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## Book Review

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## Book review

### The History of the Theory of Structures: Searching for Equilibrium, 2nd edn

Karl-Eugen Kurrer. Ernst & Sohn, Berlin, Germany, 2018, ISBN 978-3-433-03229-9, £125-00, 1212 pp.

Karl-Eugen Kurrer wrote his first book on the history of structural theory (*Geschichte der Baustatik*) in 2002. This appeared in English, in an expanded version, in 2008 – *The History of the Theory of Structures: From Arch Analysis to Computational Mechanics*. A second, expanded German edition appeared in 2015, and the second, further expanded, English edition was then published as *The History of the Theory of Structures: Searching for Equilibrium*.

This book is the most comprehensive book on the subject in any language. Aside from dealing fully with the origins and development of mathematical methods underlying structural analysis, the book also covers many aspects of the wider context within which structural science was developed, in particular the research and teaching undertaken in many institutions. It is an essential reference book for any engineer engaged in the restoration or refurbishment of historical structural structures, not least because it gives a clear indication of what engineering science was available to engineers of existing structures.

The book has 15 chapters, which deal with the subject in two ways. Six chapters are devoted to general issues in the history of structures. 'The task and aims of a historical study of the theory of structures' considers the scientific, didactic, cultural and practical engineering purposes of history. 'Learning from history' presents 12 introductory essays on the main phases of the development of theory of structures since the sixteenth century and on a variety of themes ranging from the emergence of the trussed framework, the development of higher education in engineering, a study of earth pressure on retaining walls, the theory of various bridge types, the industrialisation of steel bridge construction and the development of various techniques of structural analysis. The next chapter considers the emergence of the first disciplines within engineering science – theory of structures and applied mechanics.

Nine chapters of the book deal with historical development of the different branches of the theory of structures: 'From masonry arch to elastic arch', 'The history of earth pressure theory', 'The beginnings of a theory of structures', 'The discipline-formation period of theory of structures', 'From construction with iron to modern structural steelwork', 'Member analysis conquers the third dimension: the spatial framework', 'Reinforced concrete's influence on theory of structures', 'The consolidation period of

theory of structures' and 'The development and establishment of computational statics'.

Towards the end of the book, a chapter presents 13 scientific controversies in mechanics and theory of structures ranging from Galileo to the disputes about the stability of St Peter's Dome and debates about the elastic and plastic analysis of structures. A chapter entitled 'Perspectives for a historical theory of structures' looks at the aesthetics of structures and the relationship between engineering science and theory of structures. The book concludes with short biographies of 260 protagonists of theory of structures, including well over 100 portraits of eminent players in the field, giving a very human view of the subject, and a bibliography that extends to over 90 pages.

The structure of the book avoids the sequential approach taken in many histories in favour of a thematic approach, which allows the reader to follow the key themes in depth without being sidetracked by developments in unrelated fields. The author also provides a well-balanced narrative of mathematical details, practical engineering and the people themselves who were involved with various aspects of the history of structural theory. The book contains some 750 illustrations, including photographs of the covers of many classic books and iconic illustrations from inside.

No historical work can be comprehensive, but Kurrer has surely come as close as anyone can. His book (almost inevitably) presents a view of the subject through German eyes, and the contributions of some French, Italian, Belgian and British names are given less prominence than they would receive at the hands of historians in those countries – for example, the works by Eaton Hodgkinson, R. V. Southwell, Zygmunt Makowski and Ronald Jenkins in Britain. Such underemphasis, however, is more than outweighed by the enormous wealth of information about the contributions made by the great engineers and scientists from German-speaking lands, many of whom are hardly known outside those countries – August Föppl, Konrad Zuse, Franz Joseph Gerstner, August Hertwig, Emil Mörsch, Wilhelm Ritter, Hubert Rüschi and Johann Schwedler, to name just a few.

Kurrer's achievement in compiling this book is colossal, and the reviewer commends it to everyone interested in the subject.

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