
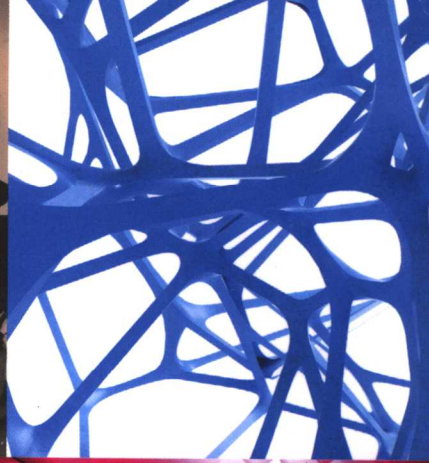

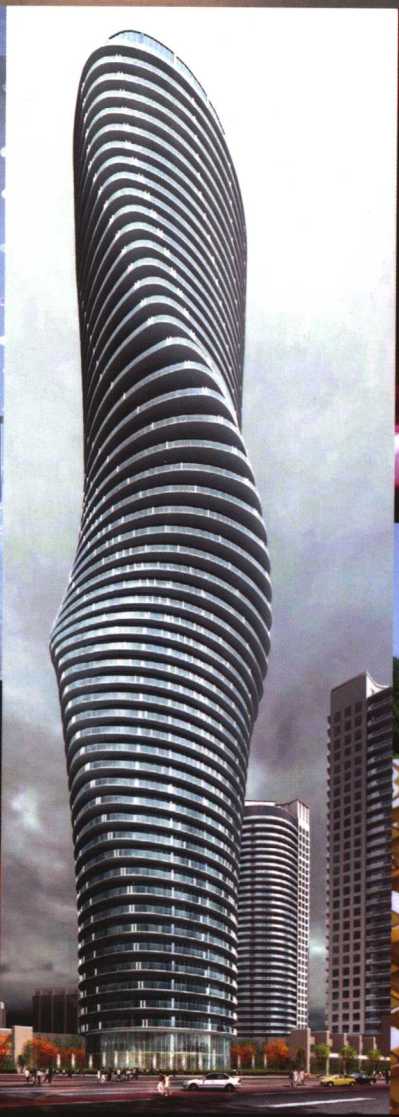
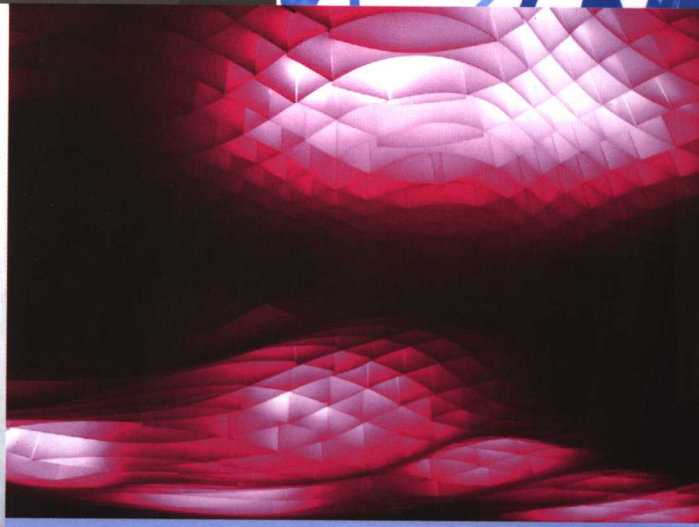

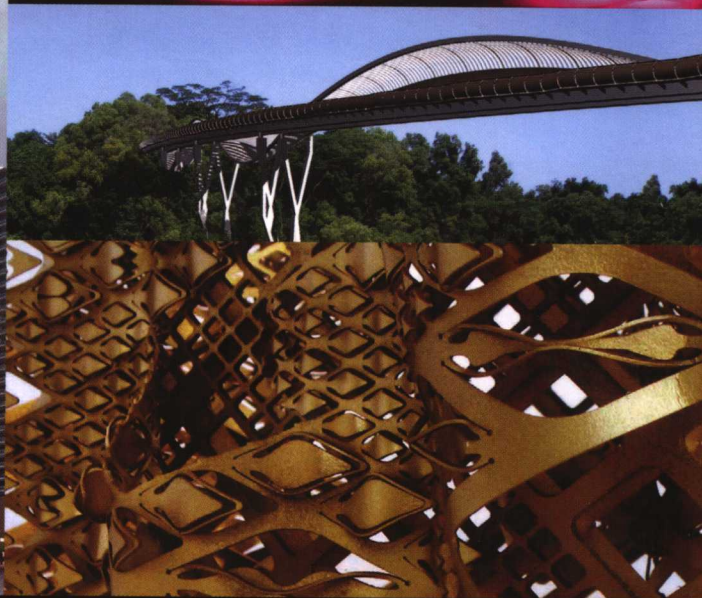

涌现

EMERGING TALENTS, EMERGING TECHNOLOGIES · ARCHITECTS NEIL LEACH XU WEI-GUO [eds.]

· 青年建筑师作品 尼尔 · 林奇 徐卫国 编

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尼尔·林奇　徐卫国　编

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前言

本书为2006中国国际建筑艺术双年展“涌现”建筑展的青年建筑师作品集。该展览试图为48个极具潜力的年轻建筑事务所提供一个展示的窗口，着重展示设计和建造新技术的创造性应用。“涌现”建筑展的另一部分为学生建筑作品展，展出24所国际著名建筑院校的学生作品。作为本书的系列，还有学生建筑作品集。

这次展览对中国来说独具意义，还从来没有过如此多的国际新锐建筑师和如此多的世界一流建筑院校能参与到同一个展览当中，同时这也是第一个强调新技术在建筑设计中运用的国际建筑展。但是最与众不同的是它展示了在中国历史重要关头国际先锋建筑设计生动的作品快照。中国正在经历一场前所未有的大规模建设，而与此同时建筑行业也正经历着一场技术性的变革。

这次展览是第二届中国国际建筑艺术双年展的一部分，该展览是由双年展组委会组织，由罗丽博士领导，并由中国文化部和建设部授权举办的。

主办者感谢国家自然科学基金给予的支持，感谢世界艺术博物馆提供展览场地，感谢清华大学建筑学院主办关于展览的讨论会。

最后，主办者感谢所有帮助布展和编写本书的人员，在此特别感谢宋刚，周实，江春亚，邹霄，榊原郁子所作出的贡献。

尼尔·林奇　　徐卫国

Preface

This catalogue covers the work on display in the architects section of the 'Emerging Talents, Emerging Technologies' exhibition at the Architecture Biennial Beijing 2006. The intention is to offer a showcase of 48 of the most talented young practices in the world, with a particular emphasis on the innovative use of new design and fabrication technologies. This work is part of a larger exhibition on the same theme, which includes student work from 24 of the leading architectural schools in the world.

This exhibition is unique for China in many ways. Never before has the work of so many talented young practices and so many leading schools of architecture been brought together in a single exhibition, and never before has there been a major international exhibition of architectural work with such an emphasis on new technologies. But what is especially unusual about this exhibition is that it offers a vital snapshot of some of the leading architectural work in the world at a crucial juncture in China's history, when the country is experiencing an unprecedented period of construction, and the architectural profession is undergoing a technological revolution.

This exhibition is taking place as part of the second Architecture Biennial Beijing (ABB2006), organised by the ABB2006 committee, under the directorship of Dr Luo Li, with the authorisation of the Chinese Minister of Culture and the Chinese Minister of Construction.

The organisers are grateful to the National Natural Science Foundation of China for its support, to the directors of the World Art Museum for permitting this exhibition to take place and to Tsinghua University for hosting a conference about this exhibition.

Finally the organisers are grateful to all who have contributed to staging the exhibition and preparing this catalogue. In particular they would like to thank Gang Song, Zhou Shi, Jiang Chunya, Zou Xiao and Ikuko Sakakibara, for their invaluable contribution in helping to design and compile this catalogue.

Neil Leach
Xu Wei-Guo

集群智能

这是一个有关正在不断涌现的新人才、新技术的展览。换言之，是一个呈现才华横溢但还相对鲜为人知的建筑实践的展览。展览所展出的是一些采用最新技术设计出的当今世界最先锋的作品。

我们邀请来自世界八个地区的八位召集人分别选择他们所在地区的六个事务所参展。这些事务所不必是传统意义上的建筑事务所，可以是研究院所或其他与建筑相关的从业形式，但他们的共同之处是具有先进的建筑观并创造性地应用新技术。

在邀请八位召集人挑选崭露头角的事务所时，我们希望展示某种新才能，并将其展现在更多观众的面前。从本质上讲，所有新生事物大都不为人知，即便近在咫尺也是如此。因此，请那些与当地设计文化有着最密切接触的人担负起发现新才能的重任，其意义非同小可。

召集人的工作方法

八位召集人采用的工作方法略有不同。爱丽莎·安德拉塞克从美国东海岸挑选了一批非常年轻且具有很强实验能力的建筑师。其中有少数人从未建造过任何建筑，但都身居数字技术的最前沿，利用最新的软件程序和制造技术进行设计工作。电脑数控铣削与快速原型技术的应用表明新技术正在以最有力的方式对建筑制造的进步作出贡献。同样，新型参数模型软件的应用也展示了数字技术如何用于方便建筑绘图的修改。改动绘图中的一条线，所有线的组合都能被重新定义。当然，正如大家从许多参展方案中明显看到的一样，通过运用元胞自动机和其他一些生成程序，数字技术作为工具也非常成功地用于生成设计。同样，人们还可以从爱丽莎·安德拉塞克、安德鲁·库德利斯和麦克·席尔弗设计的精巧作品中明显看到，对于数字技术的过度强调并没有阻碍其创造力，相反，能够看到的是一种高度诗意化的建筑生产的新传统的涌现。

埃琳娜·曼弗迪尼围绕“可穿着的建筑”　这一主题挑选美国西海岸的参展作品，暗含了阿道夫·路斯早前将建筑和衣服所作对比的寓意。而她自己的工作也大量吸取时装制作经验。作为居住在洛杉矶MAK中心的艺术家，为了制作时装，她曾进行激光切割布料工艺方法的研究。这一工作已经扩展到包括为耐克公司设计运动鞋、为艾烈希公司设计家居用品和为许多客户提供室内设计方案等方面。而所有这一切都依赖于新的基于激光的材料切割工艺方法。埃琳娜也凭借她在数字制造工艺方面的经验，以电脑数控铣削形式为展览设计了一个亭子。保罗·安德森、Xefirotarch、Gnuform、“突现”和“模式”等建筑师和设计组都为这个高度数字化的建筑生产传统作出了贡献。该传统似乎正在赋予下一代，即“后盖里”一代的西海岸设计师们以独特的个性。与此同时，导致色彩与结构发生令人震惊应用的设计活跃性，也赋予建筑制造以惊人的生命力。

拉美建筑实践的活跃和多姿多彩与美国西海岸相比毫不逊色。费尔南多·罗梅罗是一位非常有才华的设计师，他曾是OMA的主要建筑师之一，后来在墨西哥城创办了自己的事务所。他担任本次展览拉美地区的召集人，并且为该地区建筑师的挑选确定了基调。路易·巴拉干的精神在其对空间和光线的处理中彰显无疑，这个地区的其他参展建筑师也展示了类似的敏感性。这些年轻的建筑师都极具才华，对材料的结构特性有着很深的理解。诚然，尽管他们并没有像美国东海岸的设计师那样突出强调将计算机作为设计工具使用，然而他们正在新数字时代的文化和技术背景下创作这些作品。其设计工作高度依赖软件，使那些引起美感的设计得以精确描述和构造，从而产生了本书中那些最美的设计作品。

克里斯·芒在挑选欧洲的参展项目时，更加明显地关注数字生产技术。从最终选定的由ReD设计的高技术项目，到由R&Sie(n)(一个因对技术的大胆运用而闻名的事务所）设计的具有讽刺意味的低技术项目“游戏”中，　我们可以觉察到一场生动的针对新技术潜能而展开的泛欧洲辩论。鲁贝多的设计方案是最有趣的一组方案之一。这个由艺术家／动漫画家劳伦特－保罗·罗伯特和建筑师／音乐家维斯纳·彼得拉西－罗伯特组成的斯洛文尼亚－法国团队借助其综合背景优势，在运用非线性设计过程和拓扑几何变换生成具有动漫效果的自适应结构方面，创造了惊人的效果。

许多技术最先进的作品均由汤姆·维瑞贝斯选自英国。这些作品从本质上看大多是多学科交叉的产物，通常涉及到与

Swarm Intelligence

This is an exhibition of emerging talents and emerging technologies – an exhibition, in other words, of talented, but as yet relatively unknown practices, which are employing some of the latest technologies to produce some of the most progressive designs in the world today.

We have asked eight curators to each select six practices from eight different regions of the world. These practices need not be architectural practices in the conventional sense - they may equally be research institutes or other forms of practice related to architectural concerns. But what they should all have in common is a progressive outlook and a constructive engagement with new technologies.

In asking eight curators to make a selection of emerging practices, we have been hoping to uncover some new talent, and to expose it to a wider audience. For it is the very nature of anything emerging that it is largely unknown even within its immediate environment. It makes sense, then, to ask those most in touch with local design cultures to seek out that talent.

Curatorial Approaches

The eight curators have each taken slightly different approaches. Alisa Andrasek has selected a very young and largely experimental group of architects from East Coast America. Few of them have built anything, but all are working at the forefront of advances in digital technologies with new software programmes and fabrication techniques. The use of CNC milling and rapid prototyping illustrates one of the most dynamic ways in which these new technologies are contributing to advances in architectural fabrication. Similarly the use of new parametric modeling softwares shows how digital technologies can be used to facilitate revisions in the production of drawings, where the revision of a single line can allow an entire assemblage of lines to be redefined. But digital technologies can also be used very successfully as a tool to generate designs, through the use of cellular automata and other generative processes as is evident from the work included here. What also becomes evident in the exquisite work of Alisa Andrasek, Andrew Kudless and Mike Silver in particular, is that this overt emphasis on digital techniques does not preclude creativity. On the contrary, a new tradition of highly poetic architectural production can be seen to be emerging.

Elena Manferdini has based her selection of work for West Coast America around the theme of 'Wearable Architecture', alluding to Adolf Loos's earlier comparisons between architecture and clothing. Her own work draws heavily on fashion. As artist in residence in the MAK Center in Los Angeles she conducted research into techniques of cutting fabric through the use of lasers to produce fashionwear. This work has expanded to include the design of sport shoes for Nike, household utensils for Alessi, and interior designs for a range of clients, all relying on new laser-based techniques of cutting materials. Elena has also taken her experience of digital fabrication techniques in the form of CNC milling to design a pavilion for the exhibition. Paul Andersen, Xefirotarch, Gnuform, Emergent and Patterns all contribute to a highly digitised tradition of architectural production that seems to be lending the next generation of West Coast designers – the post-Gehry generation – its own distinctive character, while the vibrancy of the designs which result - the almost shocking use of colour and texture - lends their architectural fabrications astonishing vitality.

The vibrancy and colour of the West Coast practices is matched by the Latin American practices. Fernando Romero, a highly talented designer who established his own office in Mexico City after a period as one of the key designers in OMA, is the curator for this region, and sets the tone for his selection of architects. The spirit of Luis Barragan is evident in his treatment of space and light. Other architects from this region display a similar sensitivity. These are highly talented young designers, with a strong sense of tectonic properties of materials. True, they do not foreground the use of the computer as a design tool, in the way that designers in the East Coast do, but they are nonetheless producing this work within the cultural and technological conditions of the new digital age. The work is highly dependent upon software that allows the sensuous designs to be described and fabricated accurately to produce some of the most beautiful designs in this catalogue.

Kris Mun has focused more explicitly on techniques of digital production in her selection from Europe. From the resolutely hi-tech projects by ReD to the ironically lo-tech project, The Game, by R&Sie(n) (a practice noted for its progressive use of technology), one can detect a lively pan-European debate about the potential of new technologies. One of the most interesting set of projects is that of Rubedo, a Slovenian-French team composed of Laurent-Paul Robert, an artist/animator, and Vesna Petresin-Robert, an architect/musician. Their combined backgrounds have created the most extraordinary effects, producing animated, adaptive structures generated using non-linear processes and topologic geometric transformations.

诸如哈尼德·卡拉和汤姆·贝克之类的富有才华的工程师的合作，且大部分具有极高的科技含量。但如果说这一组展览有什么独特之处的话，那便是它包含了两个商业性事务所下设的专门研究单位的作品。在学术环境中进行建筑研究的传统已经完好确立，然而，在此展出了一种在商业环境中进行研究的新形式。阿鲁普事务所下设的高级几何研究部和福斯特合伙人事务所下设的智能几何研究部都是事务所高度创新进取发展的一部分。因此，重要的是必须认识到运用最新科技的并不仅限于新兴事务所，像福斯特合伙人事务所与阿鲁普事务所之类的成功的商业性事务所，都在致力于新技术的应用。目前在北京新出现的许多高水平建筑，如阿鲁普事务所承担结构设计的中国中央电视台新总部大楼和福斯特合伙人事务所设计的北京首都机场新航站楼，其设计都是运用最新技术完成的。

北京另一个高度依赖新技术的新建筑是由澳大利亚 PTW 公司设计的奥林匹克游泳馆“水立方”。在过去的几年里，澳大利亚已确立了其领先世界的设计文化，皇家墨尔本技术学院也成为卓越的学术研究中心。这不仅是因为澳洲地区召集人汤姆·科瓦克作品的高度数字化设计，也因为空间信息建筑实验室对于最新科技的研究探索。这里展示的空间信息建筑实验室的作品，包括了针对北京奥林匹克游泳馆项目进行的对描述墙体工艺方法的探索研究。

亚洲的情况与欧洲、澳大利亚和美国形成了有趣的对照。虽然许多西方公司在亚洲设计了许多建筑，并且许多亚洲顶尖的建筑师都曾在西方受过教育，但亚洲却似乎有着另一种设计传统。亚洲地区的召集人金朱龙在其富有感染力的说明中强调了她从本地区诸多建筑师中选择参展代表所遇到的困难。因为这个地区几乎没有多少前卫出版物，而且其建筑文化中也没有真正与上述新技术结合的建筑文化传统。想到我们家中和办公室中用到的大多数高科技产品都是在亚洲生产制造的，上述情形自身就有些自相矛盾。然而，召集人尽力发掘出的是整个展览中最优雅、最感性的作品。日本建筑师中村博与 NAP 建筑事务所合作，为一家兰汶专卖店所做的精致的室内设计展示了技术所拥有的诗意化潜质。整个室内被墙上镂空的无数小洞照亮，充满犹如“兰汶派对礼服上的钻石般闪烁的光芒”。中村将其描述为“情感技术”，认为它会使人与建筑的关系变得更加密切。因此，我们在亚洲这一部分展览中能够发现一些在如何有意识地利用当代技术方面最富诗意和最人性化的经验。

中国正因其追赶世界其他地方的速度而令人瞩目。当今中国的艺术时常站在国际艺术发展的最前沿，但是建筑却有些滞后。然而，自上届双年展以来的两年间，情况发生了显著的变化。事实上，我们甚至可以说在某些方面中国的当代建筑观念要比其他地区更加富有建设性，这很大程度上是因为中国有无数的建筑机会。在由吴华负责组织的中国展区部分，我们可以从参展作品中看到一种激动人心的新创造精神。这些大胆并富有冒险性的设计几乎都将被建成实实在在的建筑。然而，当今中国令人瞩目的情况是，像马岩松建筑事务所（MAD）这样的设计机构，因赢得了许多国际性奖项和竞赛，正在西方获得极好的声誉。现在已经有哥伦比亚大学的毕业生作为实习生在北京与马岩松建筑事务所一起工作。这些正是对中国在世界舞台上所具有的非凡潜力的证明。

涌 现

在非常直白的层面上，“涌现”的含意是显而易见的，它指的是事物变得明显的过程。而“涌现的才能”指的是尚未充分显露的才能。“涌现的技术”则是指尚未变成家喻户晓的技术。然而，我们可以用另一种方式解释“涌现”这个词。近来开始激发顶尖年轻建筑师创造力的最有趣的科学理论之一便是“涌现”理论。涌现理论关注一些自然现象，如蚂蚁或白蚁的行为，并从中总结出集群智能，即“一群简单个体所涌现的集体智能”这样的普遍原理。该理论也可以应用于诸如城市增长逻辑或电脑运行等其他情境，无论这些不同的领域看上去有多么不相容也不会影响其应用。

人们可以在一群飞鸟中看到集群智能在起作用。鸟群总是以相当有序的方式进行转向、俯冲、滑翔运动，这种有序体现为每只鸟都或多或少地遵从整个群体的运动模式。传统思维认为这是因为鸟群中有只领头鸟在控制着其他鸟的运动。然而实际发生的情况是，每只鸟都在对其四周的鸟的行动作出反应，遵守着诸如“跟着前面的鸟飞”或“与右边的鸟保持一定距离”等简单的指令。这些个体反应的最终结果

Some of the most advanced work technologically has been curated by Tom Verebes in his selection of work from the United Kingdom. Much of this work is interdisciplinary in its nature, often involving collaborations with talented engineers, such as Hanif Kara and Tom Barker, and much of it is highly sophisticated in its engagement with technology. But if there is something unique about the work in this section, it is the inclusion of two dedicated research units operating within commercial practices. The tradition of architectural research within academic environments is well established, but here we have the development of a new form of research within a commercial environment. The establishment of the Advanced Geometry Unit at Arups and the Specialist Modelling Group at Foster and Partners is part of a highly novel and progressive development within practice. It is important to recognise, then, that emerging practices are not alone in engaging with emerging technologies. Successful commercial practices, such as Foster and Partners and Arups, are also engaging with them. The designs of many of the high-profile buildings now appearing in Beijing – such as the new headquarters building for CCTV for which Arups serve as structural engineers, or the new airport terminal by Foster and Partners – were developed using emerging technologies.

Another new building in Beijing that relies heavily on these emerging technologies is the 'Watercube', the Olympic Swimming Pool complex designed by the Australian firm, PTW. Over the last few years, Australia has established itself as having one of the leading design cultures in the world, and RMIT in Melbourne as an academic centre of excellence not only for high digitised design through the work of Tom Kovac, curator of the Australia section, but also for research into emerging technologies through the Spatial Information Architecture Laboratory. The work exhibited here under the SIAL includes a research study into techniques of describing the wall for the Beijing Olympic swimming pool project.

The situation in Asia makes an interesting contrast with Europe, Australia and America. While many Western companies are designing buildings in Asia, and while many leading Asian architects have been educated in the West, there seem to be an alternative tradition at work in Asia. In her eloquent curatorial statement, JooRyung Kim highlights her difficulties in finding a wide enough range of architects from which to make a selection in a region, which has few progressive publications and no real tradition within its architectural culture of engaging with these new technologies – something that is itself somewhat paradoxical given that most of the hi-tech products in our homes and offices are manufactured in Asia. Yet what she has managed to uncover are some of the most elegant and sensitive works in the entire catalogue. The exquisite interior for a shop for Lanvin, designed by the Japanese architect Hiroshi Nakamura working with NAP Architects, reveals the poetic potential of technology. The interior is lit by tiny holes punctured with tiny holes, so that it is filled 'with sparkling light like diamonds on a Lanvin party dress'. Nakamura describes this as 'emotional technology', which serves to make the relationship between architecture and people more intimate. What we can find, then, in this Asian section are some of the most poetic and humane lessons in how to engage sensitively with contemporary technology.

China is remarkable for the speed at which it seems to be catching up with the rest of the world. For some time now Chinese art has been at the forefront of international developments, but somehow architecture has lagged behind. However, in the two years since the last Biennial the situation has changed dramatically. In fact we might even say that in some ways the outlook for contemporary architecture in China is more positive than elsewhere, largely because of the numerous opportunities to build. In the Chinese section, curated by Wu Hua, we can recognise a breathtaking new spirit of invention at play in bold and adventurous designs almost all of which are to be built. What is remarkable, however, about the situation in China right now is that practices like MAD Architects are gaining a strong reputation also in the West, winning international awards and competitions. Indeed the most remarkable development of all – which is testimony to China's extraordinary potential on the world stage – has been the fact that graduates from Columbia University are now coming to work as interns with MAD Architects in Beijing.

Emergence

At a very straightforward level it is obvious enough what 'emerging' means. It refers to a process becoming evident. Emerging talent is talent that has yet to be fully revealed, and emerging technologies are technologies that have yet to become universally known. There is, however, another way in which we can interpret the term, 'emerging'.

One of the most interesting recent scientific theories that has begun to capture the imagination of leading young architects has been the theory of emergence. The theory of emergence looks at natural phenomena, such as the behaviour of ants or termites, and extracts from them general principles of swarm intelligence

遵循了集群行为逻辑，它既是个体反应的总和，而在某种意义上，又大于个体反应之和。

研究人员发现，在一个复杂性日益增加、信息超载的社会中，需要提供“一种设计‘智能’系统的替代方法，用自治、涌现和功能分散来取代控制、预设和集中化”。因此，蚂蚁筑巢行为可以被认为是一种“集群激发”，即蚂蚁间直接或间接的交互形式，这正是所有自组织群体得以维持的核心所在。不仅如此，正是蚂蚁这种认知能力有限，但具有极为先进的群体协调能力的生物所具有的高超效率，阐释了“集群逻辑”作为一种手段解决社会问题的巨大潜力。行为形成过程在建筑方面最明显的表现就是行为模式将其印记留给自然的方式，正像动物历经数年所留下的踪迹一样。这是一种自下而上，而不是自上而下地强加于场地的过程。

涌现代表了人类认识从低级规律到高层次复杂规律的转变，它与自上而下发展的拱形原则恰好相反，是一种复杂的自调节自适应系统自下而上发展的规律。它关注行为模式，但不是固化为一种表达方式的行为模式，而是可进行动态调适的行为模式。不断突变的涌现系统是一种建立在交互、信息反馈循环、模式识别和间接控制基础上的智能系统，它向传统的预设的机械控制系统观念发起挑战，更注重系统的自调节自适应能力。

涌现是一个用于描述新设计方法的日渐流行的词汇，这个词汇也被建筑界采纳，用以描述新的设计策略。然而，它同样可以作为一种理论工具，用以理解群体行为的任何形式。或许只有身临此境我们才能理解提交参展作品的这群前卫建筑师们的行为方式。因为，在这样的举动中通常可以感受到一种集群智能形式在起作用。奇怪的是，这种行为并没有受到地理距离的限制，相反，在许多建筑创作的热点地区——诸如伦敦、纽约、鹿特丹、洛杉矶等建筑创作中心，还有逐渐变为中心的北京，我们可以觉察到文化连通的形成。其部分归因于这些建筑师的高度敏感性，他们仿佛都调到某个无线电频率上，总是可以抓住国际流行的新观念；另一方面也归因于当今世界日益增加的连通性，建筑师不停地在世界范围内迁移，经常在不同的国家学习、工作。

展现在我们眼前的是一种新的集体行为形式，一种正在发挥作用的集群智能。我们将新的建筑动向汇集在一起，如果你愿意的话，不妨将此视为一所新的数字包豪斯。因为，如果将最初的包豪斯理解成为20世纪初的模拟世界生产思想的高技术工厂，那么本展览中的作品则当然可以被看成为21世纪的数字世界生产思想的高技术工厂。

尼尔•林奇

— 'the emergent collective intelligence of groups of simple agents' - that can be applied to other contexts, such as the logic of urban growth or the operations of the computer, no matter how seemingly incompatible the different fields might seem.[1]

One can see swarm intelligence at work with a flock of birds. The flock veers, dives, soars in a fairly uniform movement — uniform in the sense that each individual bird is more or less conforming to the overall pattern of the group. Conventional thinking might dictate that there would be a leader in the flock — one individual bird taking control of the movements of the others. In fact what is happening is that each bird is responding individually to those around it, obeying simple commands such as 'follow the bird in front' or 'keep a certain distance from the bird to the right', and so on. The net result of these individual responses follows a logic of swarm behaviour, which is both the sum of the individual responses, but also — in some senses — more than it.

Researchers note that in a society of increasing complexity and information overload there is a need to offer 'an alternative way of designing "intelligent" systems, in which autonomy, emergence and distributed functioning replace control, preprogramming, and centralization.'[2] Thus the operations of ants building nests can be recognised as a form of 'stigmergy' — direct or indirect interaction between ants — that lies at the heart of all self-organisation. And it is the very effectiveness of ants, creatures with relatively limited cognitive skills, but with a highly advanced capacity for social co-ordination that illustrates the extraordinary potential of 'swarm logic' as a means to address social problems. An obvious architectural manifestation of processes of behavioural formation would be the way that patterns of behaviour leave their mark on nature, such as the trails created by animals over several years. This is a bottom-up process, rather than a top-down imposition on the site.[3]

Emergence represents a shift in understanding from low-level rules to higher-level sophistication, a kind of bottom-up development of complex adaptive systems that self-regulate, in opposition to top-down overarching principles. It looks to patterns of behaviour, but not ones which freeze into one single expression, but rather ones which are premised on dynamic adaptation. Constantly mutating, emergent systems are intelligent ones, based on interaction, informational feedback loops, pattern recognition and indirect control. They challenge the traditional concept of systems as predetermined mechanisms of control, and focus instead on their self-regulating adaptive capacity.

Emergence is a term that has become increasingly popular to describe new approaches to design. The term then has been adopted for new design strategies in architecture.[4] But it could equally be used as a theoretical tool for understanding any form of group behaviour. Perhaps it is here that we can understand the way in which a group of progressive architects, whose work is collected here, operates. For often within such movements we can detect a form of swarm intelligence at work. Strangely, this behaviour is not constrained by geographic distance. Rather, within certain hot-spots of architectural creativity – centres of architectural creativity, such as London, New York, Rotterdam, Los Angeles, and, increasingly, Beijing – we can perceive a form of cultural connectivity. This is partly due to the sensitivity of these designers who can often pick up on new ideas that are circulating internationally, as though tuning into some radio frequency, but also due to the increasing connectivity in the world today, where architects migrate constantly, often studying and working in different countries.

What we have here, then, is a new form of collective behaviour, a swarm intelligence at work. Put together we have a new movement in architecture: a new digital Bauhaus, if you will. For if the original Bauhaus could be understood as a highly technological factory of ideas for the analogue world of the early twentieth century, surely the work in the exhibition can be seen as one for the digital world of the early twenty-first century.

[1] Bonabeau, Dorigo and Theraulaz, *Swarm Intelligence*. See also James Kennedy, *Swarm Intelligence*, New York: Morgan Kaufmann, 2001; Mitchel Resnick, *Turtles, Termites, and Traffic Jams*, Camb., MA: MIT Press, 1994. Steven Johnson, Emergence: The Connected Lives of Ants, Brains, Cities and Softeware, London: Penguin, 2001.

[2] Bonabeau, Dorigo and Theraulaz, *Swarm Intelligence*, p. xi.

[3] In a recent human example, a professor of biology who had commissioned a new building, suggested that, rather than adopt the top-down designs for landscaping, the contractor should wait to see the trails which people were actually laying, and then lay a hard surface over those already consolidated routes.

[4] On this see Michael Hensel, Achim Menges, Michael Weinstock (eds.), *Emergence: Morphogenetic Design Strategies*, London: Wiley, July 2004.

Neil Leach

非线性体:表现复杂性

自由形体及其建筑伦理

建筑从无到有的设计过程，犹如人的一生，“人的自由先于人的本质并使之可能；人的本质悬置在人的自由之中[1]。”同样，建筑的形体自由先于建筑的最终形象，并且通过自由选择塑造最终形象，最终形象悬置在形体设计的自由选择之中。

正统现代主义清教徒般的理性主义清规戒律束缚了建筑的形体自由，现代建筑只能是规则古板的标准几何体，枯燥无味。现代主义建筑虽然在直观形式、设计手法及设计思想上背离了西方建筑传统，但在建筑的审美原则上并没有放弃两千年来深入人心的理性美学及古典传统，这种美学思想讲求“和谐、统一、完整”，在现代派建筑师的作品里，人们仍能强烈地感受到多样统一及和谐有序带来的古典美感，“预定的和谐”、“美在于完满”仍然是建筑好与坏的评判标准[2]。

后现代主义及解构主义将建筑从现代主义的条条框框中拯救出来，使建筑获得形体自由，它们不仅在设计出发点以及视觉形象上与现代主义大相径庭，并且在美学观念上完全否定了现代主义，极力推崇非和谐、非统一、非完整的审美法则，这就意味着建筑的形体设计本身不需要遵守任何预设的标准，可以自由选择。从而颠覆了几千年的西方理性美学传统，因而具有划时代的历史意义。

但是，无论后现代主义，还是解构主义，其非理性的设计哲学以及提倡以丑为美、提升平庸价值的具体造型手法，其实仅仅集中在堆砌、拼贴、破碎、错动、扭曲等等有限的表现性手法上，观察并思考一下这些手法，不难发现，它们具有暴力特性，或采取了强制性的约束，使形象集合在一起，具有一种张力，一种动势。它们对现代主义或者更广泛一些，对西方传统，进行了一场战争，一次摧枯拉朽的革命，它们的形式与这场轰轰烈烈的征战是相对应的。然而，这种自由形体的形成从伦理学的角度来看缺少建筑道德与规范，武断、暴力、强制对于建筑上的革命来说是必要的，但当战火硝烟停止之后，人们渴望建立一种既能维护革命成果又能去除火药味的建筑伦理，从这一角度来看，后现代及解构只能送进博物馆，作为一段历史的纪念了。

另一种形体，不具有暴力性及强制性，形象自由、轻松、随机、流动，但具有一种道德伦理，似乎正成为今天的标志。这种自由形体，是设计过程不断自由选择的结果，对于形的选择来说，没有任何预设的普遍标准，可以是任何形状，但只有一条，每个形体的选择必须承担责任，选择与承担责任是一个硬币的两个面，缺一就不能有自由。这里责任指的是每一个选择的形体必须与建筑地段周边的各种动态因素及建筑内部性能相对应，影响建筑设计的各种动态因素包括地理风土、气候、景观、交通循环、人文历史、社会经济、建造条件，场所中特有的精神气氛等；建筑内部性能决非传统意义上的功能含义，功能仅仅指一种静止的使用要求，而性能包含了内部各种动态的活动以及与外部条件互动的变化因素。这种外部与内在的共同作用是建筑自由形体的基础，自由形体是各种因素综合作用的结果，我们也可称这一规则为自由形体的建筑伦理。

非线性体：表现复杂性

既然建筑的形体取决于众多外部与内在的影响因素，那么，可以把影响建筑设计的各种因素的综合作用看成一个复杂系统，组成这个系统的各因素便可称作参变量，如果我们对建筑场地及性能进行研究，找到联结各个参变量的规则，那么，就可以建立参数模型，进而便可借助计算机技术生成建筑体量、空间、形式或结构，且可通过改变参变量的固定值，获得多解及动态的设计方案。按照这一观点及方法，作为结果的建筑形态也将超出经典的欧几里德几何体系而产生出一种流动性的非线性体，它是对各种综合性复杂问题的解答，表现出建筑的复杂性。

复杂性指远离平衡态下的动态稳定化有序结构所表现出来的行为无限多样性[3]，这是对自然及社会更深刻的认识，揭示了世界永恒动态多变的真相。然而这种丰富的复杂性却又可以被极简单地破译，即组成集群的单体遵守简单相同的若干规则，结果形成复杂的集群有序行为，其实，这就是被当今先锋建筑师所热衷的技术思想——涌现理论[4]。对建筑的复杂性的探求则表现为作为结果之一的建筑非线性体具有不规则流动性的动态取向，这种非标准的曲面形状绝非随心捏造。相反，它是各种影响设计的参数相互动态作用的结果，是设计逻辑发展及理性控制的非理性成果，同时这

Non-Linear Volume: Expressing Complexity

Free Form and Its Ethics

Architecture is a process of moving from zero to one, just like the voyage of life. '*Freedom is existence, and in it existence precedes essence*' (Jean-Paul Sartre). Similarly, architecture gives priority to the freedom of its form rather than to the final image. Moreover, final images are achieved by freedom, and their *epoche* (Edmund Husserl) is found in that freedom.

However, the freedom of architectural form was fettered by the puritanical rationalism of orthodox Modernism. Modernist buildings can often be dull standard boxes. Although Modernism architecture broke away from existing Western traditions in terms of its architectural beliefs, forms and techniques, it still regarded the aesthetics of rationalism and classicism as its aesthetical principles. These aesthetics, which emphasise harmony, uniformity and integrity, could produce an extreme sense of uniformity and classical beauty inspired by harmonic proportions. Judgment of good or bad architecture still relied on notions of harmony and perfect beauty.

Postmodernism and Deconstructivism rescued architecture from the shackles of Modernism, and allowed it to obtain a certain freedom of form. These movements were quite different from Modernism not only in their basic approach to design and the visual image, but also in their aesthetic concepts. They strongly opposed the aesthetic principles of harmony, uniformity, and integrity. This meant that the physical design of a building did not need to conform to any established standards. It could be selected with extreme freedom, thereby destabilising the long standing hegemony of rationality within western aesthetics, and signifying a new paradigm in architectural design.

However, with Postmodernism and Deconstructivism alike, a certain non-rational design philosophy and advocation of the ugly as the beautiful and a call to "upgrade the value of the mundane" only served to focus attention instead on limited representational techniques, such as stacking, collage, fragmentation, disruption and distortion etc. Thinking about these practices, it is easy to see how they either appeared somewhat 'violent' or adopted a tactic of composing designs to create a kind of tension and momentum. They declared war and staged a violent revolution against Modernism in particular and Western tradition in general. The free forms that resulted are evidence of an ambitious campaign. But from an ethical point of view, the generation of these forms lacks any architectural morals or norms. Revolution depends on arbitrary violence and force. But when the dust of war has settled, people still yearn for an ethical framework to maintain the fruits of revolution while wiping away the smell of the gunpowder. From this perspective, Postmodernism and Deconstructivism should be consigned to a museum as historical relics.

Away from the violence and force of these movements, another approach seems to coming into fashion today. It gives the appearance of freedom and lightness - random and fluid - and it takes up an ethical position. This new freedom of expression is the outcome of continuing free choice during the design process. There is no established universal standard for selecting a form. It can be any shape, but must follow one principle: it must take responsibility for its choice. Choice and responsibility are two sides of the same coin – without one or the other there can be no freedom. Responsibility requires that each form be chosen to reflect various external dynamic factors within the construction site and internal performance of the building. External dynamic factors include geography, climate, landscape, traffic circulation, context, socio-economic considerations, construction conditions, the unique spiritual character of the place, and so on. As for internal performance, this differs from function in the traditional sense. Whereas function only considered static use, performance encompasses not only dynamic activities inside but also changing conditions outside the building. Considerations of site and performance lay the foundation for a new language of free form, which is the combined result of various factors. This principle could be called the architectural ethics of free form.

Non-Linear Volume: Expressing Complexity

Since architectural form depends on many external and internal considerations, all the factors involved in architectural design could be viewed as a complex system. The variables constituted by this system are the parameters. After studying the site and

However, the interest in this movement did not die. Ronchamp

种流动型的形态又是可以按照某种简单的规则分形成单元体，从而使得这一复杂的形体能以方便的途径建造。

新的流动性

对建筑的流动性的追求在上个世纪初，几乎与现代主义建筑的探索同时发生。像高迪（Antoni Gaudi）的巴特罗公寓（Casa Batllo，1904–1906）及米拉公寓（Casa Mila，1906–1910），斯坦恩（Rudolf Steiner）的巴塞尔学校（1913–1920），门德尔松（Eric Mendelsohn）的爱因斯坦天文台（1920–1921）都表现出建筑的流动性，但这一探索并未随着现代主义运动的发展成为20世纪建筑的主流。这是因为现代主义建筑适应了时代变革的要求，具备了广泛发展的工业化技术基础，而流动性的实现却步履艰难。但是，对建筑流动形态的追求从未停止，柯布西耶的朗香教堂，伍重的悉尼歌剧院，沙里宁（Eero Saarinen）的纽约环球航空公司候机楼（TWA Terminal，NY,1962），丹下健三（Tange Kenzo）的东京代代木体育馆（National Olympic Gymnasium，Tokyo，1964），代表了战后对建筑流动性的持续发展[5]。

上个世纪即将结束的最后几年开始，一种新的建筑流动性以强劲的势头迅速发展，这类设计可以用不规则、非标准、柔软的、自由的、随机的、动态的等词汇来形容，具有更强烈的流动性，如格莱格·林（Greg Lynn）的胚胎住宅，FOA的日本横滨港国际候船室（Yokohama International Port Terminal），渐近线（Asymptote）的荷兰水上码头（Hydra Pier），联合网工作室（UN Studio）的斯图加特奔驰博物馆，NOX的音效房屋等等。其实，这类建筑正是对影响建筑的各种因素综合考虑的结果，是对建筑复杂性的表现。这类建筑的流动形态与计算机数字技术紧密相关，依靠数字技术生成设计并依赖数控制造业来生产建筑构件及施工。对这类具有非线性特征的新的流动形态的探索正在迅速发展，在短短几年的时间内蔓延于世界各地[6]，本书收录的各个建筑师的作品正是这一探索的最新图景。如果说现代主义由于有工业化技术作为基础而代表了20世纪的工业社会成为主流建筑方向，那么这种流动性的建筑有数字化技术作为基础，我们似乎也能预言，它将代表21世纪的信息社会成为新世纪的建筑主流。

设计的起点

对于建筑设计而言，在标准的几何形体几乎被大师们都用绝的今天，计算机生成技术的出现无疑是一个福音，它突破了建筑师狭隘的想象能力，为设计开辟了无限广阔的新的形体领域，软件可以根据参数条件生成任何可能的独特的形体，掌握了这一技术的建筑师无不为之兴奋。然而，这一技术的使用也存在着极大的危险，如果我们仅仅从视觉美学的角度出发，热衷于玩弄具有冲击力的造型，那么，必然又会再一次陷入形式主义的泥潭。正如上文所述，这种非线性的流动形体是作为结果而存在的，其存在的原因则是影响建筑的各种复杂因素，这一点非常重要，提出了这一设计方法的核心逻辑，即复杂的因素导致了非线性体，非线性体是复杂因素的结果。

据此，我们仍然要对这一核心逻辑进一步追问，首先向前思索要回答的问题是，这些影响设计的复杂的因素如何确定？在某一项目中有哪些影响设计的因素？其实，这是要我们回答设计起点的问题。从我们用这一方法的设计实践及设计教学来说，有两点体会，第一要回到设计地段，第二要从现象出发，现象即人脑意识中的显象。"回到地段"目的在于在设计开始时就要对场地进行调查观察，包括设计者亲自观察及对他人的调查，从而捕捉到影响设计的主要因素；"从现象出发"指相信并采用那些人们通过观察而在意识中有呈现的因素，也就是直观因素，把这些因素作为某一项目复杂的设计系统中的参变量，通过这些参数的控制，产生非线性的建筑形体。这里似乎涉及到了现象学哲学的还原，即回到事物本身[7]。尽管计算机形体生成技术本身与现象学毫不相关，但在运用这一技术进行实际项目设计的过程中，现象学的还原思想却把这一技术生成的形体拉回到与人的行为及体验相对应的层面。这样我们便发展了核心逻辑的先前逻辑层次，至此，这一方法的因果关系可阐述为：直观调查观察——确定影响设计的主要因素——生成非线性的建筑形体。

图解——核心逻辑

德勒兹将图解的概念定义为，"一种处理社会功能需求和抽象形式之间关系的'抽象机器'"，"是从仅作为抽象的陈述的技术控制模型到表达文化、社会关系及实践的形式的转

by this system are the parameters. After studying the site and questions of architectural performance, we can identify the principles which connect each of these parameters and establish a model for them. Relying on techniques of computer generation, we can generate the architectural form, space, structure, and we can also obtain variations in the design by modifying the parameters. According to such an approach, the architectural form generated will be a non-linear volume beyond the constraints of classical Euclidean geometry. It is an answer to a complex integrated problem, which reveals the complexity of architecture itself. By complexity we mean the infinite diversity of a dynamically stable structure which avoids equilibrium, and which displays a more profound understanding of nature and society, revealing the eternal truth of the world. However, this rich complexity can be very simply deciphered: every multi-agent system observes several simple rules, which result in a complex orderly swarm behaviour. This, in fact, is the theory of 'emergence', the popular scientific theory adopted by many avant-garde architects today. Non-linear architectural volumes have irregular and fluid characteristics. They are the result of a mutual resolution of the parameters, but also of a logical development - the irrational results of a rational design process. At the same time this type of fluid volume could be divided into components according to simple rules using software programmes, so that the non-linear volume can be fabricated easily.

New Fluidity

The pursuit to architectural fluidity had its origins in the Organic movement at the beginning of 20th century, almost coinciding with the development of architectural Modernism. Examples include the Casa Batllo (1905-7) and Casa Mila (1905-7) designed by Antoni Gaudi, the Goetheanum (1913) designed by Rudolf Steiner, and the Einstein Tower (1920-1) designed by Eric Mendelsohn - projects which all display a certain architectural fluidity. But this tendency did not become an architectural mainstream style in the 20th century as did the Modernist movement. Modernism was better suited to the demands of the era and was based on a broad range of industrial technologies, while the Organic movement experienced certain difficulties. However, the interest in this movement did not die. Ronchamp Chapel designed by Le Corbusier, Sydney Opera House designed by Utzon, the TWA Terminal (New York, 1962) designed by Eero Saarinen and the Olympic Gymnasium (Tokyo, 1964) designed by Tange Kenzo represent the continued development of architectural fluidity after World War 2.

Since the last few years of 20th century, a new kind of architectural fluidity has been developed and has become very popular. It can be described as irregular, non-standard, soft, free, random and dynamic. Examples include the Embryologic House designed by Greg Lynn, Yokohama International Port Terminal designed by Foreign Office Architects, Hydra Pier designed by Asymptote, Mercedes-Benz Museum in Stuttgart designed by UN Studio, Sonar House designed by NOX and so on. In fact, all these projects are the outcome of the comprehensive consideration of different factors, and express architectural complexity. Their fluid volumes are closely related to digital technologies, relying on the computer to generate the design, to fabricate components, and even to construct the buildings. In the past few years the exploration of architectural fluidity with such non-linear characteristics has proliferated and spread across the globe. This catalogue contains the latest architectural contributions to this field. Just as modern technology laid the foundations for Modernism, which then became the architectural mainstream in the Industrial Society of 20th century, so too digital technologies have spawned fluid architecture which seems to have become a mainstream architectural movement within the Information Society of the 21st century.

The Starting Point for Design

For architectural design, at a time when the range of standard geometrical forms have almost been used up, the emergence of computer generating techniques is good news. It challenges architects' narrow spectrum of imagination and opens up a boundless new field of possibilities. Architects who have experimented with this technique are excited, because the software can be used to generate all sorts of unique forms based on different parameters. However, there is also a danger