BOOK REVIEWS

Bosson (R.) and Varon (B.). *The Mining Industry and the Developing Countries.* Oxford (published for the World Bank by Oxford University Press), 1977. 292 pp., 27 figs. Price £8·25 (cloth), £3·50 (paper).

This interesting paperback deals chiefly with the economics of mineral exploitation and development in less-developed countries and at the bottom of the oceans. There are, however, sections dealing with mineral reserves and resources, and excellent statistical data of a generalized sort that may be of marginal interest to mineralogists. Appendices deal with exploration costs; expansion of mineral capacity; U.N. assistance; past activities of the World Bank; profitability; classification of reserves and resources; production, consumption, and trade; the share of the developing countries. A case study based on an enterprise in Quebec is included.

K. C. D.

Mueller (R. F.) and Saxena (S. K.). *Chemical petrology with applications to the terrestrial planets and meteorites.* Berlin, Heidelberg, and New York (Springer-Verlag), 1977. xii + 394 pp., 188 figs. Price DM 72.80 ($32.10).

This book deals essentially with the thermodynamics and kinetics of igneous and metamorphic systems. The authors' assume that the reader is familiar with the derivation of thermodynamic potentials and the theory of rate processes and the style varies from a fully mathematical treatment to a readable if rather ponderous prose. The first 61 of the double-column pages gives a synopsis of the basic thermodynamics, kinetics, and systems of chemical classification considered relevant to igneous and metamorphic petrology. The next 65 pages cover meteorites, space, and extraterrestrial bodies, while 124 pages are devoted to topics in metamorphic petrology and 108 to igneous petrology. Nearly 1000 references are listed and there is a fairly short subject index and an author index.

Almost all the 188 figures are line diagrams and most of these are clear and properly labelled, but diagrams involving fugacities rarely have their units defined and some figures have axes that are not scaled where this would have enhanced the value of the diagram. The units employed are not standardized; pressure, for example, is given in lb/in^2, atmospheres, bars, and kilobars but not in pascals.

Chapter 1, in fourteen pages, reviews the basis of general thermodynamic relationships, equations of state, chemical potentials, activities and activity coefficients, reactions and equilibrium equations, the Gibbs' phase rule, the thermodynamics of the influence of the gravitational field, and the principles of reaction kinetics. It is perhaps a general criticism of the book that once described, these fundamental relationships are not directly employed in what follows, nor is the inadequacy of the approach discussed. Chapter 2 deals with mineral systems, including phase equilibria, distribution coefficients, and crystal–melt relationships. The ideal thermodynamic expressions relating to the form of the solid-solution curve are used but there is no discussion of the significance of the differing values of ΔH of crystallization that may be found for a given phase appearing in different experimental systems. An interesting treatment of the kinetics of mineral systems (especially the treatment of complex heterogeneous reactions) given in Chapter 3 is followed by a less adequate account of rock classification, including a laborious treatment of the metamorphic facies classification. The authors' claim that the Niggli 'norm' is the one most commonly employed by petrologists, a view which may be debatable, but the reader may well not appreciate the value of this norm from the account given. Errors occur in this chapter; for example, normative enstatite is given as $\frac{1}{2}HySiO_3$ and the diagram showing the P, T, relationships of the metamorphic facies has the pressure axis inverted.

The declared thematic approach is dispensed with in the next chapters, which give a brief account of rock-forming processes in space, a conventional treatment of the petrography, chemistry, and origin of meteorites, and a sketchy review of the terrestrial planets, the Moon, and comparative planetology. The nucleation and growth of metamorphic minerals and the origin of metamorphic textures and structures and compositional variation are discussed in Chapter 8, while Chapter 9 provides brief summaries of the stability relationships of the main minerals of metamorphic rocks essentially from an experimental point of view. An orthodox account of selected regional facies and some mineral equilibria of definitive importance follows and leads into an account of the petrogenetic grid and its application to selected mineral assemblages. The section on igneous petrology begins with brief accounts of the properties of melts and the origin of magma. This is followed by an analysis of the differentiation and crystallization of magma and discussion of selected plutonic igneous complexes and volcanoes, volcanic rocks, and fluids.

It is difficult to know for whom the book is intended; the rather patchy treatment makes it unlikely that it will be suitable as a course book. It

may be found of occasional use by numerate advanced undergraduates specializing in geochemistry or hard rock petrology and by teachers and researchers in these fields.

W. J. FRENCH

Greg (R. P.) and Lettsom (W. G.). *Manual of the Mineralogy of Great Britain and Ireland.* A facsimile reprint with Supplementary Lists of British Minerals by L. J. Spencer and a Fourth Supplementary List (1977) together with a foreword by P. G. Embrey. Broadstairs, Kent (Lapidary Publications), 1977. xxxiii + 483 pp., illus. Price £10·00 (postage and packing 50p; available from Lapidary Publications, 84 High Street, Broadstairs, Kent).

For more than a century, 'Greg & Lettsom' has remained the only comprehensive mineralogy of the British Isles. Heddle's coverage of Scotland and Collins's of Cornwall and Devon have been valuable contributions but Greg & Lettsom's work is the only single volume to describe the whole of Britain.

Published in one edition in 1858, 'Greg & Lettsom' has long been a collector's item and with the renewed interest in topographical mineralogy apparent in recent years, a reprinting was inevitable. This facsimile reprint, augmented by a historical introduction by Peter Embrey, L. J. Spencer's Supplementary Lists, and a fourth Supplementary List compiled by Peter Embrey brings together a complete record of British mineral species up to 1977.

A complete revision of 'Greg & Lettsom' would have been very welcome but the work and expense involved would, clearly, have been prohibitive. Meanwhile, the present reprint has a great deal in its favour; it retains the full nineteenth-century flavour and provides a valuable insight into the state of the art at that time.

The bonus of the subsequent lists of British minerals is a good reason to further congratulate Messrs. Embrey and Lambert but I would suggest that Spencer's lists of 1898 and 1931 could have been improved by filling them out with localities and more complete references. However, the work is done and very welcome it is.

ROGER S. HARKER

Augustithis (S. S.). *Atlas of the Textural Patterns of Basalts and their Genetic Significance.* Amsterdam and New York (Elsevier Scientific Publ. Co.), 1978. x + 323 pp., 604 figs. Price Dfl. 170.00 ($73.95).

The large-scale petrological studies of lunar rocks and ocean-floor lavas have led to such rapid progress in our understanding of many aspects of basalt textures that an atlas of photomicrographs would seem to be a very timely publication. Presumably, most readers would prefer such a work to give a comprehensive survey of the textures and a balanced account of the genetic interpretations of various workers in this field, together with a statement of the author's own views. Unfortunately, Augustithis has adopted a different approach.

The author's ideas as to the meaning of various textural features in basic rocks may strike many readers as idiosyncratic, to say the least. For instance, although an origin by exsolution is generally accepted for the diopside lamellae within the orthopyroxene of lherzolite xenoliths in basalts, Augustithis interprets this relationship as one of later diopsidic infiltration and replacement of bronzite. He totally rejects the concept of skeletal olivine, augite, or plagioclase phenocrysts and appears to interpret virtually all megacrysts in basalts that enclose pockets of groundmass as late-stage porphyroblasts (some originating as blobs of colloidal gel). He insists that the characteristic ophitic texture of poikilitic augites enclosing numerous plagioclase laths is generated by solid-state replacement of the augite by later-crystallizing plagioclase.

The atlas contains 100 pages of text and 600 plates. These are devoted to photomicrographs supporting the author's concepts and to illustrating his work on the little-known basalts of Ethiopia. There is virtually no attempt to recognize, discuss, and illustrate the work of other current specialists in textural relationships. The result is as overladen in some fields as it is deficient in others. Thus, the selection of photographs of field features of basalts is very poor compared with those in other volcanological publications. The textures of peridotite inclusions in basalts (mostly Ethiopian) are treated at length without any mention, for instance, of Nicholas and his co-workers. No other inclusion types are illustrated. There are no pictures of fresh vitreous basalts, the only variant in which phenocryst–groundmass relationships are entirely unambiguous. All reference is omitted to modern experimental studies of crystallization kinetics and the light they throw on crystal morphology and zoning. Leucitites are included in order for the author to argue that their leucite megacrysts are post-groundmass porphyroblasts. Nephelinites and melilitites, however, are excluded. Amygdale fillings and metamorphism of basalts are illustrated but spilites are not mentioned at all.

The text is partly connected with the plates but digresses for thirty pages (Chs. 25–34) into a general exposition of Augustithis's philosophy for igneous