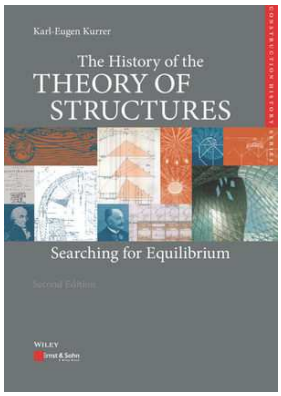
Computer Assisted Methods in Engineering and Science, **25**: 121–122, 2018, doi: 10.24423/cames.25.2–3.4

Book Review



Dr. Karl-Eugen Kurrer, *The History of the Theory of Structures. Searching for Equilibrium*, Berlin: Ernst & Sohn, 2018, 2nd ed., *Edition Bautechnikgeschichte*, ed. by Karl-Eugen Kurrer & Werner Lorenz, 1212 pp., 1002 b/w illustrations, ISBN: 978-3-433-03229-9.

The first English-language edition of this book appeared in 2008. It was preceded by the first German edition that had appeared in 2002. By 2015 it was time for a second, revised and expanded, German edition. It is now followed by a second English edition, which is a revised and expanded version of the first English edition. The extension amounts to more than 50%. One of the reasons for this expansion was, as the author mentions in the preface of this new edition, to devote "more space to a detailed treatment of (...) the connection between the formation of structural analysis theories and constructional-technical progress".

The book contains 15 richly illustrated chapters, complemented by an extensive bibliography and by name and subject indices. The titles of the individual chapters are as follows:

1. The tasks and aims of a historical study of the theory of structures
2. Learning from history: 12 introductory essays
3. The first fundamental engineering science disciplines: theory of structures and applied mechanics
4. From masonry arch to elastic arch
5. The history of earth pressure theory
6. The beginnings of a theory of structures
7. The discipline-formation period of theory of structures
8. From construction with iron to modern structural steelwork
9. Member analysis conquers the third dimension: the spatial framework
10. Reinforced concrete's influence on theory of structures
11. The consolidation period of theory of structures
12. The development and establishment of computational statics

13. Thirteen scientific controversies in mechanics and theory of structures

14. Perspectives for a historical theory of structures

15. Brief biographies of 260 protagonists of theory of structures

Let Chapter 5 serve as an example for the wealth of new material in the second English edition of Dr. Kurrer's book. This new chapter describes, in great detail, the 300-year history of earth pressure theory – the first genuine engineering science theory that shaped the scientific thinking of civil engineers in France, in the 18th century. It represents the reference theory of civil engineering (and not, as frequently assumed, beam theory). It was not until the 20th century that earth pressure theory gradually emancipated itself from the theory of structures. Analogous to earth pressure theory, also in arch theory the search for equilibrium proved to be the primary intellectual task, not least in historical retrospect. This was the motive for expanding Chapter 4, whereas the reason behind the expansion of Chapter 3 was – within the wider context of the history of science – the great significance of the development of the theory of structures and of applied mechanics to become the first fundamental disciplines of engineering science. Chapter 3 does not only include an analysis of textbooks of these two sciences (the first of its kind), but also attempts to ascertain the scientific and epistemological characteristics of the theory of structures and of applied mechanics. This is the starting point of Chapter 14, which describes the perspectives of a history-based theory of structures. This approach is an integral component of the concept of historical engineering science, as formulated by the author. It represents the foundation of Dr. Kurrer's book. In this context, it is important to draw attention to current research on the history of graphical statics, which the author has brought together under the heading of "computer-aided graphic statics" (CAGS). The number of brief biographies of prominent persons in the fields of structural analysis and structural mechanics in Chapter 15 was increased from 85 to 260. Among them are 28 scholars born in the Austro-Hungarian Empire. One of them is Ernst Melan, whose lecture on the fundamentals of theory of structures at the former Vienna TH was attended by this reviewer in 1962. Remarkably, his father had attended Melan's lecture on this topic in 1933.

This second English edition is not only characterized by an increase in the *quantity* of information over that of the first edition, but also by one in the *quality* of its presentation. In view of the high quality of the first edition of this book, this was indeed a great challenge. In his foreword, Prof. Ekkehard Ramm correctly describes the book as the *magnum opus* of Dr.-Ing. Dr.-Ing. E.h. Karl-Eugen Kurrer.

To complement this statement, let me quote from my review of the second edition of Dr. Kurrer's book: "The author's amazing book is a valuable contribution to reducing the serious imbalance between the historical study of the natural sciences and that of the engineering sciences. In a figurative sense this is the successful search for equilibrium, for a state that is the very essence of the theory of structures. May this book be successful on two counts: firstly, as a work that encourages us to reflect on our own experiences with the scientific discipline of structural analysis and, secondly, as an indispensable aid for lectures on the history of the theory of structures at universities and polytechnics".

Herbert Mang