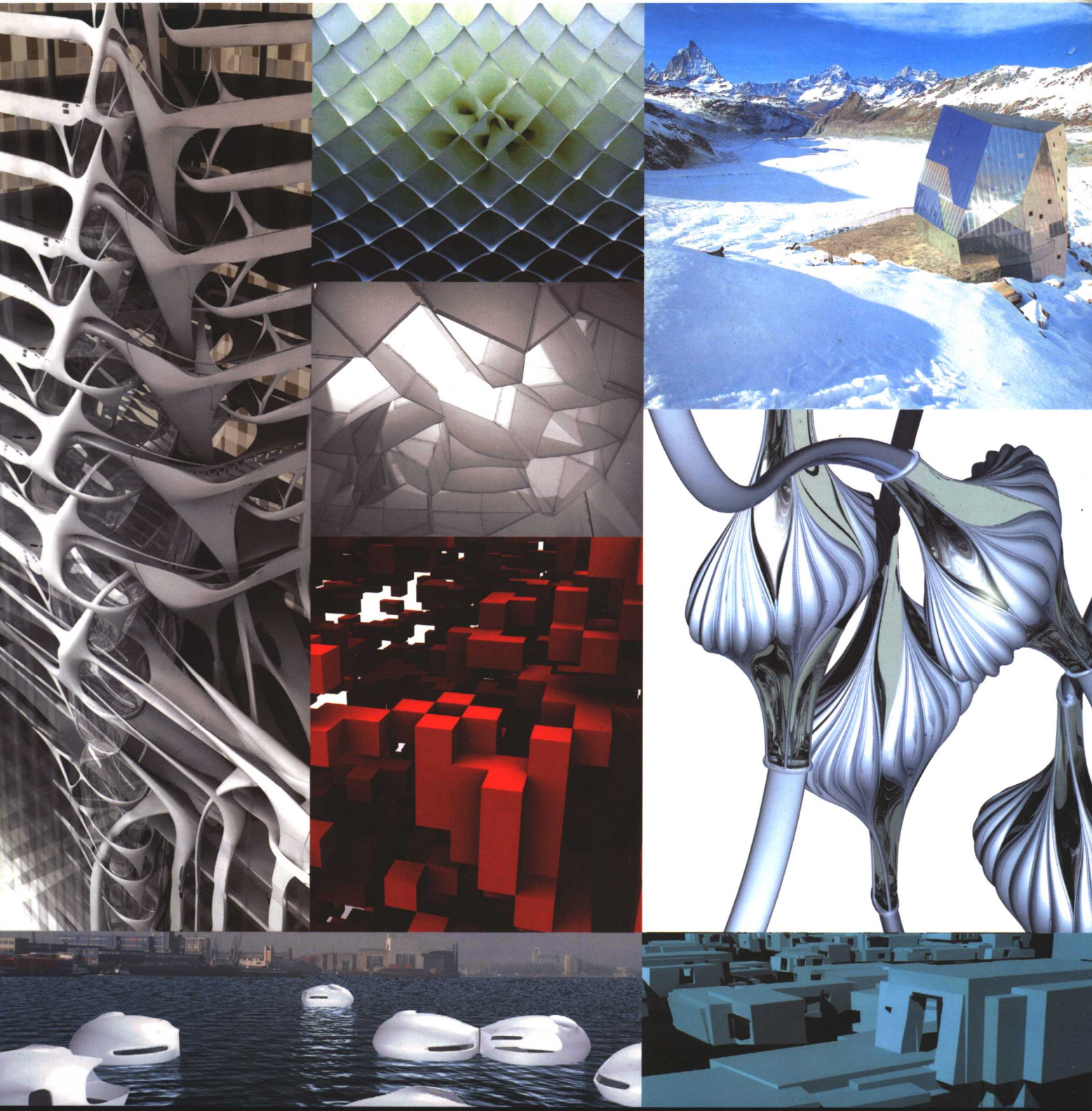

涌现 · 学生建筑设计作品

EMERGING TALENTS, EMERGING TECHNOLOGIES · STUDENTS

尼尔 · 林奇　徐卫国　编

NEIL LEACH　XU WEI-GUO　[eds.]

中国建筑工业出版社

图书在版编目（CIP）数据

涌现·学生建筑设计作品 / 尼尔·林奇，徐卫国编.
北京：中国建筑工业出版社，2006
ISBN 7-112-08526-8

I.涌... II.①林... ②徐... III.建筑设计—作品集—中国—现代 IV.TU206

中国版本图书馆CIP数据核字（2006）第106388号

本书为2006中国国际建筑艺术双年展“涌现”建筑展的学生作品集。该展览试图为24所世界一流的建筑学院提供一个展示的窗口，着重展示在建筑设计教学中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青年建筑师作品展，展出另外48位年轻建筑师的作品。作为本书的系列，还有青年建筑师作品集。

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涌 现·学生建筑设计作品

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中国建筑工业出版社出版、发行（北京西郊百万庄）
新 华 书 店 经 销
北京画中画印刷有限公司印刷

*

开本：889×1194毫米　1/20　印张：10　字数：360千字
2006年9月第一版　2006年9月第一次印刷
印数：1-3000册　定价：**78.00**元

ISBN7-112-08526-8
（15190）

本社网址：http://www.cabp.com.cn
网上书店：http://www.china-building.com.cn

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002 目录
004 前言
006 数字实验室——尼尔·林奇
012 非线性建筑探索——徐卫国
016 英国建筑联盟建筑学院
026 英国伦敦大学巴特利特建筑学院
032 荷兰贝拉罕建筑学院
040 美国哥伦比亚大学建筑、规划与保护研究生院
048 美国康奈尔大学
056 荷兰代尔夫特工业大学
062 德国德绍建筑学院
070 美国哈佛大学设计研究生院
078 日本京都大学
086 美国麻省理工学院计算小组
094 法国巴黎玛莱珂建筑学院
100 美国宾夕法尼亚大学建筑系
108 美国普瑞特艺术学院
116 美国普林斯顿大学建筑学院
124 美国莱斯建筑学院
132 澳大利亚皇家墨尔本技术大学
138 美国南加利福尼亚建筑研究中心
146 中国东南大学建筑学院
152 中国同济大学建筑城规学院
158 中国清华大学建筑学院
166 美国加利福尼亚大学洛杉矶分校建筑与城市设计系
174 奥地利维也纳工艺美术学院建筑学院
182 美国耶鲁大学建筑学院
190 瑞士苏黎世联邦理工大学建筑学院
198 索引
199 编者简介

003 Contents
005 Preface
007 Digital Laboratories----Neil Leach
013 Non-linear Architectural Exploration----Xu Wei-Guo
016 Architectural Association, UK
026 Bartlett School of Architecture, UK
032 Berlage Institute, HOLLAND
040 Columbia GSAPP, USA
048 Cornell University, USA
056 TU Delft, HOLLAND
062 Dessau Institute of Architecture, GERMANY
070 Harvard GSD, USA
078 Kyoto University, JAPAN
086 MIT Computation Group, USA
094 Paris Malaquais, FRANCE
100 University of Pennsylvania, USA
108 Pratt Institute, USA
116 Princeton University, USA
124 Rice University, USA
132 RMIT, AUSTRALIA
138 SCI-Arc, USA
146 Southeast University, CHINA
152 Tongji University, CHINA
158 Tsinghua University, CHINA
166 UCLA, USA
174 Angewandte Institute of Architecture, Vienna, AUSTRIA
182 Yale University, USA
190 ETH Zurich, SWITZERLAND
198 Index
199 Biographies

CONTENTS

前言

本书为2006中国国际建筑艺术双年展"涌现"建筑展的学生作品集。该展览试图为24所世界一流的建筑学院提供一个展示的窗口，着重展示在建筑设计教学中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青年建筑师作品展，展出另外48位年轻建筑师的作品。作为本书的系列，还有青年建筑师作品集。

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，因为，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、邹霄、江春亚、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 students section of the 'Emerging Talents, Emerging Technologies' exhibition at the Architecture Biennial Beijing 2006. The intention is to offer a showcase of 24 of the leading architectural schools 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 architectural work from 48 of the most talented young practices 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, Zou Xiao, Jiang Chunya and Ikuko Sakakibara, for their invaluable contribution in helping to design and compile this catalogue.

Neil Leach
Xu Wei-Guo

数字实验室

伯纳德·屈米曾经将建筑学院描述成进行各种探索的实验室。近年来建筑文化中许多最精彩的发展都源自建筑学院的教室。许多世界上最前卫的建筑师都投身于建筑教育，这一现象也决非偶然。教学是一个双向的过程，教授和学生都能从彼此身上学到许多。因此，我们不该轻视建筑学院，认为他们只是提供外部“真实世界”建筑实践的“低版本”。相反，我们应该认识到：建筑学院不仅仅是教学场所，而且还是极为独特的实验场所。

20 世纪的建筑史可以被解读为一部各种思潮学派史——换言之，是各个建筑学院对专业实践产生影响的历史。因为，建筑学院已经成为当代建筑领域各种创新、突破的发源地，包豪斯学院可以作为此方面最典型的例证。自20 世纪上半叶以来，该学院的影响大大超越了其地域和实际存在的时间。包豪斯的许多教师，如原来的院长沃尔特·格罗皮乌斯和密斯·凡·德·罗后来都移居美国，并使包豪斯精神在诸如哈佛大学设计学院、伊利诺伊理工学院等得到了延续。包豪斯作为一个实体机构，迫于纳粹统治而关闭，但作为一个思潮学派，却继续在各方面产生影响。

包豪斯精神的核心观念——建筑学院是进行科学技术实验探索和描绘乌托邦式社会理想的场所，在20 世纪下半叶得到了许多学院的认可。而包豪斯精神最著名的继承者则是伦敦的建筑联盟建筑学院。20 世纪60 年代，是充满披头士、迷你库伯轿车、迷你短裙、协和式飞机和建筑电信派等各种新奇事物的时代，建筑联盟在其最知名的主席阿尔文·博雅尔斯基领导下，在上述令人眼花缭乱的环境中，于20 世纪70 年代成为第一个真正意义上的国际性的先锋派建筑学院。我们只需看看曾在那里学习过的建筑师——雷姆·库哈斯、扎哈·哈迪德、本·范贝尔克，还有曾在那里教过书的富有灵感的老师——丹尼尔·里伯斯金、伯纳德·屈米、雷姆·库哈斯、扎哈·哈迪德、伊莱亚斯·曾格利斯和彼得·库克，即可知建筑联盟在当今世界建筑领域影响之大。

接踵而来的是上述观念在前卫建筑教育发展中的第二次增殖——把握无限的建筑想象力，并且将前卫建筑教育的概念转化为一项全球性的商业运作。许多建筑联盟的老师——朗·黑伦、彼得·索特、尼格尔·柯尔兹和彼得·库克，都成为伦敦其他建筑学院的领导。但是，或许最终还是在美国，建筑联盟的影响经由诸如伯纳德·屈米、雷姆·库哈斯这些建筑联盟的前教师才得以广为传播；他们在对建筑教育的本质和结构体系进行再定义方面发挥了领导作用。

1988 年，伯纳德·屈米被任命为哥伦比亚大学建筑学院院长后，运用建筑联盟的单元结构模式彻底改变了该学院的体制，使其成为继建筑联盟之后又一极具影响力的建筑学院。我们的确可以将屈米对建筑教育的贡献与其导师阿尔文·博雅尔斯基对建筑教育的贡献相比较；亦可以将被他吸引到哥大的一批教师，比如克雷格·林、哈尼·拉什德、卡尔·朱、阿雷延德罗·扎拉·波罗、拉尔斯·斯布意布罗意克和曼纽埃尔·德兰达，与当年在包豪斯或建筑联盟教书的教师相提并论。另一方面，雷姆·库哈斯在1995 年担任教授并建立学生研究小组进行着眼于城市的“哈佛计划”时，也延续了建筑联盟带有高度探索性的建筑研究方法。也许正是这两位在许多方面都存在竞争的对手翻开了建筑教育的新篇章，引领着资金雄厚的美国教育体制朝着一种新的建筑创作模式前进，随后，该模式又经由近乎泛滥的出版物而广为传播。

进入21 世纪，许多建筑学院都对上述模式进行了发展和扩充。建筑联盟和哥伦比亚的影响以病毒扩散般的方式在全球散播。一些教师，如斯坦·爱伦、克雷格·林、克里斯·海特、马克·高索普和阿雷延德罗·扎拉·波罗，纷纷到普林斯顿、加利福尼亚大学洛杉矶分校、维也纳工业美术学院、耶鲁、苏黎世高工、莱斯、麻省理工和贝尔拉格等高校执教。与此同时，两所学校的毕业生，如赫南·迪亚兹·阿隆索、爱丽莎·安德拉塞克、西罗·纳吉和克里斯·佩里，则到南加利福尼亚理工、宾夕法尼亚大学、康奈尔和普拉特等学校执教。在记述这一事实的同时，还应当列举其他一些深受上述如潮水般“涌现”的新设计思潮影响的学校，如巴特勒特、哈佛、代尔夫特、RMIT 和德绍，以及中国的清华，我们可以深刻地感受到一个思想交织、互联且影响遍及全球的网络已经形成。

Digital Laboratories

Bernard Tschumi once described schools of architecture as laboratories for experimentation. Many of the most interesting developments in architectural culture in recent years have originated in the classrooms of schools of architecture. Nor is it any coincidence that many of the most progressive architects in the world are themselves involved in education. For education is often a two-way process. Professors can learn as much from their students as their students learn from them. We should therefore not look down on schools of architecture, as though they offer inferior versions of practice in the 'real world' outside. Rather, we should recognise schools of architecture not only as spaces of education, but also as uniquely privileged spaces of experimentation.

Indeed the history of twentieth century architecture could be read in terms of a history of schools of thought – a history, in other words, of the influence of various schools of architecture on professional practice. For schools of architecture have provided the breeding grounds for many of the innovations in contemporary architecture. Here we might cite the Bauhaus as the most famous example of a school from the first half of the twentieth century whose influence extended well beyond its geographic location and limited actual lifespan. Many of the tutors there, such as Walter Gropius, the original director of the Bauhaus, and Mies van der Rohe emigrated to the United States, and in turn spawned a afterlife of the Bauhaus in schools such as Harvard GSD and the Illinois Institute of Technology. The Bauhaus as a physical institution might have been forced to close under pressure from the Nazi authorities, but as a school of thought it has continued to exert its influence.

The spirit of the Bauhaus – the notion of a school of architecture as a place of technological experimentation and utopian social vision – was picked up by a number of schools in the second half of the twentieth century. But it was the Architectural Association in London that became the most famous inheritor of the spirit of the Bauhaus. In the shadow of the swinging sixties – an age of the Beatles, the Mini Cooper car, the mini-skirt, Concorde and Archigram – the Architectural Association, under the directorship of its most famous chairman, Alvin Boyarsky, became the first truly international avant-garde school of architecture in 1970s London. We only need to look at the architects who studied there – architects such as Rem Koolhaas, Zaha Hadid and Ben van Berkel – and who subsequently taught there along with inspirational figures such as Daniel Libeskind, Bernard Tschumi, Elias Zhengelis and Peter Cook – to grasp the influence that it held on the world stage.

The next step in the evolution of progressive architectural education was a secondary proliferation of these ideas which caught hold of the architectural imagination and turned the concept of progressive education into a worldwide commercial business. Many of the tutors at the Architectural Association – among them Ron Herron, Peter Salter, Nigel Coates and Peter Cook – became the heads of other schools of architecture in London. But it was in the United States, perhaps, that the influence of the Architectural Association was felt most keenly with former tutors from the Architectural Association, such as Bernard Tschumi and Rem Koolhaas, taking on leading roles in redefining the nature and indeed the structure of architectural education.

Bernard Tschumi used the model of the unit structure of the Architectural Association to radically overhaul the Graduate School of Architecture Planning and Preservation in Columbia University, when he was appointed Dean there in 1988, and to produce the next highly influential school of architecture. Indeed we might compare Tschumi's contribution to education with that of his mentor, Alvin Boyarsky, and the line-up of tutors whom he attracted to Columbia – Greg Lynn, Hani Rashid, Karl Chu, Alejandro Zaera Polo, Lars Spuybroek and Manuel Delanda, to name but a few – to the line-up of tutors who had taught at the Bauhaus or Architectural Association before. Meanwhile Rem Koolhaas continued the highly research conscious approach of the Architectural Association, when he established the student-led research group, the Harvard Project on the City, when appointed a professor at Harvard in 1995. It is perhaps these two individuals – rivals in more ways than one – who opened up the next chapter of architectural education, directing the well financed system of American education towards a new mode of architectural production that was then disseminated by a plethora of publications.

Entering the twenty-first century we find that schools of architecture have developed and extended this model. The influence of the Architectural Association and Columbia has spread like a virus throughout the world. Individual tutors like Stan Allen, Greg Lynn, Chris Hight, Mark Goulthorpe and Alejandro Zaera Polo have gone on to teach at other institutions such as

今天，建筑教育已经成为一个全球性产业，并且呈现清晰的层级——当然，这只是学生们暗自为每所学院论定名次。因此，现在的情形并非建筑学院失去其影响力；相反，其影响在这个通信即时化、出版全球化的文化环境中将更加巨大。因为，思想的传播不再仅限于某位教授的课堂讲授，整个世界已经成为一间大教室。

新思维的范例

长久以来统治这些学院的思想随时间推移已渐式微。20 世纪下半叶，许多知名建筑学院的重心由包豪斯那种乌托邦式的科学和社会理想转移为一种更明确的哲学性展望。一方面，我们有（受爱得蒙德·胡赛尔、马丁·海德格尔、汉斯·乔格·加达莫尔、毛里斯·梅洛·庞蒂等人著作的影响）以现象学派为主的学院，拥有如达利玻尔·维塞利、丹尼尔·里伯斯金和阿尔伯托·皮雷斯－戈麦斯这样才华横溢的教师；另一方面，结构主义逻辑的出现引发了对查尔斯·詹克斯、罗伯特·文丘里等早期后现代主义理论家著作中提倡的折中主义的探求，并引发后结构主义对于雅克·德里达及受其影响的彼得·埃森曼等人作品的思考。最终这些探索在上世纪 80 年代末启发了整整一代因“解构”和“解构主义”之名产生的先锋作品。不论这场运动实质上是否真的与创造“解构”这个词的法国伟大后结构主义哲学家雅克·德里达的哲学主张有共通之处，运动本身在建筑教育史上已经留下了不可磨灭的印记。

自计算机诞生以来，我们可以洞察到在理论研究关注点方面的进一步转移。如果说 20 世纪八、九十年代人们最关心的是文学理论和欧陆哲学的话，那么在新世纪的第一个十年里人们的关注点又重新回到了科学话题上。今天，主宰一切的逻辑似乎已完全是一种“科技哲学”及“物质行为哲学”。正因为如此，我们可以察觉到人们对文学理论和以其为基础的哲学的热情在消减，而那些可以帮助人们更深刻地理解物质进程的哲学则日渐为人们重视。同样的，德里达的著作越来越受到忽视，而吉尔·德勒兹的著作却日渐流行。诚然，多亏像曼纽埃尔·德兰达这样的评论家引用了德勒兹的哲学并发掘其与建筑之间的关系，这种哲学才能为建筑界所接受和拥护。从某种程度上说，这可以被解读为建筑界在科技领域的一次巨大的进步——科技长久以来一直处于历史和理论的阴影中，人们认为它更多属于实证哲学范畴，而与建筑少有共通；然而如今人们又撇清误会和偏见，重新认识到它的高度价值及其与建筑千丝万缕的联系。让建筑理论家们充满想像和激情的并不只有唯物主义哲学，科学的思维方式本身也在建筑课程中占有一席之地。从早期对达西·汤普森《论生长与形式》到近期的理论——如斯蒂文·约翰逊提倡的“涌现”理论和史蒂芬·沃尔夫勒姆提及的《新科学》，两者都是关于如何由一系列简单的初始规律生成一个复杂系统的理论。

再看看人们对计算机方法论日益增加的兴趣——编程、参数模型生成及遗传算法、复杂生命系统等以功能为本的生成式技术，我们可以觉察到在一些前卫的建筑学院中出现的一种转变，这种转变也迅速扩展到设计实践中。

虽然计算机科技在一些学校有着决定性影响，成为一种生成工具逐渐使设计文化从“表现文化”转为“过程文化”，但在许多其他的学校，它仍然仅是传统设计方式的重要组成部分。在苏黎士高工，既有马克·安吉利、克雷格·林和哈尼·拉什德这些教师所提倡的数字生成、非线性的形式，也有维多利奥·兰普纳尼和汉斯·科尔霍夫这些教师的正统线形设计。计算机在传统的设计课程中也扮演极为重要的角色。我们在汉斯·科尔霍夫的学生所渲染的一丝不苟的表现图中也可以发现传统设计与最新表现科技成功的结合，形成一种新的视觉表现方法。

站在现在回顾不久之前建筑学院对计算机所持的怀疑态度，并且禁止学生们使用电脑，我们也许可以有所领悟。确实当今许多人对计算机仍然抱有敌意，有人认为现在计算机在建筑领域的新运用只是在呈现一个“幻境”，与现实物质世界和日常生活毫无关联。但这种看法现在已经有些站不住脚了：读过法国心理分析思想家雅克·拉坎著作的人都明白，幻想由我们对现实的认识决定；撇开定义不谈，如果说上述“幻境”成立，那么更荒谬的幻想就是认为每个毕业生都能对软件程序一窍不通便能在当今建筑市场找到一份工作。同时，计算机技术在建构方面对材料性能的分析使原有的非物质化数字世界和现实的建构世界不再有对立和隔阂，取而代之的是一种称为“数码建构”的新领域。

Princeton, UCLA, Angewandte, Yale, ETH Zurich, Rice, MIT and Berlage, while graduates like Hernan Diaz-Alonso, Alisa Andrasek, Ciro Najle and Chris Perry have gone on to teach at schools such as SCI-Arc, Penn, Cornell and Pratt. When we put this record alongside the example of several other schools heavily influenced by these emergent new forms of design, such as the Bartlett, Harvard, Delft, RMIT and Dessau, and even schools in China, such as Tsinghua, we can recognise a network of interrelated and interconnected patterns of thought whose influence extends around the globe.

Today there is a worldwide industry of architectural education, and a clear hierarchy – certainly in students' minds – of the standing of each school. It is not, then, that schools of architecture have lost their influence. If anything their influence is even more dominant in a culture of instantaneous communication and global publishing. The dissemination of ideas is not limited to the voice of one professor in a single classroom. The whole world has become a classroom.

New Paradigms of Thinking

The intellectual ideas that govern these institutions have also mutated over the course of time. In the second half of the twentieth century a shift occurred in many prominent schools of architecture from the utopian technological and social visions of the Bauhaus towards a more overtly philosophical outlook. On the one hand there was the phenomenological school (inspired by the work of Edmund Husserl, Martin Heidegger, Hans-Georg Gadamer, Maurice Merleau-Ponty and others) of inspirational teachers like Dalibor Veseley, Daniel Libeskind and Alberto Perez-Gomez. On the other hand there was the structuralist logic that informed the early postmodernist quest for semiological concerns in writers from Charles Jencks to Robert Venturi and developed into the poststructuralist enquiries into meaning in the work of Jacques Derrida that informed the work of Peter Eisenman and others. This in turn inspired a whole generation of avant-garde work in the late 1980s coming under the name of Deconstruction or Deconstructivism. Whether or not this movement had much in common with the philosophical ideas of the great French poststructuralist philosopher who coined the term 'Deconstruction', Jacques Derrida, it certainly left its mark on architectural education.

With the advent of the computer, however, we can detect a further shift in theoretical concerns. If the 1980s and 1990s were characterized by an interest in literary theory and continental philosophy, the first decade of the 21st century can be characterized by a renewed interest in scientific discourses. It is as though the dominant logic of today has become one of technology and material behaviour. As such, one can detect a waning of interest in literary theories and literary-based philosophies, and an increase in interest in philosophies informed by an understanding of material processes. So it is that just as the work of Derrida is fading in popularity, the work of Gilles Deleuze is becoming increasingly popular. Indeed it has been through secondary commentators, such as Manuel Delanda, that the relevance of Deleuze's material philosophies has been championed within architectural circles.[1] To some extent this can be read as a highly positive development within architectural circles in that the domains of science and technology, for so long neglected at the expense of history and theory and treated as largely positivistic domains, have now been re-appropriated and recognized as offering a highly relevant and rich domain of intellectual enquiry. But it is not just materialist philosophies that have seized the imagination of architectural theorists. So too, scientific thinking itself has begun to find its place in the architectural curriculum, from the early observations of D'Arcy Thompson on growth and form to more recent theories – such as 'emergence', popularized by Steven Johnson, and Stephen Wolfram's discourse of 'A New Kind of Science', both of which deal with complexity emerging from a simple set of initial rules.[2]

If we add to these the developing interest in computational methodology – the possibility of scripting, parametric modeling, and performance-based generative techniques such as multi-agent systems or genetic algorithms – we can begin to define a broad shift that is beginning to appear in certain progressive schools of architecture, which extends into the design studio itself.

Yet, while the computer has become the dominant influence in certain schools of architecture, where it has been developed as a generative tool of design that feeds into this culture of process over representation, it has remained in other schools a highly influential part of more traditional approaches to design. In ETH Zurich, for example, which maintains a pluralistic approach from the curvilinear digitally generated forms of tutors such as Marc Angélil, Greg Lynn and Hani Rashid, to the strict rectilinear orthodoxy of tutors such as Vittorio Lampugnani and Hans Kollhoff, the computer can also play an important role in more

就计算机的影响而言，显而易见，当今没有哪个领域未受这种迅速发展的数字文化影响；同时人类对于数码科技惊人的适应力和掌握能力也逐渐显现出来。人们开始无意识地在使用电脑，就如人们无意识地开车一样。与德国哲学家海德格尔所论断的相反：电脑不会导致人类的疏远，反而成了人类活动的一种延伸；不但不会妨碍人类想象力的发挥，反而扩大了人们想象力的范围。更重要的是，由于电脑可以模拟并由此预测人类的行为，因此设计中的人为因素并不会被减少，反而可以通过电脑使人们更深刻地认识如何进行更人性化的设计。当然，我们也必须时刻明白数字领域的局限性：电脑在一个使用者手中亦不过是一个机械的工具，其本身并不可提供更好的设计方法。同时，人体本身与电脑极为相似，且其复杂精密程度为任何计算机不可比拟。因此，计算机的使用并不意味着我们能做出好的设计；而近年来最糟糕的设计往往都由于滥用计算机造成。过分依赖某些软件和程序设计的结果是设计往往看上去很惊艳，却很难付诸实现。

一方面，计算机这种充满潜力而强大的工具正在给设计过程带来革命，也使建筑学科本身得到充实和拓展；另一方面，电脑也有可能沦为一种极具诱惑力和误导性的工具，设计出浅薄而空洞的建筑。因此，作为教育者的任务就是对这些新数码科技的潜力保持一个开明的态度，同时也对其局限性持批判态度。

尼尔 · 林奇

traditional design studios. Indeed we can see in the extraordinarily fastidious computer renderings of the students of Hans Kollhoff a new form of visual expression emerging that marries more traditional design approaches with the latest technologies of representation.

It seems remarkable now to look back on a time – not so long ago – when computers were treated with suspicion and banned from the studios of some schools of architecture. Indeed, to this day a certain antipathy towards the computer can still be detected. It is argued by some that the computer somehow presents a 'fantasy' domain, abstracted from ontological reality and the materiality of everyday life. But such an outlook has become highly contested. Aside from the fact that anyone who has read the works of the French psychoanalytic thinker, Jacques Lacan, will understand that fantasy is constitutive of how we see reality, surely the greatest fantasy is to think that any graduating student could find employment in the contemporary architectural market place without a thoroughgoing understanding of certain software programs. Moreover the increasing use of the computer to understand the tectonic properties of materials has displaced the old opposition between the immaterial world of the digital and the material world of the tectonic and replaced it with a new culture of 'digital tectonics'.[3]

In terms of the impact of the computer in recent years, what has become abundantly clear is that there is scarcely any domain in contemporary existence that is unaffected by this fast developing digital culture. But what has also become evident is the astonishing capacity of human beings to adapt to and assimilate to digital technologies. Human beings have begun to operate unselfconsciously through the computer, just as they drive through their cars. Far from being a source of alienation, as many who followed the thinking of German philosopher, Martin Heidegger, had once claimed, the computer has established itself an extension to human operations, so that it constitutes not an impediment to the human imagination, but a powerful prosthetic device that increases its range of possibilities. Moreover, through its capacity to simulate and therefore predict human behaviour, the computer has shown that, far from compromising the human element in design, the computer can actually facilitate our understanding of what it is to be human. Nevertheless we must remain constantly vigilant to the limitations of operating in a digital domain. For the computer is nothing more than a relatively dumb tool in the hand of the operator. In and of itself it does not guarantee a better way of designing. Moreover, the human body itself serves as an analogue form of computer that is surely far more sophisticated than any digital computer could ever be. The use of the computer is no guarantee of quality of design. Indeed uncritical use of the computer has produced some of the poorest designs in recent years. All too often the over-reliance on particular software programmes has generated projects which appear superficially impressive, but which do not translate easily into a language of physical construction.

On the one hand, then, the computer offers a potentially powerful tool that is revolutionising the design process and expanding the discipline of architecture itself. On the other hand, it can be a seductive and often misleading tool that produces superficial and meaningless designs. The task for all educators, surely, is to be open-minded towards the potentialities of these new digital technologies, and yet also critical of their shortcomings.

Neil Leach

[1] See Manuel Delanda, *War in the Age of Intelligent Machines*, New York: Zone Books, 1992; *A Thousand Years of Nonlinear History*, New York: Zone Books/Swerve Editions, 1997; *Intensive Science and Virtual Philosophy*, New York and London: Continuum, 2002.
[2] D'Arcy Wentworth Thompson, *On Growth and Form*, New York: Dover Publications, 1992; Steven Johnson, *Emergence: The Connected Lives of Ants, Brains, Cities and Software*, London: Penguin, 2001; Stephen Wolfram, *A New Kind of Science*, London: Wolfram Media, 2002.
[3] See Neil Leach, David Turnbull, Chris Williams (eds.), *Digital Tectonics*, London: Wiley, 2004.

非线性建筑探索

20 世纪建筑思想理论系统的演化

如果我们把20 世纪西方建筑思潮及理论看作一个系统，每一种建筑思潮及理论即为组成系统集合的元素，那么，我们就可以用系统论的观点来看待20 世纪西方建筑思想理论系统的演化。这一系统的简明发展过程可表示为：

19 世纪末：古典复兴，折中主义，浪漫主义；
一次大战前：美国的芝加哥学派，英国的工艺美术运动，法国及比利时新艺术派，维也纳分离派，意大利未来主义，德国制造联盟；
一次大战后：风格派，表现派，构成派，立体主义；
20年代至60年代：现代主义；
60年代至90年代：后现代主义，新现代主义，解构主义；
90年代以来：欧洲理性主义，建筑现象学，极少主义，古典复兴，波普主义，巨构建筑，行为建筑学，模式语言，洛杉矶前卫建筑，日本实验建筑；
生态建筑思想，地区主义建筑思想，建构理论

从上述思想理论发展过程可以看出，20 世纪建筑理论系统的演变遵循“系统进化规律”，并符合“系统演化一般图式”。“系统进化规律”指系统进化的标志是从一种旧的稳定化结构演变为另一种新的稳定结构，而“系统演化一般图式”可表示为：稳定的原结构——原结构的失稳——稳定的新结构。

从19 世纪末西方稳定的形式风格体系失稳，到20 世纪20 年代现代主义建筑的产生，这段建筑历史明显地是系统演化的一次完整的循环。如果把19 世纪末的建筑历史看作“稳定的原结构”，一次大战前后建筑思想的多元现象则是原结构失稳后无序化的表现，而20 年代产生的现代主义建筑体系显然可以称作新的稳定结构。当现代主义建筑思想成为主流并统治了世界近半个世纪后，现代主义建筑作为稳定的理论体系成为需要进化的原结构，后现代主义建筑首先对其进行发难，紧追其后，解构主义建筑及新现代主义建筑以不同的策略也对现代主义进行否定，现代主义建筑体系重蹈失稳离析的命运，历史又一次重复多元化的思想时代。20 世纪90 年代至今，广谱多元的建筑思潮经过了异彩纷呈之后，逐渐向着生态、地区、建构等几种有生命力的建筑思想集中，按照相同的系统演化规律，从60 年代现代主义的失稳到今天思想理论的多元共存，理论系统发展的历史轴线分明又指向了某一新的建筑理论体系，这一新的稳定的理论体系是什么呢？

换一个角度，若把注意力集中在90 年代以来的思想理论多元化现象上，我们又能发现，这一历史的横断面，呈现出远离平衡态的动态稳定化状态，它正符合耗散结构的特点，如果用耗散结构理论来分析它，似乎不难看到这一多元化建筑时代的明天。

耗散结构理论的核心是：一个远离平衡的非线性开放系统通过与外界交换物质、能量和信息，当控制参量超过某一阈值，系统可能失稳，通过涨落，由无序状态转变为有序的新状态[1]。

当今自然科学及人文科学的成果日新月异，我们把这些成果看成外界的物质、能量和信息，它们与建筑思潮这一耗散结构系统正进行着不断的结合，维持着系统的动态稳定。今天，在这众多的控制参量中，有一个变量逐渐起到主导作用，具有强大的能量，试欲主宰这种交流，导致多元系统失稳，从而推动多元系统走向一个新的有序状态，产生新的稳定结构。

这一变量便是以信息社会为背景的计算机技术的迅速发展及壮大，由于计算机强大的运算能力，人类开始对非线性的复杂现象及系统进行研究并试图全面掌握其规律，这一人类的新举措同样影响到建筑领域，非线性科学理论以及计算机技术在建筑设计上的运用，形成了非线性建筑理论以及该理论指导下的非线性建筑探索。

非线性建筑探索

非线性建筑探索是上世纪60 年代发生的非线性科学理论（即复杂科学理论）在建筑设计上的反映，受到模糊理论、混沌学、耗散结构理论、非标准数学分析等学科的启发；同时在思想上以20 世纪哲学家吉尔·德勒兹的去中心学说及相关哲学思想为武器；但最重要的技术手段在于依靠计算机强大的运算能力解决各种综合性复杂问题，包括分析影响参数，图解统计分析结果，生成建筑形体，选择多样结果，控制数字化机床，制造建筑构件，指导建筑施工等等。60 年

Non-Linear Architectural Exploration

The Evolution of Architectural Theory in 20th Century

If we were to view the architectural theories of 20th century as a system, each theory would be an element out of which the system of architectural theory is composed. We can then use Systems Theory to study the evolutionary development of architectural theory in 20th century.

The development of architectural theory can be divided into several distinct stages :

***Late 19th Century**: Classical Revival; Eclecticism; Romanticism*
***Before World War 1**: The Chicago School; Arts and Crafts Movement; Art Nouveau; Viennese Secession; Italian Futurism; German Werkbund*
***After World War 1**: De Stijil; Expressionism; Constructivism; Cubism*
***1920s-1960s**: Modernism*
***1960s-1990s**: Postmodernism; New Modernism; Deconstructivism*
***Since 1990**: European Rationalism; Minimalism; Classical Revivalism; Popular Architecture; Megastructure; Japanese Experimentation; LA Avant-Garde; Phenomenology; Behavioural Architecture; Pattern Language; Ecological Architecture; Regionalism; Tectonics.*

From the above list, we can see that the evolution of architectural theory in 20th century corresponds to 'the regulation of a systematic evolution' and 'the general pattern of a systematic evolution'. The regulation of a systematic evolution means that the characteristics of the system's evolution are that of an old stable structure developing into a new stable structure. Its general pattern can be expressed as follows: old stable structure — loss of stability — new stable structure.

The period from the Classical Revival, Eclecticism and Romanticism of the late of 19th century through to Modernism in the 1920s can be regarded as a complete cycle of systematic evolution, if the former can be thought as an old stable structure and the latter as a new stable structure. Similarly, having developed, Modernism becomes an old stable structure that dominates the architectural world for nearly a half century. It too becomes subject to evolutionary processes. Postmodernism first attacks Modernism, and then Deconstructivism and New Modernism also challenged Modernism in different ways. Modernism is virtually isolated, and loses its stability. Architectural history therefore repeats itself, and enters a period of diversity. Since the 1990s a number of colourful architectural theories have emerged, and in fact the system has reached a stage of 'loss of stability'. According to the same principles of systematic evolution, the system will develop into a new stable structure. The development of architectural history suggests that today there should be a new theoretical paradigm. What, then, is to be the new stable structure of architectural theory?

From another viewpoint, if we focus on the theoretical pluralism that has has existed since the 1990s, we could also find this historical period demonstrating a 'dynamically stabilised status' which is far from a state of equilibrium, and consistent with the characteristics of a 'dissipated structural system'. If we use Dissipated Structure Theory to analyse this historical period, it is not difficult to predict the future of architecture.

The core idea of Dissipated Structure Theory is that a non-linear system (a dynamically stabilised status) which loses its stability can develop a new stable status by exchanging material, energy and information with the outside world, when one of control parameters exceeds its threshold.

If we view the results of research emerging today in the arts and sciences as a system of material, energy and information interacting with the architectural world, we can see how these might combine with the system of architectural theory to develop a dynamically stabilised system. Out of this research, one particular variable begins to play an increasingly leading role, until it has sufficient power to dominate exchanges. And it is this that might provide the system of architectural theory with a new stable structure.

This variable in question is the rapid development of computer technology in our Information Society. It is because of the increasing capacity of computer processing that people have begun to look to non-linear complex systems and phenomena in order to fully comprehend its behaviour. This work has also had

代，当复杂科学理论建立时，就有建筑师把它运用在建筑上，试图改变设计方法，但是因为缺少有效的计算手段而流产，以至于80年代还有人写书讽刺这种建筑的理性行为，但没想到的是90年末，这种科学的建筑设计方法迅速地在世界各地蔓延，主要功劳应归功于计算机技术的发展。

非线性建筑设计探讨了褶子的世界，在这个世界中，时间和空间随着物质的折叠、展开和再折叠而形成[2]，物体是在由内向外及由外向内的双向折叠中形成的，因此，物体本质上没有内外之分，外观是物体自组织的体现。这一观念打破了欧几里德几何的传统空间概念，展现了一个动态运动中时空共存的流动世界。

非线性建筑设计是对游牧空间的瞬时定格取型，游牧空间对应于矢量状态空间而言，在矢量空间中的运动受力的牵制，只能在固定点之间运行；而游牧空间是开放的，运动可以在任意点之间发生，变量永远处于变化的状态之中。因而非线性设计追求“平滑”[3]，它是游牧空间的个性写照。

非线性建筑设计强调生成的“过程设计”方法，即重视各种影响设计的参变量的相互作用，并通过分析研究过程，让建筑形态自然浮现，这样将作为结果的建筑转化成了作为“过程”的建筑，体现了自下而上的设计思想。因而生成的结果再也不会有模仿或再现，而具有唯一性。正如德勒兹在《生成》一文中指出，生成总是逃避在场性的“现在”，在某个特定的时点，它既在又不在，这里没有可以独立分隔开的在场和不在场，二者总是在互动和转换的游戏之中[4]。

从本书收录的建筑作品发出一个令人振奋的信息，即学生已经投入到这场21世纪的先锋建筑设计探索之中，这场与21世纪信息技术革命紧密相关的建筑运动方兴未艾，它将走向何方，如何深刻影响人们的生活，目前还不可预测。但是，代表建筑世界未来的学生的行动，以及这场运动背后具有哲学、科学、计算机技术、以及其他多种学科的支持，就这些而言，不能不让人们对这一运动的发展充满信心。

徐卫国

注释：

1. 参见 李曙华. 从系统论到混沌学. 广西桂林：广西师范大学出版社，2002.5
2. 参见 Gilles Deleuze, Translation by Tom Conley. The Fold—Leibniz and the Baroque(The Pleats of Matter). Folding in Architecture. AD, Vol.63 No3/4: 1993,（London: John Wiley & Sons Ltd）
3. 参见 陈永国. 德勒兹思想要略. 安徽师范大学学报，2002.5
4. 参见 同3，又姜宇辉. 超越历史和结构的二元对立. 哈尔滨工业大学学报（社会科学版），2000（3），Vol.12，No.11，P93

an influence on the field of architecture. The application of non-linear scientific theories and computer technologies to the field of architecture has led to the theory and practice of non-linear architecture.

Exploration of Non-Linear Architecture

The exploration of non-linear architecture has been developed out of non-linear scientific theory which is in turn inspired by Blur Theory, Chaos Theory, Dissipated Structure Theory, Non-Standard Mathematical Analysis and so on. At the same time it is also influenced by the philosophy of Gilles Deleuze. But the powerful computational capability of the computer is a further important factor. Today the computer is helpful in solving a range of integrated complex problems, such as the analysis of the design parameters, the diagramming of statistical results, the generation of architectural form, the selection of the diverse results, the control of CNC milling machines, the manufacture of the architectural components, the production of construction information and so on. When scientific theories of complexity were established in the 1960s, some architects tried to use them in order to introduce new design methodologies, but they were hindered by the absence of any effective means of computation. Even in 1980s some theorists were writing books criticising rationalism in design. However, in the late 1990s, scientific design methods began to spread rapidly throughout the architectural world, and it is clear that computer technologies played a key role in encouraging this development.

Non-linear architectural design explores the world of 'the fold', a world in which material is formed in time and space through a continual process of folding and unfolding. An object is formed by bi-directional folding, either inside-out or outside-in, so there is no distinction between inside and outside. The appearance of the object is the representation of its self-organisation. This concept overturns the tradition of geometric space, and reveals a fluid world in dynamic movement.

Non-linear architectural design is a snapshot of nomadic space. Compared with vectorial space in which movement is constrained by forces and only happens between fixed points, nomadic space is open, and movement can occur between any points and is in continuous flux. Movement in vectorial space is therefore striated, and movement in nomadic space is smooth. Non-linear architectural design pursues 'smoothness', which belongs to the world of nomadic space.

Non-linear architectural design places stress on 'process as a design method' and on 'form generatiion'. It emphasises the analysis of the interaction of parameters which affect the design. Through the study of design processes, the architectural form emerges by itself. Thus, architectural design is now concerned more with process than result, which reflects a bottom-up approach to design thinking. The results generated should not be copied or imitated, but remain unique. As Deleuze points out in his theory of 'becoming', becoming is not generated from 'the present'of the presence. In a particular time, it is both here and not here. There is no separate presence and absence, and they are always locked into a process of reciprocal presupposition.

The works included in this catalogue send an exciting message that students from architectural schools around the world have arrived at a new stage of avant-garde exploration. This new architectural paradigm is closely related to the revolution in information technology. And it is still emerging. We cannot know where it will go or how deeply it will affect our lives. But developments in the work of these students who are the future of our architectural profession, as well as developments in philosophy, science, computer technology, and many other disciplines supporting this paradigm, can give us cause for hope.

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