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Book Review

Cornelia Leopold

Geometrische Grundlagen der Architekturdarstellung

3rd ed.

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*Deinde graphidis scientiam habere, quo facilius exemplaribus pictis quam velit operis
speciem deformare valeat.*

Vitruv, *De architectura libri decem*, Bk. I, ch. 1, 4

The visualisation in perspective of buildings and other three-dimensional objects in two-dimensional construction drawings, which can convey a realistic picture of a structure to build, is one of the most important tasks and therefore a special challenge for architects, engineers, designers etc., because of its significance in explaining their ideas and projects to their clients. Admittedly, nowadays these tasks are made easier by CAD software, but nevertheless the drawing made by hand is still part of the basis of competence of any architect etc. The purpose of the book reviewed is to instruct students – of architecture, building engineering, city and environmental planning and related fields – in this discipline and to deepen their knowledge, as the author explains in her preface:

Die hier vorgestellten geometrischen Grundlagen haben einen universellen Anspruch der Anwendbarkeit und werden in diesem Buch exemplarisch an der Architektur aufgezeigt.(...) Die Kenntnisse der geometrischen Grundlagen sowie die räumliche Vorstellungsfähigkeit sind insbesondere bedeutend für computergestütztes Zeichnen und Visualisieren (p. 9).

In her introduction the author points out the significance of drawings in perspective and three-dimensional models as media of communication throughout the whole process of building, starting with the first sketches and ending with the realisation. But while the drawing is needed to show all the details, the model as a three-dimensional object is meant to make the planned object visible at smaller scales and is reduced to the most important parts. The task of geometry here is to provide the language of form that can be understood by all involved persons.

The functions of geometry, important for training the imagination and the intellectual capacity for understanding of space, are defined by the author as follows: 1) as understanding and description of geometric forms, which can be integrated into some system of order created by man: “Geometrie ist ein vom Menschen geschaffenes

Ordnungssystem, um Formen begreifbar und erfassbar zu machen” (p. 12); thus geometry takes over the position of a sensory factor of order; 2) to create methods for the illustration of spatial objects on the level of drawing, for example in perspective drawings such as central and parallel projections, etc.; 3) the reconstruction of geometric properties taken from the picture of the object by methods, which enable the unambiguous conversion from the drawing; 4) as execution of geometric construction of space on the level of drawing; and 5) as method to train spatial imagination and thinking.

In the first part of the textbook the author points out the importance of the drawing as a medium of communication between architects and engineers etc. on one side and their clients on the other side. Especially during the planning process, geometric sketches and drawings enable all those involved to follow all changes and developments, alternatives and details in the designs and drafts. During the process of planning the act of seeing is of crucial importance. The explanations that follow provide a historic retrospective of the development of the medium of drawing from its beginnings. The focus is on the importance of drawings as basis of the planning process, but it is at the same time a historical view onto the development and history of geometry and its methods themselves. The Egyptians were the first to use geometric methods to measure their fields every year after the flood of the Nile or the geometry of space to calculate cylindrical container. From the sixth century B.C. onwards, the Greeks started the scientific survey of geometry – the phrase *geometry* means literally “measurement of the earth”. The author also points out the development of visual perception of space during the various periods of childhood, explains the physical process of seeing in the eye and the origin and meaning of the imagination of space. The first part also involves short explanations of the development of the graphic sign system, which serves as vocabulary for understanding geometrical drawings, and the representation of dots, lines and sides.

Part 2 is divided into several chapters according to the various methods of illustration, starting with the different kinds of projections, like the classical central perspective, and ending with the navigation of a three-dimensional computer model. All the subjects discussed are explained in depth. The clear chapters, which follow each other in relation to their content, make it possible to look quickly and purposefully at each single method, so the reader is quickly informed about geometric constructions such as axonometry, construction of ellipses and polyhedrons, curved surfaces and solid bodies, constructions of silhouettes, encoded projections, and the transferral of these methods into CAD-software programmes. The author also points out explicitly that the use of CAD processes cannot possibly be managed without the knowledge of the classic methods of drawing and illustration – an appeal to the beginning students to study this discipline intensively.

The explanations are supported visually by many detailed and clear drawings made by Andreas Matievits. Other illustrations, such as photographs of contemporary built architecture (by Zamp Kelb, Mario Botta, Renzo Piano, Frank O. Gehry, etc.), incunabulums of architecture (New York, Guggenheim Museum by Frank Lloyd Wright; Marseille, Unité d'Habitation by Le Corbusier; Wichita, Wichita-House and Montreal, USA-Pavillon both by Richard Buckminster Fuller; Sidney, Opera by Jørn Utzon, etc.) and architectural drawings (Philibert de l'Orme, Daniel Libeskind, Gerrit Rietveld, Tadao Ando, etc.) show the wide range of use and provide a vivid presentation of the complex matter. Geometric theorems are marked by exclamation marks and therefore easy to find in case of urgent need.

In the appendix basic geometric constructions are explained and visualised in drawings. The book concludes with a glossary of the conventional sign system, bibliography and index. To sum up: Following the first part with an introduction on the complex social-cultural context of geometry, in circa 250 pages even complicated geometric constructions are explained clearly to students of architecture, engineering and design etc. and help to train spatial sight. Easy to handle – absolutely recommendable as textbook!

About the reviewer

Bettina Marten is an art historian with a special interest on the mutual relationships between art, architecture and mathematics. She was the organizer of the symposium "Fortification in focus – Mathematical Methods in Military Architecture of the 16th and 17th Centuries and Their Sublimation in Civil Architecture", which took place in Dresden 2008. She teaches at the universities of Dresden and Frankfurt am Main.