

## BOOK REVIEWS

Yardley, B. W. D. *An Introduction to Metamorphic Petrology*. London (Longman Scientific and Technical), 1989. xiv + 248 pp. Price £13.95.

At long last here is a textbook on metamorphic petrology that one can wholeheartedly recommend to undergraduate students, and whose contents are close to those of most modern undergraduate courses in this subject. It represents an ideal text for second and third year courses in metamorphic petrology, and could be recommended to keen first year students. Moreover, it is an extremely readable book, which introduces terminology gradually, where relevant (new terms are highlighted in bold typeface). It does not go overboard on technical detail. It contains the right balance of general description and more rigorous methods, while giving the reader a taste of the complexities of some aspects of the subject.

The examples used are drawn from a wide range of areas, and the cross-referencing throughout the book makes it easy to browse. The illustrations are generally clear, appropriate and informative. Selected references for further reading are provided at the end of each chapter, and the index is sufficiently detailed to be useful. At the present time no other book is directly comparable as an undergraduate text, although some chapters of M. Best's 'Igneous and Metamorphic Petrology' (MM 47-421) are more comprehensive.

Chapter 1 is a general introduction to the concept of metamorphism and its historical development. It includes descriptions of some widely different examples of metamorphism to give the reader a feeling for the scope of the subject. Nomenclature is dealt with briefly without trying to be too rigorous.

Chapter 2 introduces the concept of chemical equilibrium as applied to rocks, emphasising its uses and limitations. The importance of utilizing both  $P$ - $T$  and compositional phase diagrams is explained, together with the basic principles of thermodynamics, geothermometry and geobarometry. Schreinemaker's method is covered in an appendix rather than in the main text.

The next three chapters cover the major rock types that are most useful to the metamorphic petrologist, indicating the mineral assemblages and reactions that are likely to occur with pro-

gressive metamorphism. Specific concepts are introduced as appropriate, and methods of estimating  $P$ - $T$  conditions for the different rock types are considered. Chapter 3 covers the progressive metamorphism of pelites and introduces the concept of AFM diagrams. The classic Barrovian area is used as a general example, and variations from this pattern are then described. Chapter 4 concentrates on metabasic rocks and introduces the concept of facies classification. Hydrothermal metamorphism and mineralization are also included. Chapter 5 deals with the metamorphism of carbonate and calc-silicate rocks, emphasizing the importance of the composition of the fluid phase.

Chapter 6 concentrates on the development of metamorphic textures and their interpretation. Mention is made of the interaction of deformation and metamorphism, and this is followed by a discussion of the kinetics of metamorphic processes and reactions. This chapter would probably have benefited from a few more schematic diagrams of some of the textures discussed, and an example of how the metamorphic-deformational history of a polymetamorphic rock may be unravelled from the microstructure and mineralogy. The description of mylonites (p. 158) is inaccurate. Although there is some controversy over how to define a mylonite, it is generally recognized that crystal plastic processes are important in the process of grain size reduction, with or without the effects of cataclasis. The discussion on responses of different minerals of deformation is rather misleading. The definition given for superplastic flow (p. 176) is also incorrect. The inaccuracies are, however, relatively minor within the context of the whole book.

The book finishes with a discussion of the tectonic setting of metamorphism (Chapter 7) and the introduction of the concept of  $P$ - $T$ -time paths. These are areas of current active research which are always difficult to handle in a book. The author manages to convey the historic aspects along with the current thinking, and to leave the reader with an impression of the likely direction of future progress.

While anybody who has taught metamorphic petrology will have their own ideas about what should be included in a book of this type (I would have liked to have seen a little more on the tex-

tural aspects of polymetamorphic rocks, but possibly this is deliberately sparse in anticipation of the publication of the atlas of metamorphic rocks), Bruce Yardley has managed successfully to give a very readable account of most of the important aspects of the subject and introduced some of the complexities without intent to baffle. I would highly recommend this book to anybody wanting an introduction to the subject, or indeed an update on current research trends in metamorphic petrology. It should be essential reading for all geology undergraduates, and at £13.95 is affordable.

K. H. BRODIE

Carr, D. D. and Herz, N. (eds.). *Concise Encyclopaedia of Mineral Resources*. London and Oxford (Pergamon Press), 1989. xxiii + 426 pp. Price £80.00.

This volume is intended as a companion volume to 'Encyclopedia of Materials Science and Engineering'. Many of the articles have been taken from that work and they were originally written for the 'materials scientist'. As such, many of the articles are not really suitable for the 'mineralogist'.

The book is clearly an attempt to produce a relatively compact work (of 426 pages) and to cover a huge field in an encyclopaedic fashion. It begins with a useful but brief introductory chapter and an even briefer guide to the use of the encyclopaedia. The bulk of the work consists of a series of articles on topics in mineral resources. These articles are relatively brief and the importance given to each topic appears to be somewhat haphazard. Certainly the encyclopaedia contains many articles of general interest: there are, for example, fascinating accounts of 'metals recycling' and 'plate tectonic settings for metallic ore resources'. This latter article seems a little out of place alongside an extensive discussion of Portland cements and prices of industrial minerals. The basic problem with the book, however, is that it tends to begin discussing a topic and then stops before saying anything useful about it. It is difficult to see who would really want to buy the book, especially at its present price. The book falls between two stools. On the one hand, if it had been produced as a cheap popular publication, it might have been valuable to the mineralogist as a quick reference guide. On the other hand, if it is to be sold as a high-price encyclopaedia, it really needs to be radically rewritten with far more detailed information.

The encyclopaedia claims to be a 'comprehensive reference work covering all aspects of mineral

resources' with information presented as 'alphabetically arranged articles which deal concisely with individual topics in a self-contained manner'. The topics selected, however, are very strange to the mineralogist and possibly to the materials scientist as well. For example, under B, we find only four entries (Beryllium Resources, Binders: Clay Minerals, Binders: Industrial Minerals, Bismuth Resources) and T warrants five entries (Thorium Resources, Tin Resources, Titanium Resources, Traditional Ceramics: An Overview, Tungsten Resources). To be fair there is a better coverage of some other areas.

Overall, it is difficult to recommend this book almost regardless of price. It contains interesting and useful information and many of the individual entries are worthwhile in themselves and indeed may be helpful, but the basic thinking behind the book is very doubtful.

J. N. WALSH

Ineson, P. R. *Introduction to Practical Ore Microscopy*. London (Longman Group), 1989. 181 pp. Price £11.95.

This cheap paperback is intended for the novice/undergraduate market—a market that has been, and will continue to be, best served by the soft-back edition of Craig and Vaughan's excellent 'Ore Microscopy and Ore Petrography'.

Ineson's book itself owes a great deal to Craig and Vaughan. Some of the line drawings, used instead of photomicrographs to illustrate textures and textural relationships, can only be recognised and understood after seeing the original photomicrographs in 'Ore Microscopy, Ore Petrography'. This is a rather nice confirmation of Ineson's assertion that 'descriptive terms . . . are of limited value. A photomicrograph with a scale is essential' (p. 44). What is true of descriptive terms is also true for poor line drawings.

The text carries few typographical errors (mainly restricted to localities—Great Gossan Lake (sic) and authors Shouten (sic)) which is surprising as the level of proofing has allowed numerous factual inconsistencies, far too many low-grade misunderstandings (reflectance and pleochroism are confused in a number of the mineral descriptions) and a dozen or so errors that would be extraordinary for an ore microscopist. Statements in bold type are no more likely to be correct than those in normal typeface.

A book where rutile is described as having no internal reflections (p. 115), as not showing twinning in polished section (p. 136) and as having high reflectance, and where native copper is said