Antarctic Science 8 (4): 415–416 (1996)

Book reviews

The Penguin Dictionary of Geology

Philip Kearey
Penguin Books, London (1996).
365 pages. £6.99. ISBN 0 14 0512772

For a dictionary first published in 1996, the New Penguin Dictionary of Geology does itself no favours by having no general bibliographic reference more recent than 1993. Specialized fields do much worse; engineering geologists can expect nothing more recent than 1985, while the remainder are lucky if reference works from as late as 1990 are cited, and these are few despite 15 pages of bibliography. One can always nit-pick, but I think that any 1996 geological reference work could at least recognize that the oldest known rock is the 3.96 billion year old Acasta gneiss from Canada. Although geomorphologists can discover the meaning of every flavour of stream; obsequent, resequent, inseqent, anteconsequent and all their kin, students of structural geology will be at a loss for the meanings of such widely used terms as porphyroclast, S-C mylonite, metamorphic core complex, or even transecting cleavage (in use since at least 1980). Why leave out a definition of orocline if you are going to include cymatogeny (an orogenic event intermediate in intensity between epeirogeny and orogeny)? Igneous petrologists need not look for Large Igneous Provinces here, and they will find themselves confused if they seek out the meanings of xenolith or xenocryst. Some hair will also undoubtedly be torn out at the unvarnished inclusion of granite in the definition of diapir. Sedimentologists will be amazed at clays with 4 mm grains; not a substance to rub against ones teeth (a characteristic way of distinguishing clay from silt). Tectonically, the southern hemisphere seem to have received short shrift; where are the Ross and Gondwanian orogenies, the Lachlan fold belt, or even the Karoo flood basalts?

The news is not all bad; rock, mineral, palaeontological and chronostratigraphic names are well represented, and sedimentology and geophysics seem well covered. Nevertheless, I feel that a work of this ambition is probably beyond the scope of a single lexicographer; Philip Kearey's expertise as a geophysicist shows in the good treatment of terms from the field, but what of the rest of geology?

In summary, this book may be new, but it is neither an up-to-date nor a particularly complete dictionary of geology. Penguin have provided us with an improvement on the 1972 edition, but they have not done enough for such a prestigious and widely-used work, and I feel an opportunity has been lost. Like its predecessor, I'm sure this book will sell; there will always be students of geology. The pity is that it could have been so much better.

ALAN VAUGHAN

Past Glacial Environments. Sediments, Forms and Techniques

Edited by *J Menzies*
Butterworth-Heinemann Ltd., Oxford (1996).
598 pages. £40. ISBN 0 7506 2352 7

This book is the second of two volumes describing glacial environments (volume 1 was reviewed in *Antarctic Science*, 8 (3): 307-308). It is a large book, amounting to 598 pages arranged in 17 chapters, five of which were written entirely or in part by the editor, John Menzies. The remaining chapters are written by a wide range of glacial experts, mainly geographers. This second volume sets out 'to provide a contemporary and extensive survey of the sediments and landforms of *past* glacial environments' [my italics]. The book focuses mainly on the sediments and landforms of past glacial environments, although there is a heavy emphasis on the Pleistocene epoch. However, the editor may have overstated his case when, in chapter 1 (pp. 1), he suggests that 'the Earth is essentially a Glacial Planet *punctuated by* periods of ameliorative conditions'. This assertion is belied elsewhere in the book, and it is obvious that, although glaciations are important, they account for the smaller part of the geological timescale.

The book opens with a short discussion by Menzies of past glacial environments and a synopsis of the other chapters. Chapter 2 is a very long and comprehensive text (122 pages) by Menzies and Shilts, comprising a summary of the vast literature on subglacial environments from a sedimentological perspective, including descriptions of the diagnostic properties and sedimentology of the deposits and their relationships with diverse landform types. Pleistocene ice-marginal and supraglacial deposits are described by Johnson and Menzies in chapter 3, mainly using the mid-western USA for examples, followed, in chapter 4, by an exposition by Woodworth-Lynas of ice scour as an indicator of glaciolacustrine environments. Since practically all the information on ice scour is based on that effected under marine conditions, much of this chapter is speculative. It forms a natural link with chapter 5 by Elverhøi and Henrich, on glaciomarine environments and ancient glaciomarine sediments, which highlights the lack of reliable criteria for the distinction between marine and terrestrial sediments, and shows how many supposed terrestrial deposits are now being reinterpreted as marine. In chapter 6, Derbyshire and Owen describe glacioaeolian processes, sediments and landforms, followed by a short chapter by Young on pre-Pleistocene glacial environments. Young makes the worthwhile observation that the depositional setting can often only be identified by studying the associated rock types (i.e. the stratigraphical

context). The stratigraphy of glacial sequences is described by Rose and Menzies in chapter 8. This is a well expressed section expounding the general principles for the development of a sound stratigraphical framework. Most of these principles could be applied to any sequence, but stratigraphers solving the complexities of fragmented glacial successions also have recourse to additional, less well-known tools (e.g. morphostratigraphy, kineto-stratigraphy). Lithofacies associations are used by Kemmis in chapter 10 to illustrate the complex processes involved in the formation of terrestrial glacial successions, whilst Boardman summarises existing knowledge on palaeosols in chapter 10. Palaeosols are important indicators of periods of relative environmental stability and are of particular value in deducing glacial stratigraphies. In chapter 11, Gray discusses the complex interrelationships between ice sheet distribution, global climate and ocean currents as functions of isostacy and eustacy. Chapters 12 and 13, by van der Meers and Whalley, respectively, explore the techniques and information to be gained from microscopic techniques, including scanning electron microscopy. Thus far, these techniques have not commonly been used by glacial sedimentologists but they have substantial potential for understanding processes of glacial erosion, transportation and deposition. Major advances in dating glacial sequences are summarized in chapter 14 by Brigham-Grette, emphasizing how the most reliable dating can only be achieved by using multiple methods. Those discussed range from sidereal, isotopic, radiogenic and chemical/biological, to geomorphological and correlation techniques. The following two chapters are concerned with applied aspects of glacial sequences, incorporating drift exploration (Shilts) and placer deposits of gold and other precious metals (Levson and Morison). The latter is more concerned with deposits in areas adjacent to or post-dating glaciation, since glaciation tends to remove or else substantially dilute the signal from placers. The final chapter is a short, selective editorial summary of problems and perspectives facing glacial geo(morpho)logy.

Like its companion, this volume was written to 'provide university students with a comprehensive examination of modern research and ideas on.....glacial environments', and both were conceived from a series of university courses. However, the wealth of information provided is probably more appropriate to a post-doctorate researcher. The bibliography is immense, amounting to 82 pages of publications up to 1993 (and a few 'in press'). Typographical and other editorial errors are more numerous than in volume 1, but are still at an acceptably low level (for example, check the page headers for chapters 1 and 3; tephrochronology is consistently miss-spelt as tephr*a*chronology (except in Figure 14.27); Plates 2.24b, and 2.5a and c are upside down; and there seems to be no text reference or description (other than the caption) for Plate 4.5). By contrast with volume 1, only a few of the chapters contain recommendations for future research. However, to some extent, this is addressed by Menzies in the final chapter. A surprising omission is a chapter on glaciofluvial sediments. Menzies also bemoans an apparent lack of interest in the community in studying proglacial environments (on pp. 483), which are dominantly glaciofluvial. I was also disappointed, but not surprised, at an absence of volcanism in glacial environments. Interpretations of volcanic sequences can confirm whether or not ice was present, and those formed from eruptions beneath ice can yield important information on the thickness and thermal regime of that ice. Moreover, volcanic rocks can usually be dated precisely.

Having read avidly volume 1, and come away inspired by the abundance of theories, principles and mathematics indicative of a vibrant science, I was left with mixed feelings about this book. Somehow it didn't feel just right, that a balance had shifted somewhere and I wasn't getting a complete story. This probably reflects my own inadequacies as a (mainly) field-based geologist who believes that, if you get it wrong in the field (e.g. mis-identify the lithofacies), no amount of inspired theorising in the laboratory will ever put it right. This book (like volume 1) is very big on processes and dynamics, but rather less emphasis is placed on the sediments themselves. This is despite a statement, early on (pp. 9) that 'a persistent problem in all glacial studies is the recognition of glacial sediments'. Lithofacies characteristics are presented, but they are often in table form and not well illustrated, although references are provided which presumably fill in the gaps. Personally, I would have preferred to see a shift of the emphasis towards greater textual description of the rocks and lithofacies characteristics, with ample supporting photographs. It would make it of more practical use, particularly for geologists. Instead, I feel that relying entirely on this book (and its companion volume) would produce students knowledgeable about principles and theories of formation of lithofacies and landforms, yet unable to identify confidently many of them in the field. The book is *NOT* a guide to glacial lithofacies and deposits. But it *IS* an excellent, advanced text describing the theories and principles. As an example of the unbalanced presentation style, take chapter 13 (scanning electron microscopy). This chapter is creditably (over?-)served by an abundance of photomicrographs. Although several are poorly reproduced in black and white with resultant irritating loss of important details, all are repeated as excellent-quality colour plates. Unfortunately, an opportunity to describe the detailed microscopic features of these glacial sediments is missed and I was left largely wondering why the photos were included.

However, my criticisms of this volume, like those attached to volume 1, are few and comparatively minor. Menzies and his co-authors have produced a major source of information on glacial environments that is likely to become an important reference text for many years to come. I predict that glacial geomorphologists will love this book in all its aspects. Geologists may have mixed feelings.

JOHN SMELLIE