

10 describe the main types of ore deposits under the headings: (2) magmatic deposits; (3) magmatic hydrothermal deposits; (4) hydrothermal vein deposits; (5) placers; (6) sediment-hosted Cu–Pb–Zn deposits; (7) ore deposits formed by weathering; (8) iron ores of sedimentary affiliation; (9) uranium ores of sedimentary affiliation; (10) ores formed by metamorphism. Each type of deposit is treated systematically—typically an introduction followed by a description of its characteristics and genesis, and concluding with a description of appropriate exploration methods and, in some cases, details of evaluation and recovery procedures for specific deposits. Whilst agreeing with the authors that no single scheme for classifying ore deposits is satisfactory, the typological approach they adopted might have been followed more rigorously; for example, porphyry Cu and Mo deposits are grouped under the same chapter heading as volcanogenic massive sulphide deposits yet they formed in totally different environments, have different geological characteristics, origins and ore-forming processes and are discovered by different exploration methods. Perhaps a more radical approach in which ore deposits are grouped according to exploration and exploitation criteria would have been more appropriate for a book of this type. The final chapter outlines how an exploration programme is designed and implemented and includes descriptions of the commonest exploration methods in the context of an exploration strategy. The text is well supported with line drawings and tables, and each chapter contains a useful map showing the world distribution of locations mentioned in the text.

The book is designed primarily for undergraduates who are taking options in economic or mineral deposit geology and their teachers. But the well-illustrated style and pragmatic approach with good reference to case studies in the exploration sections will appeal to geologists in mining and exploration. Reasonably priced (paperback version) and philosophically pitched to fulfil a market need, I have no doubt that this book will be a success.

N. J. JACKSON

Criddle, A. J. and Stanley, C. J. (editors). *The Quantitative Data File for Ore Minerals* of the Commission on Ore Microscopy of the International Mineralogical Association (Second Edition). British Museum (Natural History), Cromwell Road, London SW7 5BD, 1986. xlix + 420 pp. Price £45.00 (hardback).

Since its inception in 1963, the Commission on Ore Microscopy (COM) of the International Mineralogical Association (recently renamed the

commission on Ore Mineralogy in recognition of its widening interests) has had the development of techniques in quantitative ore microscopy as one of its main objectives. Much work by members of the Commission and their colleagues has led to major advances in the instrumentation commercially available to measure reflectance spectra of ore minerals, in the provision of reliable standards for use in measurements, and in the systematization of the reporting of quantitative data for ore minerals. These advances led to publication by the COM in 1977 of the first issue of the Quantitative Data File. It is very appropriate that this splendid, much enlarged, second issue is dedicated to the memory of the late Dr Norman Henry, who did much to inspire the development of quantitative ore microscopy and served as editor of the first issue of the Data File.

The first issue of the Data File took the form of a set of cards, 204 in all, and with data in varying degrees of completeness for 155 minerals. Although the data are presented in a similar tabular format in this new issue, it takes the form of a bound volume and there are 420 data sets ('cards') arranged alphabetically by mineral name, 327 for individual mineral species and a further 93 for compositional and structural variants. Most of the data, covering the common ore minerals and many less common and rare species, are previously unpublished and were obtained specifically for the Data File. Individual entries record, in addition to the mineral name, formula and symmetry, as much information as possible regarding provenance of the sample measured, full quantitative chemical analysis (available for 85% of the entries), X-ray data (again available for 85%, and commonly presented by cross-reference to the appropriate entry in the Powder Diffraction File of the JCPDS), and micro-indentation hardness (Vickers) data (for over 70% of entries). The bulk of each 'card' is taken up with spectral reflectance data; in the vast majority of cases (86% in fact) reflectance values measured in air and oil at 20 nm intervals from 400 to 700 nm are provided. In these cases quantitative colour values relative to the A and C illuminants of the CIE are also given. Ancillary information provided includes details of the polishing method employed, reflectance measuring instrumentation and reflectance standard used. Also shown is the source of the data; as the editors point out, the data originate mainly from laboratories in Europe and represent the work of many scientists. However, this observation understates the contribution made by Criddle and Stanley themselves, who between them account for over 53% of the measurements presented in this new issue.

As well as an introductory section providing

background information on the Data File, and matters such as how the data have been edited and presented, a very welcome addition to the second issue is a series of three keys to enable the File to be used in mineral identification. Thus, key 1 lists all the minerals in order of increasing reflectance in air at 546 nm, plus the data for the other three COM recommended wavelengths (470, 589, 650 nm) citing, as do the other keys, the page number of the major entry for that mineral. In key 2, colour values are used in a similar way with minerals listed in order of increasing luminance (Y%), and in key 3 minerals are listed in terms of increasing reflectance in air and oil at 440 nm, with data given also at 500, 600 and 700 nm. There is also a brief bibliography and a brief section dealing with the historical background to the Data File.

The whole volume is attractively produced with the same blue used both in the binding and in the headings and subdivisions of the tables, the data standing out in a clear black typeface. The only regret might be that this large body of data is not yet available in a form that can be mounted on a computer and manipulated so as to plot and compare spectral curves with ease; but I believe that plans are underway to make the data available in this form in future issues. However, we do now have this excellent compilation, and no laboratory with a serious interest in ore minerals should be without it. As a contribution to the study of ore minerals it is invaluable; a credit to the editors and to the British Museum (N.H.) who have had the far-sightedness to publish it.

D. J. VAUGHAN

Barker, D. S. *Igneous rocks*. Engelwood Cliffs, New Jersey, U.S.A. (Prentice Hall, Inc.), 1983. xii + 417 pp. 228 figs. Price £43.80.

This book has much to commend it, and some failings. It presumes an elementary knowledge of igneous petrology for its readers, and seeks to enhance their knowledge to a relatively advanced level. As such it occupies the overcrowded 'middle ground' in igneous petrology textbooks. It would not be first choice as a book for describing and classifying igneous rocks. Nor could it be described as an 'advanced' text, detailed discussion of petrogenetic theory is alluded to, but not evaluated. It covers many aspects of igneous petrology, including chapters on the Role of Magma in Geological Processes; Igneous Minerals; Phase Relations; Estimating, Reporting and Comparing Igneous Rock Compositions; Classification of Igneous Rocks; Crystallisation and Textures; Generation and Evolution of Magma; Forms of Igneous Rock Bodies; and Effects of Volatile Components. Some

groups of igneous rocks are selected for Chapters of their own—Ultramafic Rocks, Mafic Rocks, Intermediate and Felsic Silica-Oversaturated Rocks, and Silica-Undersaturated Rocks. These four chapters include sections on most types of igneous rocks, but somehow fail to convey an appreciation of the relative abundances and significance of the rock types. The last three chapters of the book cover Metasomatism, Magmatism and Tectonism, and Relations of Magma to Energy and Mineral Resources.

The overall presentation of the book is good, but not outstanding. The price is high enough to exclude this book from the 'popular' range. There are a large number of carefully prepared figures in the text, although many are small. The photographs are disappointing, especially the photomicrographs, lacking definition and appearing out of focus. The index is comprehensive and the reference list exhaustive, but few papers published after 1980 are included. There is a certain haphazardness in the coverage of topics: pyroclastic rocks are discussed in part of the chapter covering 'Forms of Igneous Bodies', for example. Chapter One (The Role of Magma in Geologic Processes) makes reference to plate tectonics, the lithosphere and asthenosphere, subduction, heat flow within the Earth, geothermal gradients, pressure within the Earth, magmatism on other planets, etc., and yet somehow fails to explain how igneous rocks are produced by partial fusion (this is explained in Chapter 7). Many topics are referred to in the text, but the discussion is frequently unsatisfactory, detailed explanations or their significance is often lacking. Even in a book at this level, some elementary account would be expected of the important conclusions to be drawn from modern trace element and isotopic studies.

Nevertheless the book has much to recommend it. The subject is covered and the book will be useful to the non-specialist. It includes the answers to those questions one did not like to ask the igneous petrologist. Where else could the stratigrapher, palaeontologist or other mortal men find out about A-type granites, spreading centres, fertile mantle, jacupirangite or even KREEP.

J. N. WALSH

Freer, R. and Dennis, P. F. (editors). *Kinetics and Mass Transport in Silicate and Oxide Systems* (Materials Science Forum, Vol. 7). Aedermannsdorf, Switzerland, and Rockport, Massachusetts (Trans. Tech. Publications Ltd.), 1986. xii + 331 pp., 150 figs. Price SFr. 150.00 (\$70.00).

This book represents the proceedings of an international conference held in London in September