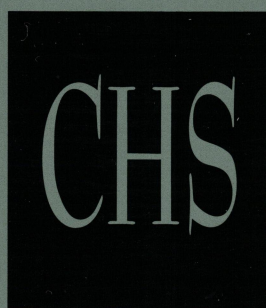


CONSTRUCTION —HISTORY—

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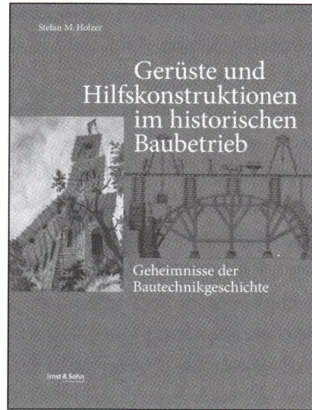
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Gerüste und Hilfskonstruktionen im historischen Baubetrieb. Geheimnisse der Bautechnikgeschichte.

Stefan Holzer Berlin: Ernst und Sohn, 2021

Construction history remains primarily concerned with the processes that bring buildings into being: the development of the design, planning, production of building materials, the application of building technology in construction, and the activities and roles of the people involved. Their study provides the basis for understanding the underlying intentions and concepts, issues of organization and communication, economy and society, and more generally, the history of technology and knowledge. Hence, temporary structures deployed on building sites, such as scaffolding, formwork and cranes, may be considered a core issue of construction history. In some cases, such as domes and vaults, building elements are directly moulded by the temporary formwork. In others – for example, in the erection of obelisks and ashlar bridges – supporting structures can be more technically demanding than the permanent structures themselves. In all cases, such technologies constitute essential boundary conditions for the design, construction, and final appearance of buildings. This is the subject of a comprehensive new book by Stefan Holzer – the title of which can be translated as “Scaffolding and auxiliary constructions in historical building practice”. Stretching over four hundred pages, the study correlates archaeological surveys, pictorial evidence, and historical literature, some of which have never been published before.



The subtitle of the book – “The Secrets of Construction History” – alludes to the fact that such auxiliary structures rarely survive, being temporary by their very nature. Nevertheless, some very few are still preserved – such as, for instance, the scaffolding used in the construction of a seventeenth-century bridge at Grins (Austria). Illustrated in a detailed survey, this survival provides an insight into many of the planning and building practices inherited by early modern builders from earlier periods. In many other cases, from Antiquity to the First World War (which is the chronological scope of the book), the forms of temporary structures can be deduced from the visible traces they left on the built fabric, such as putholes, corbels, and various other marks.

Along with the few material remains, these traces constitute a primary source for the study of auxiliary structures in historical building practice. Buildings are made legible as historical sources by interpreting their fabric from the perspective of building archaeology and architectural engineering. The same perspective is necessary for reading the very rich information contained in pictorial sources and in the technical literature: these are only accessible through careful study, underpinned by a deep understanding of the technologies involved. Modern sources which provide detailed descriptions of scaffolding machines and supporting structures, must still be correlated with material evidence from the buildings themselves, and discussed with regard to their originality and technical relevance. Particularly difficult in that sense are the nineteenth-century publications produced in the context of polytechnic and craft schools, problematic (and sometimes unreliable) as they often contain information from other publications without any references. Reaching back further, to medieval sources, many images are known that show building sites – including scaffolding and cranes – while referring to such biblical themes as the building of the Tower of Babel or the architectural patronage of various ancient figures. The problem that these sources pose for critical discussions has long been acknowledged: that they were never intended as documents of actual construction labour is amply clear. However, these images provide a valuable background for reading material evidence – their correlation with building archaeology and historical technologies providing a new basis for critical interpretation. While this particular task fall

outside the scope of the present book, it will no doubt prove useful to future students of this subject.

The first section of the book is dedicated to working scaffolds: temporary and adaptable structures that facilitated access for the workers and (to some extent) the transportation of materials. These include horse scaffolds, often shown in historical images (where they sometimes appear piled up in several stories reaching alarming heights), putlogs that cantilevered from the wall under construction or were additionally supported by standards, and lastly, free-standing scaffolds. Here, the author underlines the great continuity of practice from Antiquity to the Industrial Revolution. A particularly interesting type of scaffolding dealt with in the book is the so-called antenna scaffold. Described in a number of building treatises from the late eighteenth century, it is already found in a model made by Elias Holl, master builder of the city of Augsburg, in 1614. The detailed analysis of historical models and mock-ups, as additional sources, is a particular merit of this book.

The following section deals with auxiliary structures for the construction of vaults: formwork and centring. Their interest goes beyond the scope of mere scaffolding and support because the characteristics of these auxiliary structures are intrinsically related to the design and geometry of the vaults: here, the conceptual differences between various forms of vaulting are much more pertinent than any sort of technological progress. Another chapter focuses on auxiliary structures for building domes and cupolas: wide spans had to be vaulted at considerable height, causing not only problems with stability, but also with the need to provide access for labour and materials. This chapter provides new insight into some particularly prominent buildings, such as the Cupola of St. Peter's.

Section five deals with transportation devices and cranes. In the devices for lifting heavy work pieces, such as lewis and kerb lifters, reels and treadwheels, the study demonstrates a great deal of continuity between ancient and medieval practice. The technique remained apparently unaltered, except for the fact that on medieval building sites the weights of the building elements to be lifted appear to have been much smaller than in ancient Roman construction, and a tendency to fix cranes to the rising building, rather than next to it, can be observed. The numerous late medieval treadwheels preserved in church attics represent another interesting case study: their construction is described in detail, including a survey of one particularly important example. It has already been suggested that the design of such lifting devices was to a large extent based on the writings of Vitruvius, Heron of Alexandria, Pappos of Alexandria, and of other ancient authors. What this book provides is a nuanced discussion of the relationship between technical prose and building practice.

Another section looks at the rise of rotating cranes, which facilitated the final positioning of heavy building elements by turning the boom together with the vertical shaft around the vertical axis. Although neither the available sources nor archaeological evidence offer an absolute chronology of their occurrence, the general historical trajectory of rotating cranes can nevertheless be traced. Passing through the fascinating story of the "French cranes" of the 17th and 18th centuries, the development that eventually led to the modern rotating tower crane is narrated using technical literature, early modern visual evidence, and historical photographs.

The final section of the book is dedicated to the construction of bridges. What sets this form of construction apart is the fact that its spans considerably exceed those found in most other vaulted structures. Moreover, the loads are particularly heavy, and the structural behaviour during construction is much less beneficial than, for instance, in domes. The need for auxiliary structures to support ashlar arches of great span or height, sometimes with complex geometries (e.g., flat multi-centre arches often employed in river crossings), is one of the recurring themes in early modern building treatises. This chapter provides a critical survey of such works, including a number of hitherto understudied treatises.

In general, the author argues that early modern descriptions and drawings of auxiliary structures and scaffolding can be interpolated for the study of earlier practices. He states that between the Middle Ages and the Modern period, building technology changed only gradually, without major disruptions. He supports his thesis by correlating images and descriptions from these sources with observations on the built fabric from earlier periods. This is convincingly corroborated by archaeological evidence pertaining to a wide range of examples presented in the book, painting a vivid panorama of historical building sites. One could argue that the historical development of science and technology must be manifest in particular situations in the history of auxiliary structures, whose design would be expected to reflect a variety of mechanic theories. Thanks to the comprehensive research presented in this book, that discussion is now open.

Research on the vast corpus of primary sources, technical literature and building manuals, is a great scientific desideratum: studies of specific sources, such as medieval "Lodge Books", or treatises on Stereotomy, have already been undertaken, but overall, the subject remains somewhat anecdotal. This is partly due to the difficulty of studying such sources, which require a thorough insight into the technical issues of construction, structural mechanics and practical mathematics. Nevertheless, these sources are of primary importance because they directly address issues of planning and building. As printed books, they circulated widely among planners and patrons, narrating and potentially influencing solutions of design and building technology. Needless to say, this matter goes far beyond one book or just the topic of scaffolding, but hopefully this publication will encourage further research in the field.

Finally, the geographical and cultural boundaries of the study should not remain unmentioned: only buildings in Europe and the immediate surroundings are presented, studied and discussed. This is justified by the need for a profound knowledge of the building traditions under consideration, and the capacity for reading and understanding the relevant written sources, as the author rightly points out. Hence, another desideratum that emerges is that research with similar amplitude and integration of archaeology and textual sources should also be carried out on the architecture, building traditions and sources of other areas. This will surely be undertaken by scholars who can claim the same profound knowledge and reading in their respective cultural contexts and languages.

Lastly, the spatial and material complexity of scaffolds and other auxiliary structures is more easily communicated visually than verbally. The same is true of the evidence contained in the built fabric. Thus, most of the cited sources are images (mainly drawings), generously reproduced throughout the book. Hundreds of excellent images and the high quality of paper and binding provide visual and haptic qualities that are more than appropriate for a book that requires profound reading, will surely be frequently consulted, and may serve as a reference book for a long time.

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