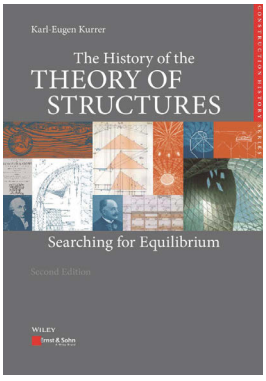
Review

Bill Addis recommends this update of a classic historical work on theory of structures, whose thematic structure makes it a joy to read.

The history of the theory of structures: Searching for equilibrium (2nd ed.)



Author: Karl-Eugen Kurrer
Publisher: Ernst & Sohn
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Until a few years ago, there were two classic books on the history of theory of structures – Timoshenko's *History of strength of materials*, and Edoardo Benvenuto's *Introduction to the history of structural mechanics*. That changed when Karl-Eugen Kurrer wrote his first book, *Geschichte der Baustatik*, in 2002. This appeared in English, in an expanded version, in 2008 as *The history of the theory of structures: From arch analysis to computational mechanics*. A second, expanded German edition appeared in 2015 and, last year, the second, further expanded, English edition was published.

This edition is the most comprehensive book on the subject in any language. As well as 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, especially the research and teaching undertaken in many institutions.

The content is presented in 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 16th 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 building, 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. Towards the end of the book, a chapter presents 13 scientific controversies in these disciplines, 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 the theory of structures and an extensive bibliography.

The remaining nine chapters of the book deal with historical development in different branches of 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'.

The structure of the book makes it a joy to read, for it 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 involved with various aspects of the history of structural theory.

The book is well illustrated, with well over a hundred portraits of eminent players in the field and even more photographs of the covers of classic books and iconic illustrations from inside. This gives a very human view of the subject.

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 receive at the hands of historians in those countries – e.g. the work of Eaton Hodgkinson, R.V. Southwell, Zygmunt Makowski and Ronald Jenkins in Britain.

It would also have been good to read about the innovative use of physical models to analyse complex structures before modern theory was available. Photoelastic stress analysis is also underrepresented. Such under-emphasis, 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.

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

Bill Addis

Bill Addis is an engineering historian and author of *Building: 3000 years of design, engineering and construction* (London: Phaidon, 2007).