VOL.3

SUSTAINABLE ARCHITECTURE

Energy-Efficient & Environmental Friendly – New Tendency of Current Buildings

MEDICAL + PUBLIC + RESIDENTIAL

可持续建筑（下）

节能环保——现时建筑新方向

医疗+公共+住宅

高迪国际 HI-DESIGN PUBLISHING 编
刘健琨 毕崇云 吴越 胡丹琳 译

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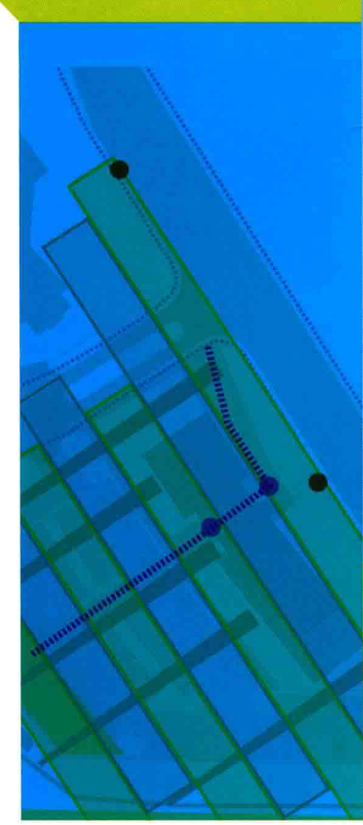

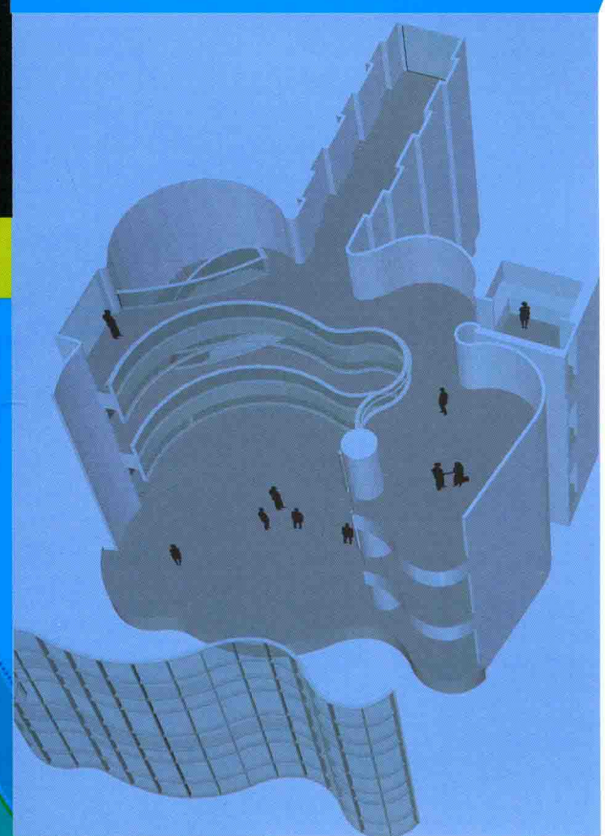

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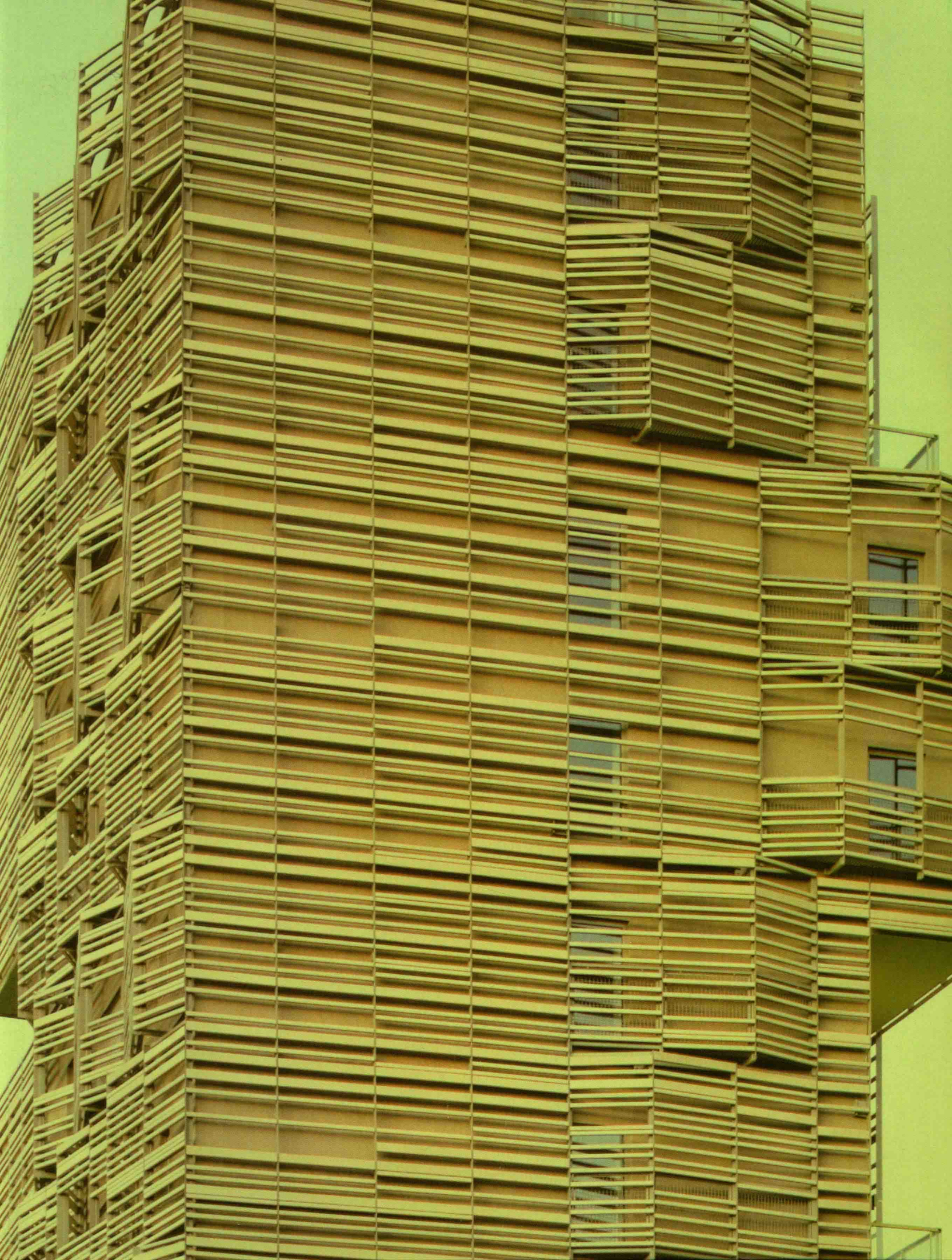

PREFACE

1 序言

进入21世纪的第二个十年间，气候变化已然成为显著的全球现象，设计部门有道德与义务解决其产生之无数后果。建筑行业有许多可实现与可持续设计的解决方案。然而更重要的问题是如何选择正确的策略。

可持续设计真正的成功之处不在于复杂技术的使用，而在于使用被动式的、自然的、低技的方法去创造一个健康的环境。这些措施成本低廉：隔热表皮以减少能源消耗；自然通风以减少风机能量；天然采光以减少电力消耗；天然可回收材料的使用（以降低成本）；集成的生态屋顶的使用可以减少雨水的影响；延伸自然栖息地以减少热岛效应。上述这些都是如何使用自然系统创造更加绿色、更加可持续性的环境的策略而非技术。

正如您将在本书读到的一样，建筑师、客户与专业顾问如今有了新的楷模般的合作氛围。毕竟这符合每个人的最佳利益。戴蒙德·斯密特建筑事务所的两个项目很好地例证了这一观点。位于多伦多儿童医院的新彼得·吉尔根研究与学习中心是世界上最大的儿科研究塔。虽然实验室通常和节能无关，但通过整合设计和建筑整体化的策略，能源和水的节约，本土材料的使用、垃圾填埋转移和室内空气质量的改善都卓有成效。

位于新墨西哥高地大学的学生会大楼使用了北美的第一个机动式太阳跟踪百叶窗系统，直接回应了美国西南部的气候条件。地热能源的使用、屋顶和墙组件的高隔热性，高效的照明与集水和可再生木材在这幢高可持续的设施都有应用。

未来几年内，“近零碳建筑”和“近零能源建筑”将成为建筑设计的主流，将随之带来蕴含的机会。公认的绿色设计评价系统中最高的可持续评价——LEED白金评级，可以通过使用传统的机械系统和传统建筑预算所达到。我们已经做到了。其关键是进行智能设计和与专业顾问的合作。通过设计投资与遵循最高的绿色标准可以改变世界各地的建筑景观。这显然是减少能源消耗和减轻气候变化影响的重要一步。

唐纳德·斯密特

戴蒙德·斯密特建筑事务所董事

It's evident midway into the second decade of the 21st-century that climate change is a global phenomenon and that the design sector has a moral obligation to address its myriad consequences. There are many tools available to the architecture profession to implement sustainable design solutions. It's more a matter of choosing the right ones.

Where sustainable design is truly succeeding is not in the use of complex technologies, but in the use of passive, natural and low-tech approaches to healthy environments. Many of these measures are low cost as well: well insulated thermal envelopes to reduce energy consumption; natural ventilation to reduce fan energy; daylight harvesting to reduce electrical consumption; integration of natural and recycled materials; and the use of green roofs to reduce storm water impacts, extend natural habitat and reduce the heat island effect. These are all strategies, rather than technologies, which use natural systems to create greener, more sustainable environments.

As you will read in this edition of Sustainable & Green Building Design, there is a renewed sense of collaboration among architects, clients and consultants to achieve exemplary performance. After all, it's in everyone's best interest. Two projects from Diamond Schmitt Architects demonstrate this. The new Peter Gilgan Centre for Research & Learning at The Hospital for Sick Children in Toronto is the largest paediatric research tower in the world. Laboratories are not typically associated with energy conservation. By taking an integrated design and a 'whole-building' approach, significant savings were realized in energy and water consumption, in sourcing local materials, landfill diversion and improved indoor air quality.

The New Mexico Highlands University Student Union building employs one of the first motorized sun tracking louver systems in North America - a direct response to the climate conditions of southwestern USA. Geothermal energy sourcing, high insulation values of roof and wall assemblies, high efficiency lighting, water harvesting and renewable wood sourcing round out this highly sustainable facility.

The big opportunities in the next years are to pull net carbon zero and net energy zero design more into the mainstream of architectural design. LEED Platinum, the highest rating for sustainability in a widely recognized green design rating system, can be achieved using conventional mechanical systems and conventional building budgets. We've done it. The key is intelligent design and collaboration with specialists. Making the investment in design, while setting the highest green standard can transform the built landscape around the world. It is clearly an important step towards reducing our energy consumption and to mitigate the effects of climate change.

DONALD SCHMITT
Principal, Diamond Schmitt Architects

Preface

2 序言

仿生学：向自然看齐的建筑创新

我第一次获悉“仿生学”这个词，是在佐治亚理工学院的一场可持续性论坛上，从 Ray Anderson 这位近日逝世的著名企业家和 Interface 有限公司的前 CEO 口中听到的。他将其定义为“师法自然的创新”，他的解释令我着迷，但我仍致力于思考它与可持续性之间的关系。从那以后，我开始在我的工作中整合这一概念，并坚信大家都可以从仔细向自然学习以推进我们的学科这一过程中受益匪浅。

仿生学［从 bios（意为生命）和 mimesis（意为模仿）衍生而来］是一个相对新兴的学科，以研究自然，在现代设计中模仿自然并发展之以解决人类所面临的挑战。其核心前提是在自然进化的过程中，不以改变或对脆弱的生态系统产生负面影响为条件。与日俱增的是越来越多的建筑师、设计师和工程师正以同样的方式在更大程度上向自然看齐。

然而更常见的情况是，人们倾向于改变自然，使自己成为主宰。诸如胡佛水坝、石化塑料、以核能作为新能源之来源、用抗菌肥皂来预防疾病等例子不胜枚举。然而其所带来的生态问题的后果却并没有被充分考虑其中。

大坝会阻隔自然迁徙、阻滞河流，形成生物产卵障碍，并最终减少生物多样性；石化用于从垃圾袋至保鲜膜等一系列家居用品，但当其以高浓度被释放到大气中或海洋中时也可能有毒。最近在日本发生的灾难中，福岛核电站显示了污染和辐射对生态系统的潜在危害。

作为有志于为我们的后代保存并保护一个更美好的环境的建筑师，我相信研究表征着了机会——向自然现象研究和学习，以带来创新的设计方法的机会，其好处是普适的。

为什么不向自然与其数百万年的进化、创新和进步看齐呢？自然是如此的高效、多样、普适与美丽，且它给世界提供了一个新的进行创新的可能性。

以新干线子弹头列车为例，在 1990 年代，Eiji Nakatsu 这位来自 JR-West 铁路的喜爱观鸟的公司工程师，从翠鸟这一掠过水面几乎不引起涟漪的鱼类捕食者撷取灵感。Nakatsu 设计了长为 50 英尺的具有翠鸟般钢嘴的火车，不仅美观，且它还使以 300 公里每小时的速度在东京和大阪之间的列车能耗降低约 20%。

同样，因其独特的在微小尺度上覆盖着小齿的皮肤，鲨鱼能够保持自身不受藻类的污染，且减少阻力。它们的皮肤还可以防止微生物的“搭顺风车”。NASA 的科学家因使用类鲨鱼皮材料来构建他们的飞船而于 1987 年赢得一枚 Olympic 奖牌和 American Cup。今天，除了被用来使飞机、船只和风车减少阻力和节约能源，这一概念被用来制造表面为医院、餐厅、厨房和公共厕所。

仿生建筑的定义是“不是模仿自然形式，而是通过了解这些形式生成的规则，向自然寻求可持续发展的解决策略的当代哲学”，这不仅仅是关于美和美学的命题，它也试图用自然所汲取的灵感来解决建筑与环境的挑战，完善可持续发展，促进能效，提高建筑寿命来满足我们社会的发展需求。

当为医院、教育设施、公共部门或是私人进行设计时，这种设计哲学可以从更可持续性的角度改变我们在设计过程中运用的设计方法，使设计具有无限可能。从自洁的外表到更高效、更合适、更舒缓的装饰，自然都是我们撷取灵感与追求变革的不竭源泉。

我们的行业一直在前进，与此同时，应对可持续性挑战的设计策略——诸如采暖和通风系统、可再生能源、永续建筑材料、废物管理、建筑更新甚至用户体验、设计和美学都在协同进步。我鼓励各位将“仿生学”视作灵感和创新之源，不断去探索，去发现。

维罗妮卡·普莱尔

斯坦利·比曼 & 希尔斯建筑事务所董事，美国建筑师协会会员，美国绿色建筑认证专家

Biomimicry: Looking to Nature for Architectural Innovation

The first time I heard the term Biomimicry was during a talk on sustainability at The Georgia Institute of Technology by Ray Anderson, a well-known [recently deceased] entrepreneur and former CEO of Interface, Inc. He defined it as "looking to nature for innovation." His explanation intrigued me but I struggled to understand how it related to sustainability. I have since integrated the concept into my work and now firmly believe that we can all benefit from taking a closer look at nature to advance our discipline.

Biomimicry (rooted in the word bios, meaning life, and mimesis, meaning to imitate) is a relatively new discipline that studies nature and then imitates it in modern design and processes to solve human challenges. The core premise is that as nature evolved, it adapted to its changing environment without altering or negatively impacting the delicate ecosystem around it. Increasingly, architects, designers and engineers are looking to nature in much the same way.

More often; however, humans tend to alter or dominate nature to their own advantage. Examples include the Hoover Dam for architecture, petro-chemicals for plastics, nuclear power for new and more energy-efficient sources, and antibacterial soaps to prevent disease. But not enough thought has been given to the ecological consequences.

Dams can block natural migration and sedimentary flow, creating obstacles to spawning and ultimately decreasing biodiversity. Petro-chemicals are used in a range of household goods from trash bags to saran wrap and utensils, but when released in high concentration into the atmosphere or ocean, they can also be toxic. And, Japan's recent disaster at the Fukushima nuclear plant demonstrates the potential risks of contamination and radiation to the ecosystem.

As an architect with a desire to preserve and protect our environment for future generations, I believe that Biomimicry represents opportunity - opportunity to study and learn from natural phenomena and to bring forth innovative new approaches to design. The benefits are widespread.

So why not learn from nature and its millions of years of evolutionary innovation and progress? Nature is efficient, diverse, adaptable, beautiful, and it offers a new world of possibilities for innovation.

Take the Shinkansen Bullet Train, for example. In the 1990s, a Japanese bird-watching engineer from the JR-West rail company, Eiji Nakatsu, took inspiration from the kingfisher, a fish-eating predator that darts in and out of the water barely causing a ripple. Nakatsu's sleek design of a 50-foot train with a long steel beak, is not only beautiful, but it reduced energy consumption by about 20% and enabled travel speeds of up to 300 km an hour between Tokyo and Osaka.

Likewise, sharks manage to stay remarkably clear of algae and are able to reduce drag thanks to their unique skin, which is covered with denticles that have microscopic patterns. Their skin also prevents microorganisms from hitching free rides. NASA scientists won an Olympic medal and an American Cup in 1987 using shark-skin-like materials to build their boat. Today, in addition to being used to help planes, boats and windmills reduce drag and conserve energy, the concept is being used to make surfaces for hospitals, restaurants, kitchens and public restrooms.

Biomimetic architecture is defined as 'a contemporary philosophy that seeks solutions for sustainability in nature, not by replicating the natural forms, but by understanding the rules governing those forms.' It is not solely about beauty and aesthetics, but it also seeks to use nature as inspiration to solve architectural and environmental challenges, improve sustainability and drive energy efficiency and longevity to meet the evolving needs of our society.

When designing for hospitals, educational facilities, public sector or private, this philosophy can be applied to transform the way we approach our projects in a more sustainable manner. The possibilities are endless. From self-cleaning exteriors to greater efficiency or even a more comfortable and soothing décor, nature is a bountiful resource for inspiration and transformational change.

Our industry is evolving and so are the number of solutions to sustainable challenges regarding heating and ventilation systems, renewable energy, sustainability in building materials, waste management, building placement and even user experience, design and aesthetics. I encourage you to explore Biomimicry as a source of inspiration and innovation.

VERONIQUE PRYOR
AIA, LEED AP, Principal,
Stanley Beaman & Sears

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