

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/in², 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 $\frac{1}{2}\text{HySiO}_3$ 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