑确实独立于周围环境中，以将我们的生活融入了某些梦幻的元素。

越南Vo Trong Nghia建筑师事务所在河内设计的绿化改造项目，是在其重新战略性地调整建筑周围破败的环境规划后脱颖而出的。例如，防盗栏换成了镀锌的钢骨网格，能够让绿色藤蔓植物生长，或者是架高地面来防止潮气和湿气。建筑的立面装饰成"绿色瀑布"，这样就形成了双重视野：从建筑里面欣赏到的是森林一样的景象（在典型的城市社区），从外面看，这座布满绿叶的墙壁在这片单调的区域非常吸引人的眼球。同时，这样的立面可以遮挡住西面的阳光，而从重新设计的楼梯间的天窗里射入的自然光洒满室内，天窗同时也是一个自然的通风口。显然，这座建筑是一个设计原型，其方案可以应用到很多热带城市的典型房屋中。这个项目使用一个朴实的方式，再次引入与自然共存于城市中心的所带来的益处，并以自己为例来证明这种再生方式是简单可行的。

ZLG设计的Point 92建筑将垂直分区的复杂设计理念付诸实践，从

25 Green by Luciano Pia is undoubtedly a strange beast. Utilizing the means of narrative more than mere form and geometry, it evokes an experience that is fundamentally uncanny. The programmatic principle is quite simple: Pia means to facilitate "a smooth transition between the inside and the outside" by installing a filter between the residential units and the street. By design, this filter is a metabolist's dream; a three-dimensional grid of steel beams, trusses and columns, stands as the supporting frame for a number of plug-in elements including curve-shaped balconies and – perhaps most imposingly – plants. The artificial blends with the natural, not only in juxtaposition but also in form. The columns turn into metal trusses, transforming the apartments into tree houses and the balconies into forests, with the oversized planters used to plant trees rather than typical decorative greenery. Entering the complex structure is an act of entering into wonderland, evoking a child-like response to an environment. At the same time, the building will work silently in controlling micro- and macroclimate, saving energy and establishing biodiversity in a former industrial part of the city. In spite of the fact that the extravagance is not always Pia's architectural language, 25 Verde stands absurdly distinctive within its surroundings in order to infuse our lives with something of a dream.

Green Renovation residential project in Hanoi by Vo Trong Nghia Architects stands out first and foremost as a strategic repurposing of the very building's failing conditions; for example, security bars were exchanged with a galvanized steel trellis where green climbers would grow, or the ground floor was elevated to prevent rising damp and condensation. The facade, dubbed as a "greenfall", allows for a two-fold view: one from the inside of the residence, where the owners enjoy a forest-like image (in the place of a typical urban settlement), and one from the outside where the leafy wall acts as an attractor to an otherwise dull area. While this facade acts as a shade against punishing west sunlight, the more filtered natural light bathes the interior through a thoughtfully placed skylight at the redesigned staircase, also working as a natural ventilation duct. Evidently the building is considered as a prototypical design, its scheme being applicable to many typical houses in tropical cities. In reintroducing the benefits of living with nature in the heart of the city, the project is, at the same time, a modest approach. As such, it is indicative of a stance that exemplifies the simplicity of means needed for this kind of regeneration.

Point 92 by ZLG Design puts in operation an intricate idea of verti-

1. Cf. Bruno Latour, *The Pasteurization of France*, Cambridge, Massachusetts: Harvard Univ. Press, 1993.
2. Vitruvius Pollio, *The Ten Books on Architecture*, (1st century BC).
3. Sörlin ("Nature", in Arne Hessenbruch[ed.], *Reader's Guide to the History of Science*, [Fitzroy Dearborn: London; Chicago, 2000], pp. 122~127) recounts Lovejoy's("Nature" as Aesthetic Norm, Modern Language Notes, Vol. 42, no. 7, November 1927, pp. 444~450) claim that "nature" "had approximately sixty established meanings [and that] this number has not diminished since"("Nature", p. 123).
4. Sörlin, *Nature*, p. 124.
5. Michel Serres, *The natural Contract*, Ann Arbor: University of Michigan Press, 1995.
6. M. Serres, *The Natural Contract*, p.1.
7. See World Commission on Environment and Development(ed.), Our common future, Oxford, New York: Oxford University Press, 1987), p. 16; also known as *The Brundtland Report*.
8. Sörlin, *Nature*, p. 126.
9. [9]See: École des Ponts ParisTech [École Nationale des Ponts et Chaussées] established in 1747, a prestigious "Grande École" founded on the study of the building of bridges, canals and roads, and the training of civil engineers. www.enpc.fr
10. Boeri Studio, Vertical Forest, http://www.stefanoboeriarchitetti.net/en/portfolios/bosco-verticale/ Accessed 28/5/2015.

地理位置选择，到塔楼类型方案，采用了一个意想不到的、独具匠心的方案，从而设计了独一无二的建筑。建筑师在整体构架上将这座建筑分为三部分：第一部分是植被覆盖的倾斜的停车场底层，第二部分是位于建筑中层的两层透明大堂，第三部分是高层的白色混凝土办公大厦。纵观这个设计的各种形式和技术，自然与建筑的有机融合可以体现在三个层次：其一是底层的隐蔽覆层区，第二是中间的市民购物中心，第三是上层露台（看起来是从主体量中切割出来的）的主展览区。和本篇文章中提及的其他建筑一样，显然，Point 92建筑如同一台绿色机器在运作，这个设计的亮点在于在所在地理位置和周围环境内如何使这样的宏伟建筑设计真正实现与自然和谐共处。

最后，Boeri工作室建筑设计的垂直森林项目似乎总结了我们在这篇文章中讨论过的每一座建筑的特点。它位于米兰古老的新门地区，由两个塔楼组成，有约400座私人公寓，绿色植被和露台错落设计，与公寓相互连通。就像建筑师们所说[10]，这两栋楼对于大型雄心勃勃地"在城市建造森林"的项目来说，也是个原型范例。超过2000种不同的植物种植在露台上，有小型的灌木也有大型树木，相当于7000m²的森林。这些自然元素不仅能直接改善居住环境，还可以使更大范围的城市变得更宜居。垂直森林项目使用现有的科学技术解决了建筑中高层建筑的结构负重和操作问题，巧妙借鉴了高层建筑的核心理念（即面积最小化和密度最大化），利用城市与自然失去联系所使用的理念，来建立了一个新的城市自然生态景观。

cal zoning, responding in a rather unexpected and creative manner to the particularities of both the geography of the site and the typology of a tower building. In this framework the architects propose a building that develops in three parts: a green clad parking space base that blends with the sloping site, a two story transparent arrival hall in the middle, and a taller volume dedicated to office space envisioned as a white concrete block. Looking beyond the building's various formal and technological statements, nature is integrated in a similar three-fold manner: an almost camouflage-like cladding in the base level, a civic plaza in the middle, and a prominent exhibit area in the terraces that are seemingly carved out of the main volume on the upper level. As is the case with all the other buildings in our survey, the building obviously functions as a green machine. Yet, it seems that the principal merit of the design is how a building of such magnitude can show concern for co-existing with the natural tensions coming from the site and its surroundings.

Finally, the Vertical Forest project by Boeri Studio seems to sum up every single argument we made in this introduction. It consists of two towers inserted into the historic Porta Nuova district of Milan, containing no less than 400 condominium units, which are articulated in a series of interlocking green terraces and apartments. By the word of the architects[10], the two towers also stand as prototypes for a largely ambitious project of "urban reforestation". Over 2000 plants are used for the terraces, varying from small shrubs to large trees, the equivalent of a 7000m² area of forest. At this level, the natural element not only contributes to the immediate environment of the residences, but also practically stands as a terra-forming machine for the larger part of the city. Using the available technology to cope with the high structural loads and operational needs, the towers themselves take the core idea of the high-rise (minimum footprint and maximum density) to establish a new urban ecology using the same principles by which our cities became almost devoid of any relationship to nature. Angelos Psilopoulos

这个项目展现了利用一种混合设计理念来建造的学校和体育馆，同时也包含了第三个设计元素：促进生态多样性。从环保角度来讲，这座小学的设计采用了一种非常创新的建筑设计方案，设计理念根据其原有景观的发展，因地制宜地来绘制其纹理和设计构件。这项工程也标志着一个全新的建筑设计趋势，即生态多样性回归到城市中心地区。与其他类型的设计项目相比，学校设计是一个能激发设计师的美学灵感的项目，设计学校要重新考虑怎样的设计理念可以将诗情画意、教书育人和大自然融为一体。而这座学校的建筑设计迎接了这个挑战，将学校重建成一座功能完善的自然生态园，当地孩子能够在这里充分学习，开发潜能，且当地居民也将其视为社会枢纽。

这个设计主要包括两个部分：带18间教室的学校（其中7间学前班教室，11间小学教室）和一个体育场，这个体育场对当地居民开放。这所小学位于布洛涅-比扬古古老的场地，如今的布洛涅-比扬古已然建筑成群。设计的两个结构覆盖一层“矿物墙”，将学校和公共体育场组合在一起。

建筑主体也包括两部分：矿物覆盖区域——外立面，以及植被覆盖的屋顶。建筑的外围护结构将学校包裹起来，形成一个轮廓平滑，线条柔和的大型体量，同时体现出建筑内部的流线设计空间和建筑外部的可延展的空间，使体量间很好地结合起来。高度紧凑的建筑主体朝向当地社区，展示其高大夯实的一面。操场是两个可以相互连通的室外空间，彼此可以看得清清楚楚（总有一天学前班的孩子会升级进入小学）。建筑整体庇护了一处原生态的自然环境，而这处环境也将促进在更大型场地中心建设长期自然生态化的进程。可以说，这座建筑是有生命的，因为它会成长变化。虽然它只是一个微型的自然景观，但是在未来的五年或十年里，它将以新的外围护结构形象呈现在世人面前，就如同大自然的变幻莫测。

这个设计的亮点是“生动的”墙体，主体成分是预制的混凝土体块。这些体块展现了两种不同的纹理。可见的一面是经过抛光处理过的，平滑，可以反射光线，另一面是棱纹的，纹理粗糙。这两种纹理的墙面有助于水流快速流向建筑一侧，避免水流向墙体可见的一侧，从而有效避免墙体提前老化。这两种纹理的对比能够突出立面的厚重感，强化其浮雕感。在墙体稍矮一点的地方，高度大概2m左右，独立的墙体被设计成平滑的或者是向外倾斜的，以抵挡外来人员进入，或者可能的动物入侵。墙壁一侧的凹槽有助于植被的生长（凹槽适合蕨类植物，粗糙的混凝土适合苔藓）；而墙上的小型孔洞和褶皱结构是给动物预备的（悬垂的结构可以让燕子筑巢，角落里的空隙适合昆虫生活），同时也可以吸引多种鸟类来筑巢。

科学与生物多样性小学

Chartier Dalix Architects

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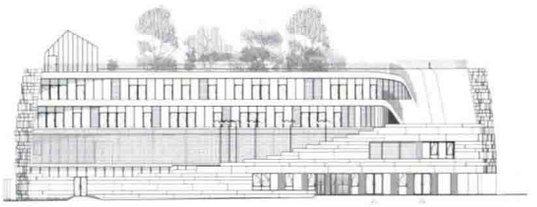
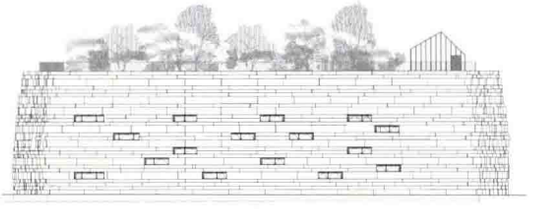
西南立面
south-west elevation



东南立面
south-east elevation

东北立面
noth-east elevation



西北立面
north-west elevation

项目名称：Primary School For Sciences and Biodiversity
地点：Boulogne-Billancourt, France
建筑师：Chartier Dalix Architectes
合作者：structure_EVP, fluids_CFERM, economist_F.Bougon, HEQ_F.Boutt, ecologist_AEU, biodiversity_Biodiversita
承包商：SAEM Val de Seine
用地面积：5,164m² / 有效楼层面积：6,766m²
设计时间：2011—2012 / 施工时间：2013—2014
摄影师：
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屋顶则是一座真正的空中花园，高出体育馆12m，同时也是三层不同植被的共同家园：生长在50cm深的土壤里的草地，草地外围的灌木丛，以及种在1m深土地里的树林。在这里，植物使生态走廊富有连贯性，并且各个物种在此能够相生相息。空中花园有两个功能：促进生物墙内的物种多样化和生物自身的多样化，因为花园内有丰富的资源（额外的栖居地、营养介质等），因此生态多样化得以保证。

Primary School for Sciences and Biodiversity

The project presents a mixed program to build a school and a gymnasium, but also incorporate a third element: encouraging biodiversity. It has been designed as a particularly innovative program, environmentally speaking. The concept of the building relies on the development of a primary landscape which would draw its textures and components from the landscape in which it is set. This project may well signal the start of a new trend: striving to return biodiversity to the heart of urban areas. More than any other project, building a school is an opportunity to rethink the fundamental conceptual connections between poetry, education and nature, drawing inspiration from new aesthetic impulses. Thus, the building takes up the challenge of recreating a fully functional ecosystem as a place of learning, a space where local children will go to fulfill their potential, but also a social hub for local residents.

The project involves two structures: a school with eighteen classrooms (seven preschool, eleven primary school) and a gymnasium which will be open to local residents. It is located in the old Boulogne-Billancourt, now a densely built area. The two structures are united in a single volume, bounded by a same skin: the mineral wall.

There are two distinct parts to the building: a mineral section – the facades – and a section made of plants, the roof. This envelope wraps itself around the school, a general volume with smooth contours and supple lines, revealing fluid interior spaces and elastic exterior ones, avoiding ruptures between volumes. The highly compact building opens onto the neighborhood, offering a multitude of perspectives. The playgrounds are two outdoor spaces in conversation, in plain