



## BOOK REVIEW

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*Karl-Eugen Kurrer: Geschichte der Baustatik – Auf der Suche nach dem Gleichgewicht (History of the theory of structures – On the search of equilibrium). Ernst & Sohn, Berlin 2016.*

After thirteen years, the second – deeply enlarged edition of K.-E. Kurrer’s noticeable research on the history of the theory of structures has been just published. When compared with the reviewer’s opinion expressed in this journal [AIK-ACE 49(2003), 1, 97-98], the present one can be only much more enthusiastic. Really, the reviewed book deserves the name of being a work of excellence. Its material and spiritual contents exceeds that of the first edition more than twice. Thereby, it discusses the subject beginning from Leonardo da Vinci and Galileo, up to the present time. Furthermore, it underlines the importance of equilibrium not only as the key principle of each structural system, but also – recalls to look after its practical applications.

The main part of book consists our of fifteen chapters. In Chapter 1 the aims and tasks of the relevant historical study has been specified – underlining its scientific, engineering, didactic, and cultural reasons. Chapter 2 recalls – within an introductory manner – author’s former twelve university lectures characterizing: the definition of structural statics, the time from the lever till truss, the development of the higher engineering education, the study of earth pressure and the resisting walls, insight into bridge engineering and structural statics of the 19th century, industrialization of bridge construction within 1850-1900, the virtues of influence lines, the behaviour of elastically supported beams, the displacement method, the 2nd order theory, the ultimate load procedure, and the constructional canons based on the needs of statics and the creative thinking. Chapter 3 presents the first engineering science fundamental disciplines: structural statics and applied mechanics.

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Also the matters of the mutual relations between the encyclopaedic and technical sciences have been revealed. Chapter 4 concerns the problem of vaults and arches – based upon the geometrical thinking in the theory of masonry bridges, along the wedge theory and collapse scenarios, the line of thrust theory, the theory of elasticity, the ultimate load assessment, up to the assumptions of the finite element method (FEM). In Chapter 5 the history of the earth pressure theory has been outlined. Subsequently, the resisting walls of the fortress constructions, earth pressure as subject of the military engineering, enlargement of Coulomb's theory, participation of continuum mechanics, the state of theory within the time of 1875-1900, the assistance of experimental approaches, and the development of the earth pressure theory based on geomechanics, have been analyzed.

Chapter 6 describes the beginnings of the theory of structures. The notion of strength of materials has been introduced and its character in the time of Renaissance and Galileo identified, as well as – the theory's development until 1750 and its final form at the end of the XVIII century defined, including the most important input of Navier – specially his analysis of the elastically supported beam. The emergence of the particular components of structural statics has been noticed in Chapter 7. Clapeyron's and Castigliano's efforts to establish the classic form of the technical sciences have been shown, as well as – the final shape of the theory of structures, made known. It based on the particular research of Rayleigh, Kirpichev, and the Berlin school.

Chapter 8 is engaged into the subject of iron and steel constructions. The appropriate torsion theories for the period of 1850-1900 (e.g. – St. Venant and Bredt) have been presented, and the relevant realities of the crane-building needs, exposed. The torsion theory for the time of 1900-1950 has been characterized and the search for a genuine buckling theory, described. Also the steel construction features for the time 1925-1975 have been settled, as well as – the problem of eccentricities, brought up.

In Chapter 9 evidence has been given – how the statics of bars has conquered the third dimension, i.e. – the emergence of spatial frameworks has been noticed. Chapter 10 raised the influence of reinforced concrete on the theory of structures. The relevant beginnings and the first design methods have been recalled, and the revolutionary elements of the mutual relations between structural statics and the reinforced and compressed concrete, indicated. Accordingly, also the member modelling of reinforced concrete has been typified.

In Chapter 11 the consolidation of the theory of structures concerning its formal appearance (proper relations of text, image, and symbol) has been described. The attributes of the displacement method and its rational approaches based on matrix analysis and automatic calculations, have been revealed. Consequently, in Chapter 12 the point of computer statics – from the historical beginnings of FEM,

together with the matrix elements of structural mechanics, across the possibilities of developing adequate theories, and the FEM's relation with the variational calculus, until the contemporary properties of computer mechanics, have been comprehensively discussed. In Chapter 13 the history of twelve scientific controversies in mechanics and the theory of structures, have been produced. Chapter 14 concerns the further historic outlook for the present theory of structures. Hereby, stress has been put on the virtues of the structural aesthetics. Chapter 15 contains brief biographies of 243 leading specialists in field, of world range. Among them, with the reviewer's participation, the following representatives of Polish science have appeared in that list: Maciej Bieniek (1927-2006), Roman Ciesielski (1924-2004), Ryszard Dąbrowski ((1924-2004), Maksymilian Tytus Huber (1872-1950), Feliks Jasiński (1856-1899), Witold Nowacki (1911-1986), Waław Olszak (1902-1980), and Witold Wierzbicki (1890-1986).

Finally, the book contains a list of ca. 4100 references, and similarly rich – the name and subject indexes.

The reviewed book, a work of real excellence, hast great cognitive values and, for sure, can be very interesting also for a wide spectrum of specialists in Poland – men of science and engineers, as well as – students of civil and environment engineering departments. Furthermore, the book contains explicit references to culture and civilization, as a whole. Therefore, it should be studied also by humanists of different cognition, having superior interests.

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