The elements of architecture: Principles of environmental performance in buildings, by Scott Drake, Earthscan, 2009, xx+124 pp., \$59.95, ISBN 978-1-84407-717-5

Literature on sustainable architecture is becoming more prolific as we enter the second decade of the 2000s. This is perhaps not surprising given the alarming predictions and forecasts for cities, the ecology and life in general. In this context, Scott Drake's book is a timely addition to the growing body of knowledge relating to sustainable design. Although sustainable design per se is not the focus of the book and Environmental Sustainable Design (ESD) principles are only given a token mention, nonetheless most of Drake's principles of environmental performance are embedded in sustainable design practices. It is important to note Drake's use of the word 'environment', he understands 'environment', in a very generic sense, as the space in which we live, work and play. He says (p. x) the book 'explores the idea of a building as an environmental filter' creating 'comfortable' environments for people to inhabit.

The stated aim of the book is 'to show that environmental considerations are among the most fundamental of all design decisions affecting the size, shape and orientation of any building' (p. ix). Drake's claim is important because throughout the book he alludes to the history of particular technologies and practices to demonstrate their robustness and their import to current architectural practices. This history telling is also important because the book is aimed at a relatively uninformed audience, presumably first-year undergraduate students, who have little or no understanding of the fundamentals of geography. The result is an easy to read, easy to understand book that a more informed reader may find somewhat benign; with claims like (p. 35) 'the principal source of light is the sun, which provides natural light directly, as sunlight, and indirectly, as daylight.' The book is replete with similar, somewhat obvious, explanations.

To explain the principles of environmental performance in buildings (primarily residential buildings) the book is divided into eight chapters loosely representing the four elements (earth, air, water, fire). Each chapter is broken down into short subsections, an appropriate structure for the target audience (undergraduate students) as it aids ease of reading and comprehension.

The first four chapters (Sun, Heat, Light and Sound) are the most substantial of the eight. Chapter one outlines how and why the earth revolves around the sun and the effects this has: sun paths (polar, tropical and temperate) and climatic zones. Drake explains (p. 1) 'the varying intensity of the sun at different points on the earth's surface causes differences in climate, which lead to differences in the buildings made to respond to that climate.' There are a number of short subsections that offer examples (including sketches) of traditional house types that respond to the specifics of climate and culture, and Drake points the reader to contemporary architects who are drawing upon these principles in their work.

The chapter on Heat logically follows the first chapter on the Sun. We are presented with a very clear explanation of some of the properties and qualities of heat flow: conduction, convection and radiation; and the different ways to heat a house: fireplace, recycled air-conditioner, hydronic and thermodynamic. This chapter includes a useful table (p. 30) outlining the conductivity, resistivity and specific heat capacity of common construction materials and a succinct account of 'R' and 'U' values.

The third chapter deals with light, both natural and artificial. On page 42, Drake warns his readers 'wires contain enough current to kill a person, light fittings must be installed by a licensed electrician and cannot simply be added by the occupants.' The chapter is informative and relates the different types and qualities of various artificial lights, lamps and luminaires. It also illustrates how to measure the amount of light emitted by a lamp. The final section in the chapter is on colour matching, which

comes across as a little tangential; however, it does highlight the complexity inherent in the elements of architecture and the links and relations that exist between them.

Sound is the title of the fourth chapter and Drake (p. 51) informs the reader that 'Buildings contain a diverse range of human activities and machines each with their unique sounds'. The chapter includes a discussion on acoustics and the example of a theatre is interesting and appropriate. There is also a useful table (p. 56) that gives the noise reduction coefficients for common construction materials and an explanation on how to measure sound. Again, the final section of this chapter seems a little out of place. The prior discussion focuses on the science of sound transmission and the final section discusses traffic. While traffic and sound transmission are linked, this section has not been well integrated into the chapter and other forms of sound transmission have not been given equal mention.

The remaining four chapters (Air, Water, Fire and Ecological Design) are well written even if the content is rather obvious, with statements like 'Whether inside or outside buildings we are immersed in air' (p. 65); and 'Rainwater tanks can be used to store water collected from roofs' (p. 87). The chapter on fire includes an interesting but obscure story about a fire in a shirt factory in 1911. The subsections of this chapter also read similar to a Fire Safety Regulation Handbook, which is perhaps a sensible thing. The title of the final chapter (Ecological Design) is a little overstated because Drake does not draw the preceding chapters together to argue for ecological design as might be expected. The chapter is short (three pages) and contains very little discussion about ecological (or sustainable) design as a theory and as a practice.

The structure of the book is clear and logical and the section titles are unambiguous and relevant to the text that follows. The writing style is engaging and easy to read. The book is well illustrated, as one might expect from an architectural publication, with illustrations drawn by Adam Brown and Tristan Wong. The illustrations are well executed, if some-what muddy and sketchy in style, and they appropriately portray the principles discussed in the text.

In summary, this book explains some of the basic elements of architecture with particular reference to domestic architecture. It draws together architectural science and principles of environmental design in a very easy to read and easy to understand format. I recommend this book to anyone who wants to understand some of the basic elements of architecture that may inform the design of a building. I concur with Drake's final words (p. 99) 'Architects must work with planners, engineers, builders and clients to create buildings that recognize the basic human need to interact with, as well as protect, the natural environment.' Drake's book is a step in this direction.

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