国外高等院校土建学科基础教材（中英文对照）

建筑模型
MODELBUILDING

[德] 亚历山大·谢林 编著
王又佳 金秋野 译

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序

模型是建筑设计的一种表达方式。因为它能够帮助设计师获得即将建成的建筑环境的空间印象，因此无论是在学习建筑学阶段还是在职业实践中它都是一种重要的表现手法。虽然三维的草图可以传达出空间的印象，但模型则允许观察者以自己的方式选择自己的视角去体验空间。

而且模型也是设计师的重要工具之一——它可以帮助设计师获得正确的比例与形式，同时也可以以三维的方式检验勾画出来的想法，并开始发展他们的理念。模型就是以这种具体的方式为设计与决定过程提供支持的。

这一系列基础教材旨在为第一次接触这一专业与学科的学生提供有益的与实用性的说明。它通过容易理解的介绍与实例来说明其中的内容。在每一章当中都系统地、深入地阐释与论述了其中最重要的原则。这一系列丛书不是编辑了专业知识的宽泛的纲要，而是意在对一个科目作最初步的介绍，并向读者传授必要的、可以熟练操作的专业技术。

这一卷探讨了以模型的形式表达缩小了比例的建筑。模型制作已经成为一种独立的艺术形式，有着自己的工具、技术和材料。因为学生们经常会不得不自己学习制作建筑模型的技术与通常的规则，本书将会介绍一些背景性的知识与实践性的技巧。

除了介绍不同种类的模型、常用的工具与机器设备，我们还将会系统地讨论适合的材料，并以其组合效果的视角来诠释它们。在本书中对于建筑模型制作过程的典型的描述还会包括一些提示与小贴士，它们可以帮助学生在模型制作所提供的多样性机会中受益，并将他们的设计转化成为富于美感与表现力的模型。

编者：贝尔特·比勒费尔德

FOREWORD

Models are a way of representing planned structures. Since they help create a spatial impression of what will become the constructed environment, they are an important means of presentation both while studying architecture and in professional practice. Although three-dimensional sketches can convey a spatial impression, models allow viewers to choose their own perspective and experience space in an individual way.

But models are also an important tool for designers – one that helps them to arrive at the right proportions and form, as well as to review sketched ideas in three dimensions and to develop their ideas in the first place. In this very concrete way, models provide support for the design and decision-making process.

This "Basics" book series aims to provide instructive and practical explanations for students who are approaching a subject or discipline for the very first time. It presents content with easily comprehensible introductions and examples. The most important principles are systematically elaborated and treated in depth in each volume. Instead of compiling an extensive compendium of specialist knowledge, the series aims to provide an initial introduction to a subject and give readers the necessary expertise for skilled implementation.

This volume examines scaled-down representations of buildings in the form of models. Modelmaking has become an independent art form with its own tools, techniques and materials. Since students are often forced to learn the techniques and general rules of model building on their own, this book will present background knowledge and practical tips.

In addition to introducing different types of models, common tools and machines, we will systematically discuss suitable materials and explain them with an eye toward their effects as compositions. The description of the typical model-building process includes tips and pointers that will enable students to benefit from the diverse opportunities of modelling and to transform their designs into aesthetic and representational models.

Bert Bielefeld
Herausgeber

THE ARCHITECTURAL MODEL AS A MEANS OF REPRESENTATION

What is modelmaking?

In the early Renaissance in Italy, modelmaking evolved into the most important means of architectural representation. It not only supplemented architectural drawings, but was often the primary method used to convey ideas and depict spaces. Ever since then, architects, engineers and clients have used models to represent designed buildings.

Plans (design sketches such as technical plans) and architectural models are both means of depicting buildings and spaces, yet plans convey only two dimensions. Once the design and the project have been thought out and sketches and details drawn, it is time to tackle the object in space. While it is true that only the finished building can communicate a complete understanding of three-dimensional effects, models anticipate the subsequent construction process. Seen this way, models represent architecture on a smaller scale. Work on models is of great importance, particularly in architectural studies, since students do not usually have the opportunity to build their own designs.

Motivation: why build models?

A model is not absolutely necessary to complete a design or architectural assignment successfully, yet it can be a useful tool in many ways: the model's scaled-down size makes it possible to examine the quality of the design and allows designers to develop a feel for space, aesthetics and materials. The additional advantages of a model include its communicative and persuasive potential: a model helps designers to demonstrate to themselves and others the quality of their ideas or projects. In addition, the model can serve as a control mechanism for assessing the building before it is built.

Working models – three-dimensional sketches

Architectural students are often confronted with the challenges of modelmaking in their first year at college. They quickly see that the models they built as children – trains, planes and ships – have nothing to do with the demands made on them in their studies. The green lawn from their train set is of no interest to professors or lecturers. The toys of childhood are now professional reality.

So how should students proceed? Let us assume they have been given a design assignment and require a model, on a pre-defined scale, that will play an important role in the way their proposed solution is evaluated. Whether they use a model in their design work will largely depend on both how they design and how the design evolves. If the spatial structure is

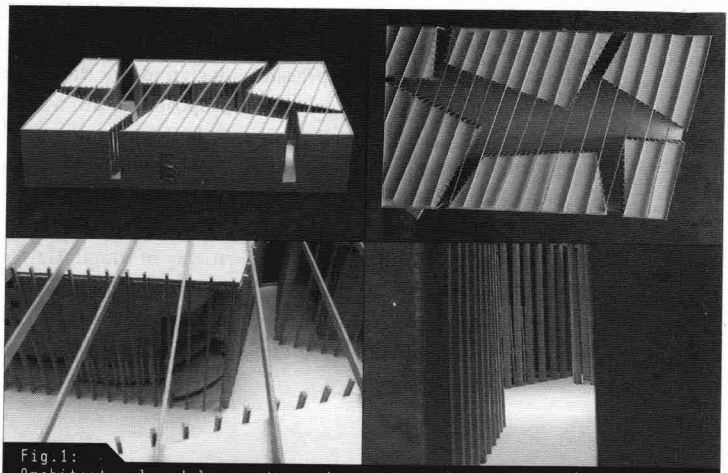

Fig.1:
Architectural models create an impression of spatiality (three-dimensionality), convey an idea of a building structure and the effects of interior and exterior space

of greater complexity than a two-dimensional drawing can represent, a model may be the only way to depict it. Simple models, so-called working models, enable designers to find solutions and test ideas. The ideas that do not work on the model can be rejected.

The working model accompanies the entire design process. Once this process is complete, the goal is then to illustrate the ideas and concepts that are essential for the design. The viewer must be convinced of the feasibility of both the concept and the proposed solution.

\\Hint:
Working models have earned their name because designers can "work" with them. They can, and should, be modified even if that harms their quality. It is therefore best to build a model that is easy to take apart and reassemble. Students can join parts with pins or easily removable rubber cement. Once two parts are glued together, they are committed to a particular form, which is not the purpose of a working model.

\\Tip:
Working models, which support the design process experimentally, can also be used effectively for presentational purposes if they are sufficiently refined. Elements such as building sections and topographic layers should be assembled temporarily both to ensure that the model can be modified and to avoid unnecessary stains and damage during work. Painting at a later stage in the process is an excellent way of enhancing a working model.

Presentation models – portraying and persuading

The presentation model, built with a great deal of effort to be almost perfect, marks the completion of the design process. At universities, this type of model is used to present a design idea – the concept. In architectural competitions, it depicts the proposed solution and competes with the designs of other participants. In both cases, the model supplements the architectural plans submitted. New media are often used to present drawings: three-dimensional computer-generated images provide a very realistic rendering of how the future structure will look. Photo-realistic representations are another modern way of simulating a spatial experience. A model cannot perform all these functions. It always remains an abstraction of the reality it portrays. Its only true function is to translate the sketched idea into three-dimensional form.

\\Tip:
It is always difficult to build a presentation model when under pressure to submit a design. It is often more efficient to make parts of the model in advance or use a site model as both working and presentation model. A presentation model does not need to be perfect or to be made of the very best materials. All that is needed is a very convincing model.

TYPES OF MODELS

Abstraction – the trick of miniaturization

A model is a more or less abstract, miniaturized representation of reality. But what does abstraction mean in modelmaking?

The opposite of abstract is concrete. In painting, "concrete" refers to an object that is portrayed as accurately as possible. In contrast, abstraction as applied to architectural models shifts the focus onto the subject matter, the informational value of the object portrayed and the spatial framework. What is at stake is not an accurate portrayal of reality but a process of simplification, which guides the eye to the model's essential features. It is crucial to find a suitable form of abstraction, one that reflects the selected scale. This point can be illustrated using the example of windows: on a scale of 1:200, a window is usually portrayed as a precisely cut-out aperture in the surface of the chosen material. On a scale of 1:50, a window is much easier to see. Glass is reproduced using a transparent material, and the window frame is built of small bars. Another example is façade cladding: on a very small scale, it cannot be depicted at all, but in larger models this element has greater relevance and is included in the design. The façade can be simulated very realistically using the right material.

Relationship between scale and representation

At the very start of a project, modellers must select the scale of their models. The dimensions in which an architectural object can be represented illustrate the role that scale plays. Depending on the scale and level of abstraction, there exist a number of model types, which will be explained below.

CONCEPTUAL MODELS (WITHOUT A CONCRETE SCALE)

A spatial pictogram can generally be described as a conceptual model. Here, the underlying idea of a design or a creative concept is depicted in an

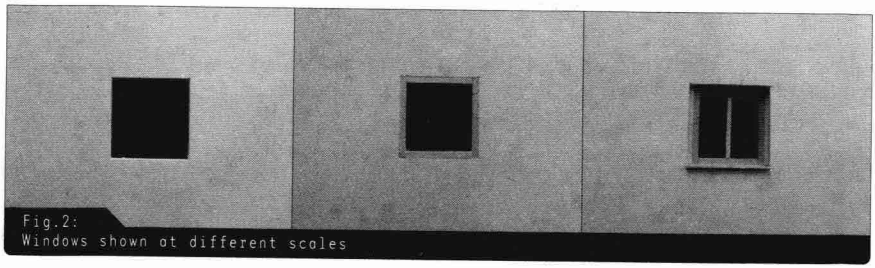

Fig.2:
Windows shown at different scales

\\Example:
Try to reproduce the character and feel of surfaces in miniature. Rough or grainy surfaces can be simulated by sanding or "keying" cardboard and wood.

Structures can be simulated as follows:

- Wooden cladding can be reproduced using small pieces of wood that imitate the real design.
- Brick façades are simulated by cutting joints in the surface of the material.
- Supports and beams can have the same shape as in reality.

entirely abstract manner as a three-dimensional object (e.g. using a metaphor as a basis). Material, form and colour highlight structures and create compositions. The model can, for instance, be used to visualize the results of urban space analyses at the start of the design process. By exploring a theme or place on a spatial yet abstract level, architects can alter or improve the view of that place. A model can support this approach.

URBAN DESIGN AND LANDSCAPE MODELS, SITE AND TOPOGRAPHY (SCALE 1:1000 / 1:500)

This type of model represents urban or natural environments. It is the first step in the representation process, since it shows the relationship

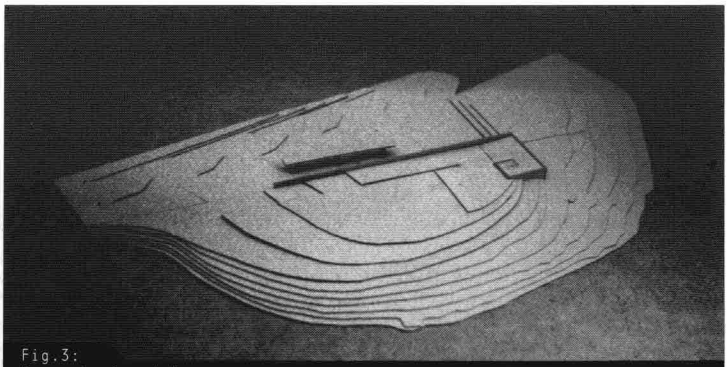

Fig.3:
Conceptual model

with the existing environment. In urban space, it is important to show how the context changes with the addition of a new structure.

This type of model is characterized by the highest level of abstraction. Buildings are reduced to "building blocks" – to abstract structures that reproduce building form and three-dimensionality in a highly simplified manner. Even so, the model includes the characteristic features of buildings such as recessions, projections, bay windows and roof designs. In its abstract form, the site – the scaled-down landscape – is simplified and depicted, in the chosen material, as a level plain. If the landscape slopes, it can be broken down into horizontal layers that are stacked on top of each other in the model.

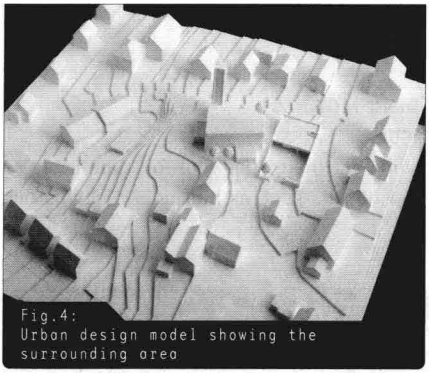

Fig.4:
Urban design model showing the surrounding area

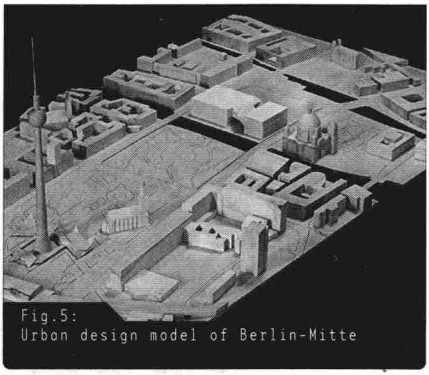

Fig.5:
Urban design model of Berlin-Mitte

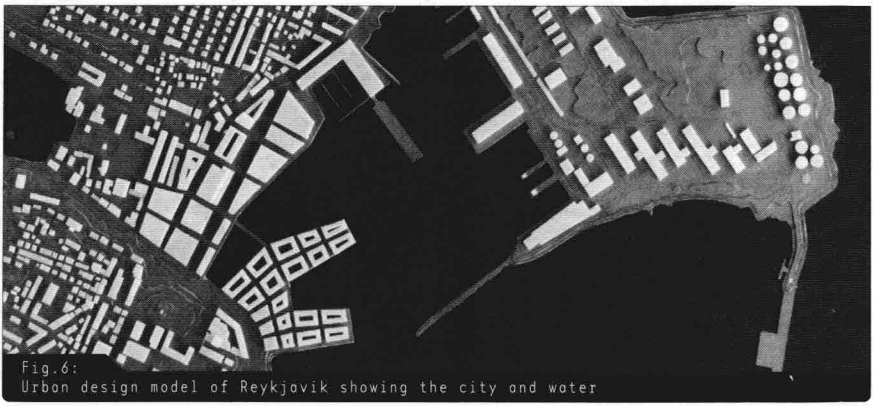

Fig.6:
Urban design model of Reykjovik showing the city and water

Raised-relief models

If the model is meant to reproduce uneven landscapes, the first step in building it is to conceive of the irregular natural terrain as a stack of horizontal layers. The more finely layered the material, the more precise and homogeneous the resulting model will be (width of the elevation layers: 1.0 mm or 2.0 mm). The work is based on a plan that shows contour lines or, at least, provides information on elevation. Once the real topographic situation is known, contour lines (curved, straight or polygonal) are drawn. Depending on the material, the modeller can cut out each layer with a utility knife or saw before arranging the layers on top of each other.

Insert models

A single assignment might include several designs, and urban design models are often constructed as "inserts" or group models to reduce the amount of work required to present them. Only one model of the surrounding area is made, and each participant is given a mounting board for the section on which he or she is working. This particular section is omitted from the urban design model so that the inserts can be interchanged.

ARCHITECTURAL/BUILDING MODELS (SCALE 1:200 / 1:100 / 1:50)

The building model is a common illustrative tool for simulating an architectural design. While larger objects such as museums, schools and

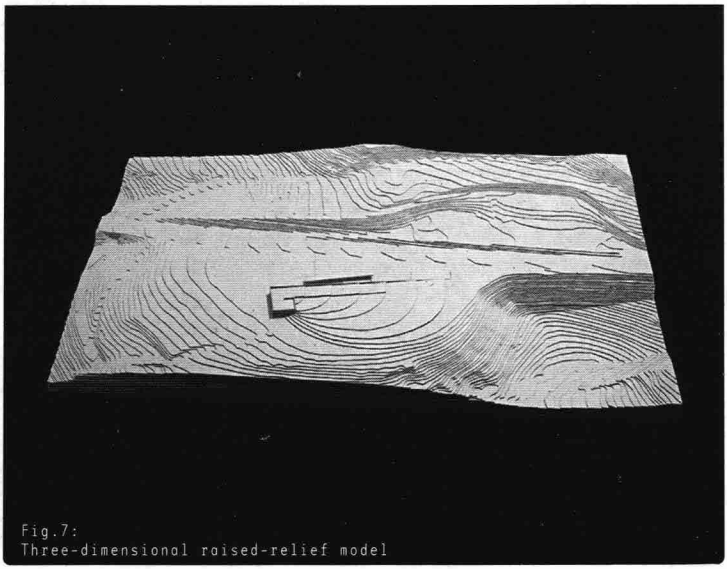

Fig.7:
Three-dimensional raised-relief model