**Cite this article**
Sheth A (2019)
Book review.
*Proceedings of the Institution of Civil Engineers – Structures and Buildings* **172(10)**: 778,
https://doi.org/10.1680/jstbu.18.00160

**Book Review**
**Paper 1800160**
Published online 10/12/2018



**Structures and Buildings**

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# Book review

**Building Structures: Understanding the Basics 3rd edition**

Malcolm Millais, Routledge (Taylor & Francis), Abingdon, UK, 2017,
ISBN 978-1-138-11975-8, £39·99, 578 pp.

*Building Structures: Understanding the Basics* (3rd edition) by Malcolm Millais is astoundingly ambitious in the ground it sets out to cover. It is 'a short history of nearly everything' in structures – a one-stop shop for a comprehensive introduction to structural engineering. The book is generously illustrated (about 1100 hand-drawn sketches) by the author.

The book takes the reader through the labyrinthine journey from basic structural concepts to building design, commencing with a bit on the history of familiar forms, structures and loads, whetting as it were, the curiosity of the reader while quietly imprinting engineering terminology along the way. The distinction between stiffness and strength is made in the introduction itself. The concept of aerodynamics is gently sneaked into the second page of the book. The first few chapters delve into engineering basics through graphical resolution and representation and without recourse to formulae and calculations. There is a passing introduction to materials and gravity load-carrying structural systems, and an entire new chapter on foundation engineering has been inserted in this edition.

Interspersed in the engineering narrative is a history of the great engineers who were instrumental in the evolution of structural engineering as it is known today. There is an interesting chapter-long critique of some 'real structures'. Millais proceeds from the twelfth century Durham Cathedral to Kew Gardens' nineteenth century Palm House, to Torroja's Zarzuela Hippodrome in the mid-twentieth century and ends at the Bank of China (1990). Each project description engages the reader in a delightful, direct conversation of structural stability, load path and structural behaviour. Most of the projects, he suggests, were driven by structural engineering.

The author follows this up with another set of contrasting projects in the next chapter and laments passionately about the structural engineer's bête noir, as it were – the architect. It is in this chapter that the author comes into his element. There is no back cover blurb introducing the author and it took a bit of a search to learn that, besides writing this book, Malcolm Millais (who has a PhD in structural engineering from the University of London), has also authored two books of a very different genre, whose titles are literally explosive – *Exploding the Myths of Modern Architecture* (published in 2009) and *Le Corbusier, the Dishonest Architect* (2017).

It is little wonder then that Chapter 12 is unrelenting in calling out the fake honesty of architectural intent and equally unsparing to structural engineers who are willing attendants in the irrational flights of fancy of the architect. The chapter charts the historical rise and fall of the structural engineer, also the engineer's diminishing role as an equal partner in the design process and the engineer's increasing subservience to the architect over the decades. This chapter describes the design process of the Eiffel Tower and the ability of the engineer to prevail upon the architect in the final profile of the tower, and contrasts it with the latter-day Sydney Opera House which, while being one of the world's most instantly recognisable structures, was as Millais quotes Felix Candela saying, 'a tragic example of the catastrophic consequence of this attitude of disdain for the most obvious laws of physics'.

Chapter 13 is a new insertion in the third edition which deals with additions and alterations (retrofit) to existing buildings, and highlights the difference in approach between the analysis and design of a new building and the evaluation of an existing one. In Chapters 14, 17 and 18, the author introduces simple and advanced calculations (it is indeed challenging to engage in very meaningful understanding of structures without indulging in a bit of calculation) – something which should have logically accompanied stress-strain and bending moment concepts, but which the author assiduously resisted in the preceding chapters to avoid distraction with numbers.

The book then veers into briefly introducing the complex topics of dynamic behaviour and progressive collapse. What is to be gained in attempting to span the astonishing breadth will understandably be compromised in depth. But in these times of increasingly popular 'tasting menus', this book does a marvellous job of inveigling the reader to take a bite into the world of structural engineering – from seemingly simple concepts to increasingly complex issues.

The last chapter, entitled 'The successful structural project', the reviewer suspects encapsulates the author's own philosophy. The author returns to dwell further on some issues he touched upon in Chapter 12. Millais talks about the need for clear load paths and clarity of structural system, about the fraught architect–structural engineer relationship, and then he tries to define a successful as opposed to unsuccessful project. He then ventures into the uneasy territory of an 'ethical structure'. In an increasingly nuanced world, these strong positions taken by the author are indeed refreshing.

This is a good book to have on any architect's or engineer's bookshelf.

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