

# ARCHITECTUR MODELLBAU

## 建筑模型

(德) 安斯加·奥斯瓦尔德 编著  
丛立宪 刘微 译



辽宁科学技术出版社



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登记号: 06-2008 第 60 号

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### 图书在版编目(CTP)数据

建筑模型 / (德) 安斯加·奥斯瓦尔德编著; 丛立先, 刘微译. — 沈阳:  
辽宁科学技术出版社, 2008.3

ISBN 978-7-5381-5357-6

I. 建… II. ①安…②丛…③刘… III. 模型(建筑)—设计  
IV. TU205

中国版本图书馆CIP数据核字(2008)第023830号

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出版发行: 辽宁科学技术出版社

(地址: 沈阳市和平区十一纬路25号 邮编: 110003)

印刷者: 利丰雅高印刷(深圳)有限公司

经销者: 各地新华书店

幅面尺寸: 225mm×280mm

印 张: 15.5

字 数: 200千字

插 页: 4

印 数: 1~2000

出版时间: 2008年3月第1版

印刷时间: 2008年3月第1次印刷

责任编辑: 陈慈良

封面设计: 郭浏灵

版式设计: 袁 姝

责任校对: 东 戈

---

定 价: 198.00元

联系电话: 024-23284360

邮购热线: 024-23284502 23284357

E-mail: lkzsb@mail.lnpgc.com.cn

<http://www.lnkj.com.cn>

ARCHITECTURAL  
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TU205/20

2008

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Ansgar Oswald

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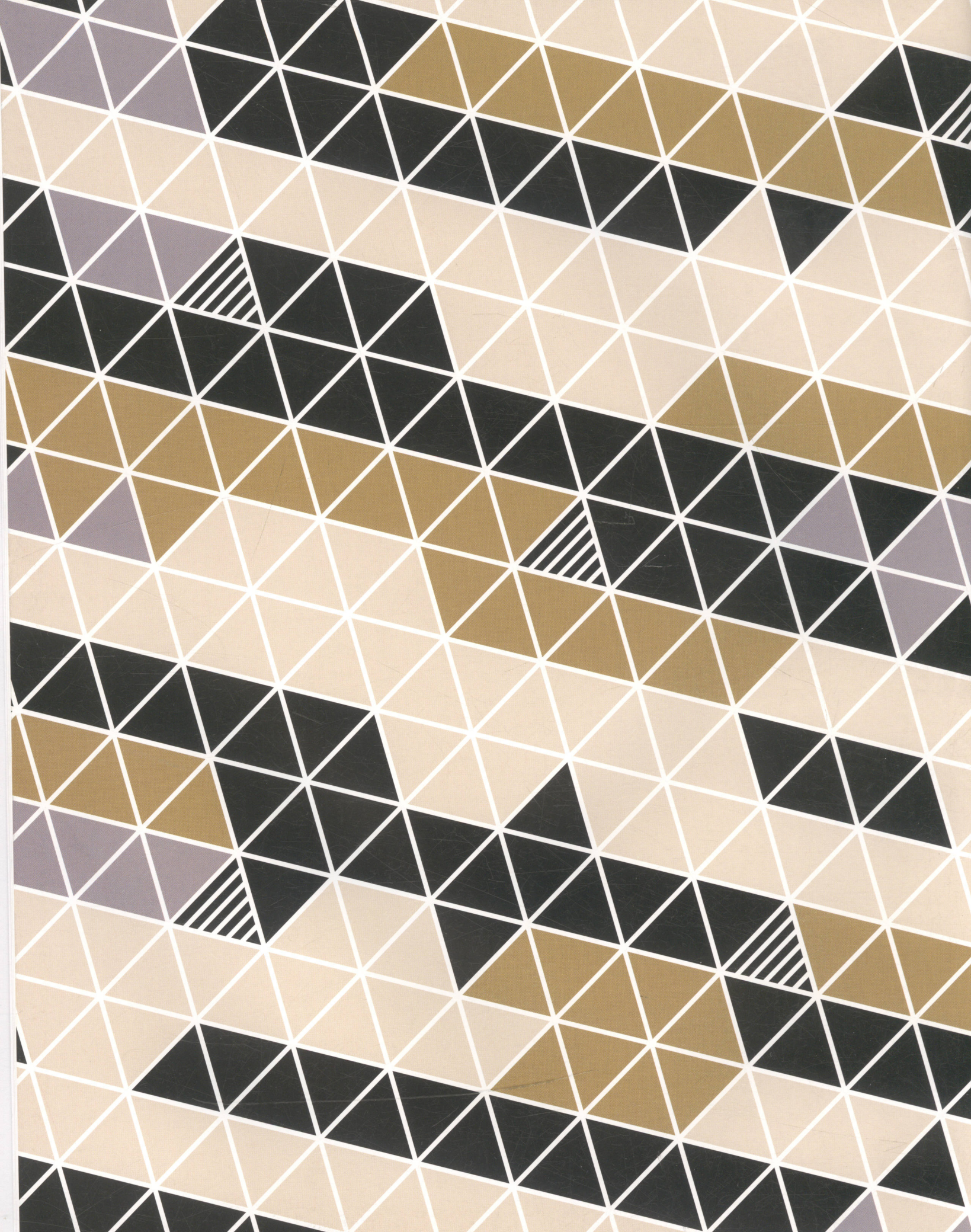
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Ansgar Oswald 安斯加·奥斯瓦尔德

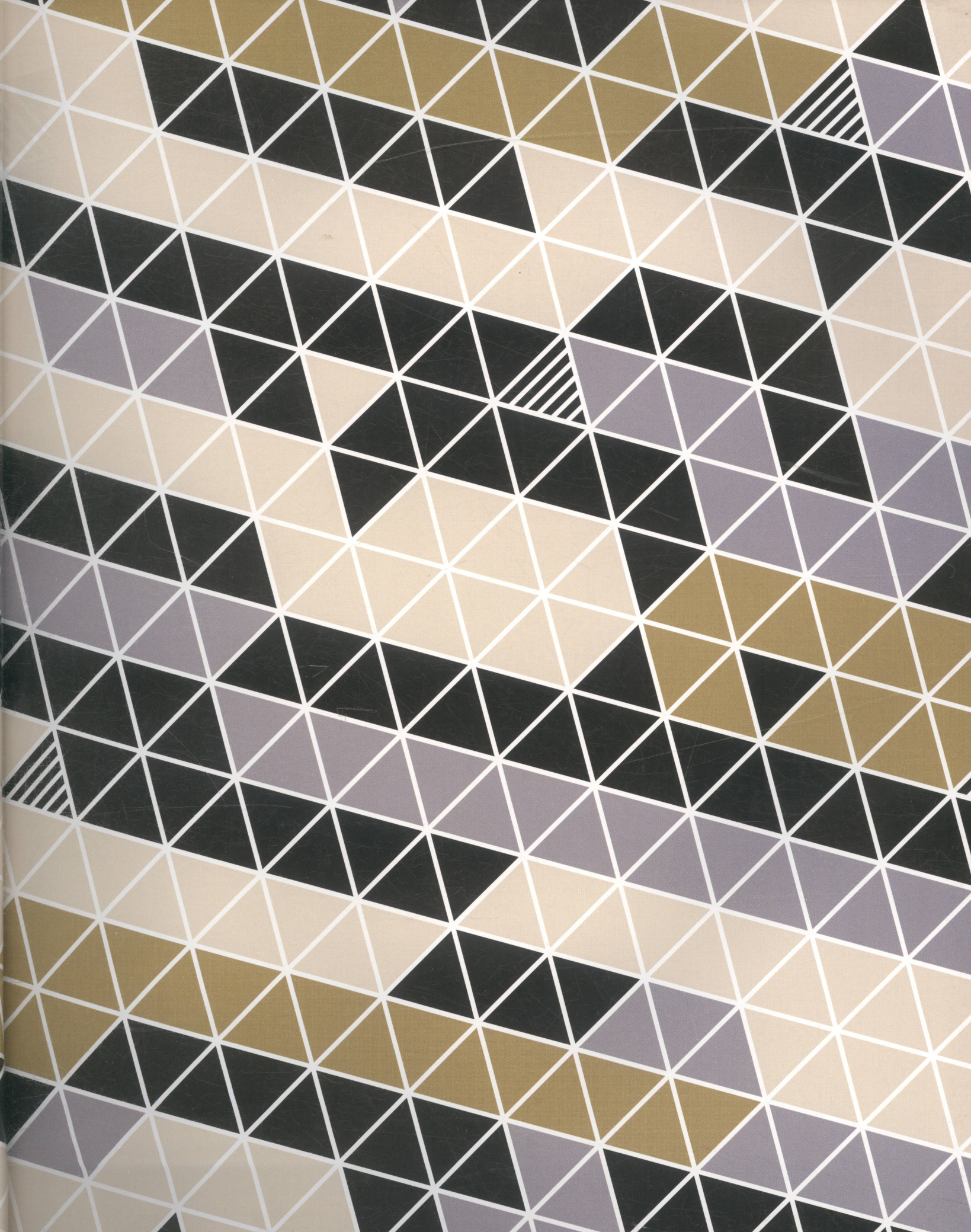
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# The First Structure

## Exploring the Nature of Architectural Models in the Twenty-first Century

### 模型，建筑构造第一步 探索21世纪建筑模型的自然属性

#### Drawings and Models 制图与模型

Change can come silently even when it comes as irresistibly as a force of nature. Change can come in infinitesimal stages, so that it becomes noticeable only when, suddenly, nothing is the way it used to be. This kind of change occurred in the early 1990s, when digital design methods began their conquest of architecture firms and ultimately became the obligatory standard. Suddenly, architects felt that it was legitimate to ask why they should get their hands dirty when models of buildings could be created just as easily in the virtual space of the computer – and when computer models could be rotated in all directions and effortlessly modified if the need arose. Similarly, the value of drawing by hand<sup>1</sup> – a long-standing staple in the canon of design methods – has been called into question since the dawn of the computer age. After all, why bother reaching for paper and pencil when sophisticated Computer Aided Design (CAD) programs are easier to use and offer more versatile options for displaying and processing the results?

No advance in technology has had a more lasting and far-reaching impact on the work of architects and model-makers than the advent of the office computer.<sup>2</sup> This is significant because there is a close professional relationship between architects and model builders. Consequently, this process also affects ideas about what to expect and demand from architectural models – which, like the finished buildings, represent works of utilitarian art which have a practical purpose. Unlike hand drawings – which represent the architect's written notes, as it were, of his impressions and inspirations – architectural models are seldom created by the architects themselves. Architects who wish to present their designs to the public usually order a model from a craftsman who knows how to create a scale model from the designer's drawings.

It is the model-maker who is the first to give a palpable shape to his client's design ideas, and it is the architectural model that first conveys the architect's ideas to the public. Without models, therefore, architectural competitions would be impossible, and without an expressive, three-dimensional representation of the design idea, no architect would ever win a commission. Thus the possibility of using computer animation to turn sketches and designs into virtual models in an apparently infinite space calls into question the validity of the usual procedure of progressing from sketch through design, drawing, and building plan to the architectural model.<sup>3</sup> The virtual model can be changed with a few clicks of the mouse and without adding a single item to the real dustbin. It can be reproduced in many different ways and incorporated into media presentations. A

Master plan for Museum Island, Berlin  
Wooden model, 2001

Photo: David Chipperfield Architects

柏林Island博物馆设计图

木质模型，2001年

图片：David Chipperfield Architects.

1 Cf. Jonathan Andrews, *Hangezeichnete Visionen. Eine Sammlung aus deutschen Architekturbüros*, Berlin 2004.

2 Philipp Meuser, *Fliegende Bauten*, in *Berlin-Stadtmodelle*, ed. Senatsverwaltung für Stadtentwicklung, Berlin 2001, p. 12.

3 Cf. Christian Gänschirt, *Sechs Werkzeuge des Entwerfens*, in *Entwerfen: Kreativität und Materialisation*, Thema 4, no. 1, (1999), [www-1.tu-cottbus.de/BTU/Fak2/TheoArch/Wolke/deu/Themen/991/Gaenshirt/gaenshirt.html](http://www-1.tu-cottbus.de/BTU/Fak2/TheoArch/Wolke/deu/Themen/991/Gaenshirt/gaenshirt.html) (9th March 2007).

virtual model represents an ideal portfolio for creating a haptic, three-dimensional impression of a construction project. The design, the plan and the model are all derived from the same data record. But architectural practice is not the only thing that has been revolutionised by computer-based design. The continual advances in computer science may also have changed our perceptions of workshop-built architectural models.

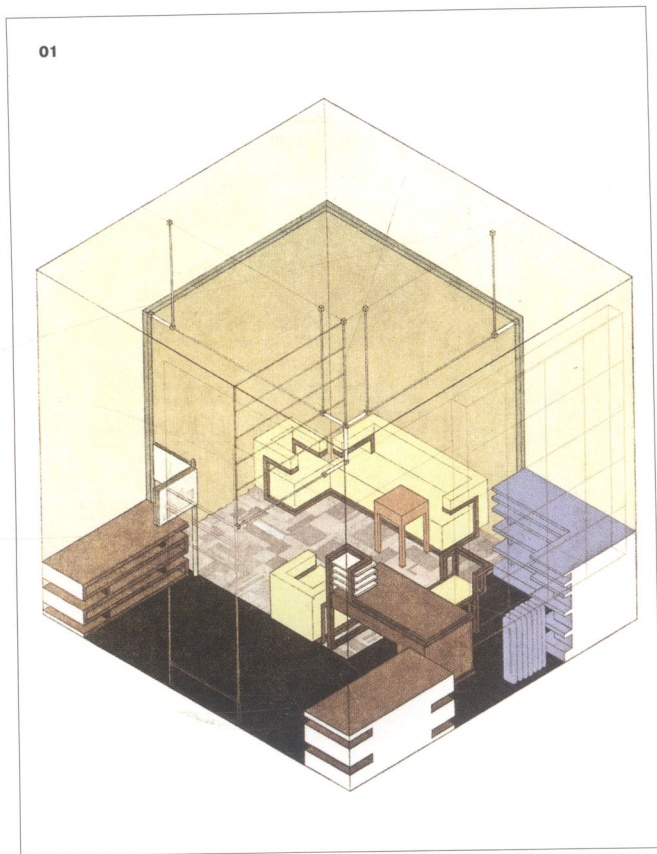
If this is true, one must ask where this change originated – and this question cannot be answered without examining the origins and purpose of three-dimensional architectural models in the design process. We must explore the intrinsic nature of the three-dimensional building template in order to detect the influences and changes which define its status in construction planning today. The technical possibilities in today's design processes and their interrelationships may have

been predetermined by the intellectual projections of Modernism – the art and architecture movement at the turn of the twentieth century which by its very self-definition aimed to break free from everything that had gone before and to embrace something entirely new. In other words, this was a movement which not only displayed an intense focus on geometry and colour as fundamental design elements, but which also changed the contemporary laws of construction by using the physical laws of space and time, the infinite size of space, and motion as the fundamentals of its style and as ornamentation for a new, functional architecture.

The scientific discoveries that underpin these stylistic features are linked to epoch-making changes in the edifice of theory and the self-image of architecture and the city. Modernism, which is linked to such famous names as Frank Lloyd Wright, Le Corbusier, Walter Gropius, Erich Mendelsohn and Ludwig Mies van der Rohe, has left its stamp on the makeup of our architectural surroundings to this day. Significantly, this new way of thinking initially manifested itself not in the building industry, but in the fine arts of sculpture and painting. The new perspectives and the building methods that developed from them were tested mainly in drawings. Here the members of the De Stijl group of artists

played a decisive role. Their clear, geometrical projections of form and colour into endless space influenced the architectural avant-garde, and especially the Bauhaus movement.

改变会悄无声息地出现，一如无可抵抗的自然力一样。改变会在极其微小的场景中发生，因此，当事物与原来突然有所不同时，改变才会为人们所注意。20世纪90年代早期，这种改变出现了，那时数字设计方法开始征服建筑公司并最终成为强制标准。应该说，任何一次技术演进所带来的影响都没有办公计算机的出现来得持久并影响深远。第一个为客户的设计理念要求提供明显形态的，是模型制作者；第一个把建筑师的理念传递给公众的，是建筑模型。因此，没有建筑模型，建筑竞赛就无从谈起；相应地，没有一个富有表现力的三维设计理念展示，就没有建筑师会赢得一份委任。在计算机的帮助下，从设计图到实际模型的实现，会变得更为容易，构思、设计和模型都可以由同一数据记录来操控。依托计算机进行设计不仅引起了建筑实践方面的变革，而且，计算机科学的持续进步也会改变我们对于车间制作建筑模型的理解。





## Models as Construction Templates 构造模板的模型

However, these spatial perspectives of depth were not entirely new. When, in computer animations by the Israeli designer Michael Levy, lines change into perspectives, combine to form grids and planes, and ultimately give rise to spaces and solid bodies to the accompaniment of John Coltrane's jazz album *Giant Steps* (2004), only to dissolve again into the construction grid, the technical steps involved in the process reveal not only the stylistic methods of the schools of New Functionalism. Rather, what the animations show is a digital version of a method of representing objects using a vanishing point and horizontal line which has been in use since the fourteenth century. Just as Early Renaissance drawings broke free from the flatness of the page by representing reality as it appeared to the eye, and just as they acquired space and depth with the aid of functional lines of projection following the laws of geometry, so these construction patterns became ornaments and art in their own right during the twentieth century. In the computer age, it is the coordinates of an image that constitute its crucial elements, while hand-drawn designs have become works of art and models at one and the same time.

In Levy's animation, the line is the fundamental element of every built structure – and even of the city as a whole, which is represented as a conglomeration of geometrical modules which at the end of the animated performance collapses into a myriad crystals. Thus the computer projections are an affirmation of a tenet that has been taught since the Early Renaissance – the tenet that the line is the basic motif of all being. At the same time, the projections refine and perfect this tenet, so that the structural elements, their results, and their decay back to their original state combine to form a closed system – a work of art. Additionally, the design possibilities appear to be infinite, just as the space displayed on the monitor is devoid of physically measurable dimensions. Everything is done with number scales and projections in which the drawing becomes the design, the design becomes the model, and the model becomes reality – a reality in which the real and the virtual world intersect and invite the viewer to embark on a seemingly endless journey through space and time. In the computer-generated images, investors, building control officials and citizens alike can experience the virtual building almost as a real-time edifice. This does not constitute an epoch-breaking event. However, what is new is the stringency with which technology perpetuates traditional elements within a reduced language of form, converting them into three-dimensional images which can hold their own against physical architectural models in today's design processes. Thus the constructed world inhabits a space beyond the dimension of the physically palpable, but also lays claim to the status of having been created with finite reality in mind.

Today's computer technology can bring to the computer screen fantastic new worlds which are completely indistinguishable from real-life environments. Elements that do not yet exist can be inserted into a photorealistic background which eliminates the dimension of time. And so the real becomes virtual and the virtual becomes real. No physical model that reflects a planned reality can rival these virtual models for authenticity. But the visual expectations created by these virtual reality images pose a challenge for today's architectural models and their possibilities.

### 01

View of Gropius's office in the Weimar Bauhaus, 1923  
Walter Gropius (design)  
Herbert Bayer (isometric projection)  
Source: Bauhaus-Archiv, Berlin  
魏玛Gropius办公室视图, 1923年  
Walter Gropius (设计)  
Herbert Bayer (等量工程)  
来源: Bauhaus-Archiv, 柏林

### 02

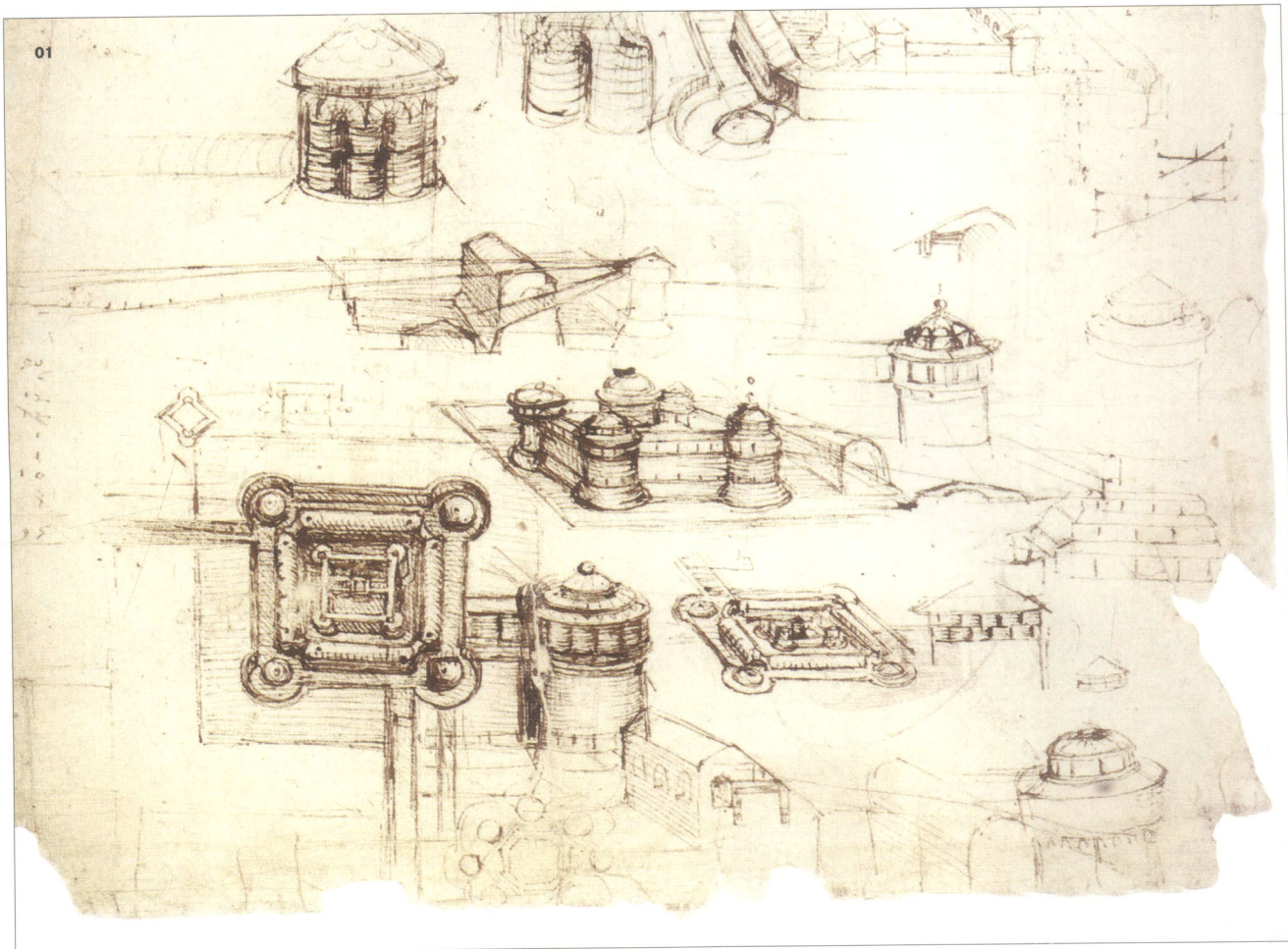
DomAquaree, Berlin, 2002  
Computer animation  
nps tchoban voss Architekten BDA

柏林 DomAquaree, 2002年  
电脑动画效果图  
nps tchoban voss Architekten BDA





在计算机时代，电脑是构成图像不可或缺的，就像手工绘制在艺术和模型制作工作中一样重要。今天，电脑技术可以在屏幕上展现出现实生活中不可能出现的奇异世界。现实中不存在之物可以忽略时间背景地面放入影像世界。真实即是虚幻，同时虚幻也是真实。没有一个现实模型比得上这些影像模型更能确实地反映出设计的真实。但是虚幻影像呈现出的视觉预期也给今天的建筑模型以挑战。为了与这些数字构成的影像竞争，出现了样式丰富的建筑模型以迎合观众习惯的、被惯坏了的观赏水准。屏幕上的三维立体图像诱人至极。当这些成为评价手工模



型的标准时，模型制作承受着添加特殊元素背叛传统的制作方法的诱惑。事情已十分紧迫，当考虑到这种数字和手工设计原则的冲突在创作早期的手工绘画时代就已产生。

## The Model – Idea as Matter 实质的模型理念

This conflict is a real one even though it has become clear beyond any doubt that the use of computer tools cannot compensate for a lack of drawing skills. On the contrary, the gift of putting a design idea onto paper with a few pencil strokes is a prerequisite for the draughtsman's sensitivity which is indispensable for placing a unique creative stamp on designs created from the menu options of sophisticated computer programs. The art of drawing is the ability to capture on paper what the senses perceive of the atmosphere of an environment or object, just as a writer or a musician takes notes to create a permanent record of inspirations gained from particular experiences. »The drawing is the language of the architect«<sup>4</sup>, wrote Peter Conradi, the former president of the German Chamber

4 Peter Conradi, introduction to Handgezeichnete Visionen, by Jonathan Andrews, p. 7.

5 Quoted from Andrews (see note 1), p.10.



of Architects, quoting Vincenzo Scamozzi. In his treatise *L'idea dell'architettura universale* (1615), the influential architect and theorist describes »the sketch as the germ cell of the design which reveals the creative skills of its author.«<sup>5</sup>

Transferring these principles from hand drawing to model-making, one may postulate that the ability to convert a design into a preliminary construction/working model made of physical materials is a prerequisite for developing that unprejudiced clarity of vision which enables the architect to visualise the projected building. And this ability is indispensable for learning to assess and evaluate one's own designs.

In contrast, virtual reality blurs the relationship between design and matter and visibly interferes with sensory perception in that it tempts the observer to view the graphical image as the material representation of an idea. Hand drawing and manual model-making, however, are similar to writing: Using typographical writing systems – typewriters or computers – is difficult without a feeling for the shape of the letters which combine to form words and sentences and which inculcate a sense of their meaning. Applying this principle to architecture, we can say, »Model-making can only be learned by making models.«<sup>6</sup> This art is taught in trade schools and by architecture departments at universities. The practical skills, however, only develop in day-to-day working life. The old adage that practice makes perfect has lost none of its relevance.

While hand drawings stand in a causal relationship between observation and idea, the causal interactions in the architectural model are between will and deed. Many wonderful ideas were never put into practice because the construction model exposed the idea as illusory. Conversely, many ideas were never put into practice because they were never taken to the stage of the model. For example, Leonardo da Vinci created countless sketches and construction drawings for devices and machines – from lathes and cranes to vehicles and mechanical flying machines. However, because no models were ever made to determine whether his construction ideas would actually work in practice, the drawings remained what they were at their inception: masterly representations from the pen of an architecture and engineering genius who also engaged in scientific research. Inverting this argument, we may conclude that it is the construction of a model that reveals the will to put an idea into practice.

**To Change the World, First Develop a Pithy Idea** This causal relationship is first documented in the year 1355. Sixty years after Arnolfo di Cambio began the construction of the Cathedral of Santa Maria del Fiore in Florence, there is historical evidence for the commissioning of a wooden model of a building. Although the building was fairly far advanced at this point, the work had been repeatedly interrupted and even stopped entirely between 1310 and 1331. The new construction manager,



## 01

Leonardo da Vinci: Study for a fort with square ground plan, 1500-1505 (?)

Pen and ink, Biblioteca Ambrosiana (Milan), Codex Atlanticus, fol. 120v/43v-a

Source: Biblioteca Ambrosiana, Milan  
Leonardo da Vinci: 研究带广场的城堡设计图, 1500-1505 (?)

钢笔画素描, Biblioteca Ambrosiana (米兰)  
Atlanticus抄本, fol.120v/43v-a

来源: 米兰 Biblioteca Ambrosiana, Milan

## 02

Dome of the cathedral of Santa Maria del Fiore, 1420-36  
Architect: Filippo Brunelleschi

Model of the upper gallery for the top of the tambour, 1507

Design by Il Cronaca together with Giuliano da Sangallo;

execution: Baccio d'Agnolo

Wood, 96 x 73cm

Photo: akg-images

Santa Maria del Fiore大教堂圆屋顶, 1420-36

建筑师: Filippo Brunelleschi

鼓形柱顶部上回廊模型, 1507年

设计: Cronaca和Giuliano da Sangallo

执行: Baccio d'Agnolo

木制: 96x73cm

图片: akg-images

6 Burkhard Lütke, *Modell Architektur Design: Die Lehre vom Architekturmodellbau*, Berlin 2002, p. 11.

7 On the construction of the cathedral of Florence see Andres Lepik, *Das Architekturmodell in Italien 1335-1550*, Worms 1994, pp. 27ff.



Giotto di Bondone, was not an architect and with the Campanile pursued an ambitious project of his own. In 1348, an outbreak of the plague in Florence once again forced an interruption of the work. To make matters worse, construction errors had crept in under a succession of different construction managers.<sup>7</sup> From 1353, when greater progress was made, it became clear that a model was needed to provide an overview of the future of this building, which was destined to be one of the landmarks of the city. The wooden model built by Francesco Talenti marked the beginning of a series of changes to the building plans, which were to give rise to a series of new models as well. This was the dawn of the rational methods of construction planning and management that has become standard practice today.

While this process looks perfectly normal to us today, at the time it was tangible evidence of the epoch-making process of social change that was to become the Renaissance. This upheaval took place at different periods in different parts of Europe. The perception of a cultural break brought about by the rediscovery of the ancient authors long served to perpetuate the concept of the »Dark Ages« even in the history of architecture. However, this idea rightly belongs to the realm of myth. The period after the collapse of the Roman Empire in the fourth century was built upon the cultural heritage of the ancient empire and its learning. Had this heritage not been handed down to subsequent ages without interruption, even the political developments of the following centuries would have been impossible.<sup>8</sup> There was simply no alternative. The time before the fourteenth century had access to ancient thought, thanks largely to the survival of the works of St. Augustine. Both Plato and Aristotle were known and read. However, the period owed its knowledge of the writings of Aristotle and other Greek and Roman authors exclusively to translations from the Arab world.<sup>9</sup> The lively economic and cultural contacts with the Arab/Islamic world also allowed the knowledge of the ancient world to flow into Christian Europe. Thus the cultural era of the Renaissance – itself a child of the Middle Ages – was dependent on certain preconditions. The change in building planning was one of the concomitant developments.

To what extent this change was the result of the reception of ancient Roman building practices remains uncertain. The historical sources provide very little conclusive information, and archaeological research into building planning and construction procedures is still in its infancy.<sup>10</sup> What is as yet completely unclear is the role which architectural models played in the building practices of the Arab/Islamic world based on its reception of ancient European and Near Eastern sciences. The influence of the Islamic world on European building practices is therefore equally unclear; however, the burgeoning trade relations between the east and the nautical republics of Genoa and Venice suggest that some such influence must have existed. In contrast, there is no dispute about the source of the inspiration for architecture as such at any period, including the twentieth century. The best example of this is the (unrealised) monument for the 3rd *Internationale*, which was designed in 1919 by Vladimir Tatlin. The monument resembles the mosque of Caliph al-Mutawakkil in Samarra (852), stripped down to its construction scaffolding and placed into an artificial pose resembling the Leaning Tower of Pisa.

It is almost inconceivable that the Romanesque and Gothic masterpieces of western ecclesiastical

8 Kurt Flasch, *Einführung in die Geschichte des Mittelalters*, Darmstadt 1987.

9 Cf. Markus Hattstein, *Wissenschaft im Islam, in Islam – Kunst und Architektur*, ed. by Markus Hattstein and Peter Delius, Cologne 2000, pp. 54–57.

10 Cf. Lepik (see note 7), pp. 3f.

11 Ibid., p. 2 and elsewhere.



architecture could have been created without construction drawings and scale models. Our lack of knowledge here can only be explained by problems with the sources and by the negligence of researchers.<sup>11</sup> A recent monograph on architectural models in Italy by Andres Lepik is one of the first to tackle the subject. A historian, Lepik writes about the planning procedures before the mid-fourteenth century that »there can be no doubt today« that »architectural drawings were in continuous use since ancient times«<sup>12</sup> both for design and for execution purposes. However, the only thing we know for sure about architectural models before the mid-fourteenth century is that scale models were not used during the design phase. There is evidence for the use of two-dimensional representation and modelled stencils as well as the so-called *paradeigmata*,

which were used since ancient times for making standardised details of architectural sculpture in original size.<sup>13</sup> This is consistent with our fragmentary knowledge of a continuity between mediaeval workshops and the artists' workshops of antiquity, where both wax and clay models were used. Around the year 1000, the term *module* appears with the meaning of rule, form, pattern and example. The word *módulo* in the Vitruvian sense of half the diameter of a column first appears in the Italian language in the thirteenth century. In the sixteenth century, the word *module* appears in French and English to mean design, architectural model, image or example. But even this etymological knowledge, »despite a wealth of literature on mediaeval building practices«<sup>14</sup> does not constitute proof that scale models were used in architectural planning.

We see from all this that research into architectural models in history is fragmentary at best. The cathedral in Florence is the only piece of evidence supporting our knowledge that architectural models as we know them in construction planning and design today go back to the European Renaissance, which originated in the urban landscapes of central and northern Italy.

**In the Model-Maker's Workshop** In the fourteenth century, the urban republic of Florence was the leading power in central Italy. With its extremely wealthy and highly educated upper middle class, the city was predestined to become the germ cell of the Early Renaissance. The combination of an efficient and prosperous trading and financial sector with an unbroken artistic tradition since ancient times also made Siena, Bologna, Milan and the republics of Genoa and Venice – which traded with the Orient – fertile ground for the new cultural era. The economic prosperity of these cities expressed itself in

Vladimir  
Tatlin: Monument for the Third  
Internationale, 1920  
Central House of Artists, Moscow  
Photo: Philipp Meuser (2003)  
Tatlin: 第三国际纪念馆, 1920年  
莫斯科艺术家中心  
图片: Philipp Meuser (2003年)

<sup>12</sup> Ibid., p. 14. On design practices before 1350 see *ibid.*, pp. 11–26.

<sup>13</sup> Cf. *ibid.*

<sup>14</sup> Ibid., p. 4. On planning and building practice before 1400 cf. *ibid.*, pp. 11–20. Also see Ludwig Heinrich Heydenreich, s. v. Architekturmodell, in *Reallexikon zur Deutschen Kunstgeschichte*, ed. Otto Schmitt, vol. 1, Stuttgart 1937, cols. 918–940, at 921.