BOOK REVIEWS

Horne (J. E. T.) and Dunham (Sir Kingsley), Organizers. *Mineralogy: towards the twenty-first century*. London (Royal Society), 1977. 404 pp., 107 figs., 27 pls., 3 geol. maps. Price £30·00 (U.K.), £30·90 (Overseas) (£20·00 to members of the Mineralogical Society).

This book represents the proceedings of the Discussion Meeting at the Royal Society on 7–8 April 1976 to mark the Centenary of the Mineralogical Society, and was first published as *Phil. Trans. Roy. Soc.*, Ser. A, vol. 286 (no. 1336), pp. 231–638.

It contains twenty-one invited papers grouped in six sessions dealing with facets of the subject currently to the fore: marine mineralogy, experimental petrology, geochemistry, extraterrestrial mineralogy, mineralogical aspects of ores, and environmental mineralogy. In addition, an introductory presidential address [M.M. **41**-7] is presented in extended summary, as is an important review by J. V. Smith on the mineralogy of the planets.

The contributions on Marine Mineralogy include papers by S. E. Calvert on the mineralogy of silica phases in deep-sea cherts; A. J. Easton, D. Hamilton, D. R. C. Kempe, and S. M. F. Sheppard on low-temperature metasomatic Ca–Fe garnets or hydrogarnets; H. Elderfield on authigenic silicate minerals and in particular on the balance of magnesium in the oceans via the montmorillonite phase formed by basalt–sea-water interaction; and R. G. and V. M. Burns on the mineralogy of manganese nodules. All of these papers serve to remind us of the vast amount of data appearing from the Deep-Sea Drilling Programme, much of it of great importance to mineralogists.

The papers on Experimental Petrology include two on techniques: M. J. O'Hara and D. J. Humphries on the problems of gain and loss of iron during high-temperature runs on iron-bearing silicates when the oxygen fugacity and iron oxide content of the charges must be controlled, and J. Nolan on the technique of determining specific component *in situ* activities in tholeiitic melts. The other two are on silicates: F. A. Seifert reconstructs rock-cooling paths from kinetic data on the Fe^{2+}–Mg exchange reaction in anthophyllite and B. J. Wood discusses the activities of components in clinopyroxene and garnet solid solutions and applies the activity composition relations to estimate the pressure of crystallization of granulite facies rocks.

Geochemistry is represented by very different contributions: C. D. Curtis on sedimentary environments and processes dominated by the involvement of an aqueous phase is followed by a lengthy and equally important paper by I. S. E. Carmichael *et al.* on the high-temperature properties of silicate liquids and the applications of these to consideration of the equilibration and ascent of basic magma. This is followed in the section on Extraterrestrial Mineralogy by a description by G. M. Brown of two major igneous events early in the evolution of the Moon. Also in this Section are papers by V. F. Buchwald on the mineralogy of iron meteorites and by J. R. Ashworth and D. J. Barber on electron microscopy of some stony meteorites.

The Mineralogical Aspects of Ores are highlighted by the four papers that this reviewer found in many ways the most intriguing in the whole volume. E. F. Stumpfl expounds the 'comprehensive geoscience approach' to studies of the response of stratabound metal concentrations in the Cape Province of South Africa to varying degrees of metamorphism, including an investigation of the participation of elements, such as tungsten, not traditionally associated with the sedimentary cycle or granulite facies conditions. The other three papers in the Section are also concerned with Southern Africa but with the longer standing problem of the Witwatersrand and Dominion Reef gold–uranium ores. P. R. Simpson and J. F. W. Bowles attribute the over-all control of the mineralization to the presence of a depositional basin overlying an Archaean craton, the uranium being deposited as detrital allogenic uraninite and by precipitation from solution under reducing conditions due to decaying organic matter, giving rise by diagenesis and metamorphism to such uraniferous horizons as the Carbon Leader of the West Wits. From a fluid-inclusion study of the Witwatersrand quartz pebbles, T. J. Shepherd demonstrates the existence of multiple entry points into the basins; however, he considers that a sympathetic relationship between uraniferous banket ores and the presence of vein quartz rich in liquid CO_2 inclusions, together with a corresponding antipathetic relationship for gold, strongly suggests separate sources for the two metals. C. C. Rundle and N. J. Snelling report on the geochronology of rocks and minerals of this area and conclude that the presence of 3050 Ma old uraniferous minerals in sedimentary sequences that are probably younger than 2740 Ma suggests the simple interpretation that the uraniferous minerals are predominantly detrital.

The final Section on Environmental Mineralogy opens with a reassuring exposition of the medical view by J. C. Gilson. D. R. Bowes, A. M. Langer, and A. N. Rohl bring us cautionary tales on the nature and range of mineral dusts in the environment, and A. A. Hodgson describes the mineralogical differences between the asbestos minerals; F. D. Pooley describes the application of an electron microscope microprobe analyser to the analysis of mineral dusts.

This is indeed a record of great progress and widened horizons in the Earth Sciences in the last few years and gives not only an indication of current research strengths but also suggests many likely lines of advance towards the twenty-first century. All mineralogists and petrologists will want it available in their libraries.

R. A. HOWIE

Bailey (D. K.) and Macdonald (R.), editors. *The Evolution of the Crystalline Rocks*. London, New York, and San Francisco (Academic Press), 1976. xii + 484 pp., 181 figs. Price £16·00.

The editors of this volume have set themselves a rather ambitious target, i.e. to produce a sequel to Bowen's book *The Evolution of the Igneous Rocks*. To this end they have enlisted the services of a number of distinguished experimental petrologists to write a series of articles with the common theme that the chapters should be on the application of experimental results to the understanding of the origin of rocks.

Part I on 'Experimental methods and the uses of phase diagrams' is by D. K. Bailey. He has kept the section on techniques rather brief because A. D. Edgar's book gives an up to date coverage of this topic. It is disappointing to find no mention in this section of ion-exchange equilibria techniques using chloride solutions or chloride melts as developed by Wyart and Sabatier over twenty years ago and used so successfully by the French experimental petrologists and in a few North American and Russian studies. These techniques have been extended to a number of elements other than Na and K and can provide information about both liquid solutions and solid solutions, which is not easily obtained by other methods.

The part of this chapter devoted to phase diagrams also has had to be abbreviated but it is clearly written and deals with P-T diagrams in some detail.

The second part of the book is divided into two sections viz Part IIA Metamorphic Rocks consisting of three chapters and Part IIB Igneous Rocks to which two chapers are devoted. The editors state that the coverage of metamorphism is more complete since it is felt that the need for a sequel to Bowen's book is greater in this field. R. C. Newton and W. S. Fyfe contribute a chapter on 'High pressure metamorphism'. In this they review experimental studies of the minerals of the glaucophane-lawsonite schists and more briefly discuss eclogites, charnockites, and granulites. The section on the minerals, although very full of facts, is extremely well written and thus easy to read and to understand—if anything resembles the writing of N. L. Bowen, it is this section of this chapter. The other parts of this chapter on the eclogite and granulite facies come as somewhat of a relief to a teacher of petrology, such as the reviewer, who has been unable to provide a convincing explanation for the origin of these rocks—a relief to find that the experts still do not have answers. However, the statement 'It is clear that we must recognize wet and dry metamorphism of the same primary rock type under the same conditions of total pressure and temperature' appears to this reviewer as a complete acceptance of the hypothesis put forward by Yoder in his classic paper in the Bowen volume of the *American Journal of Science*: a hypothesis that has caused considerable divergence of opinion over many years among metamorphic petrologists.

'Metamorphism at moderate temperatures and pressures' was written by H. T. Greenwood and there is not surprisingly considerable overlap between this chapter and the chapter on 'Metamorphic petrology at low pressures and high temperatures' by W. Schreyer since both authors of necessity discuss the same systems. It might have been preferable for these two authors to have collaborated although both are very readable chapters as they stand. Schreyer concludes his chapter with some thoughts on the facies classification and comes to the same conclusion as H. G. F. Winkler, in the latest edition of his book, that the facies classification has outlived its usefulness. Schreyer believes that, provided we can put figures on pressure, temperature, fugacities of water, oxygen, etc., this is much more useful than mere classification.

Part IIB contains a chapter on 'Granitic rocks' by W. C. Luth and one on 'Alkaline rocks' by D. K. Bailey; topics on which each author has contributed significantly. There is a slight overlap where both authors discuss peralkaline systems—what writer can omit some reference to the peralkaline rhyolites and the evils of plotting them in the residua system? There is some 'self-plagiarism' in Professor Bailey's chapter but this can be forgiven in view of his particular interest in this rock type.

This reviewer feels that it is unfortunate that Professor Bailey should in two places reproduce Schairer's (1950) diagram for the system