Reviews

KNIGHT, Peter G., 1999. *Glaciers.* Cheltenham, Stanley Thornes, 261 pp. ISBN 0-74874-000-7, Paperback. £29.

As an undergraduate I once did an independent field project on the formation and structure of lake ice. The literature review for that project opened up for me a world of ice-related research. In that review, I happened upon Paterson's *The physics of glaciers*, a book of great breadth and understanding — understanding, unfortunately, that was above my head. As it happened, my professional career developed in glaciology, and Paterson's book became my guide. By that time, in graduate school, I had the tools and background to understand much of what was presented, but I never forgot the need for an undergraduate-level book about glaciers. My desire for such a book has increased now that I am teaching at the undergraduate level in a geology/geography program. Unfortunately, most of the available choices are for lay readerships: either photographic compilations designed with the coffee-table in mind, or more informative books that still lack sufficient detail for pedagogical purposes.

Peter Knight from the University of Keele, U.K., steps into this void with his book *Glaciers*, intended for, among others, undergraduates and non-professionals. Its 12 chapters cover all the salient topics about glaciers, including mass balance, physical and chemical properties, structure and movement, as well as glacier hazards and resources, ice cores, and research directions in glaciology. This is a lot of material for 261 pages. The breadth of coverage is impressive and is achieved by packing lots of facts and concepts into a short space. Many complex ideas are described very tersely and I frequently found myself wondering whether the average non-professional or undergraduate would understand the material. The densely packed information seems motivated by the author's intent to cover all aspects of glacier science. Unfortunately, many facts or statements are given equal weight and the uninformed reader may fail to distinguish the important insights from useful additional information. A less ambitious goal or a longer book would have allowed a more careful presentation of the ideas.

Numerous oversights populate the text. For example, in the chapter on formation and mass balance of glaciers, it is stated that all of the ablation of Taylor Glacier, Antarctica, is by sublimation, when in fact melting and calving are also important processes. In the chapter on gross morphology, the shear stress is calculated but the units of each term do not work out. In the chapter on movement of glaciers, energy is equated to force. In places, vague writing leads to misinterpretation: for example, the discussion on the stratification of snow during its transformation to ice is limited to polar conditions, but as this restriction is never explicitly stated, I wonder if the reader will appreciate this nuance. These comments are not intended to sound picky, but to illustrate a recurrent problem in the text.

My other main concern is the presentation of equations. In many cases, an equation is given little or no conceptual introduction. For the benefit of all readers, and particularly students and non-professionals, I think it is important to introduce a few conceptual notions prior to an equation and spend some time on its development, so the reader understands the inherent assumptions and limitations. I suppose one could argue that the reader can always refer to the original source, and Knight does a good job of providing references to the scientific literature. But since equations are so often taken out of their original context, I would argue that it is always safe to include the assumptions with the presentation of any equation. Another problem is that the definitions of terms in equations commonly do not include units. One is then faced with having to puzzle out how the terms are mathematically manipulated, as I was when looking at the energy balance at the surface of the glacier and I had to add heat conduction (energy) into the surface, in $W\ m^{-2}$, to snowmelt (depth? mass?). Of course, snowmelt can be expressed in terms of energy if the melted snow mass and latent heat of fusion are known. But that small bit of additional information is not included.

In the end, the diversity of information presented by the book exceeds the problems with the text. I would use the book (and could have used it recently) in my undergraduate/graduate classes, as it provides a wealth of material for discussion and pointers to the literature. Hopefully the book will be sufficiently popular to create a demand for future editions such that revisions will increase the precision of the material.

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