BOOK REVIEWS

Yoder (H. S.), Editor *The Evolution of the Igneous Rocks: Fiftieth Anniversary Perspectives.* Princeton (Princeton University Press), 1979. vii + 588 pp., 157 figs. Price (paperback) £8·60, (cloth) £20·00.

This book takes the form of a review by eighteen well-known petrologists each taking as his theme one of the chapter headings of the original 1928 volume of the same title by N. L. Bowen. That Bowen's book is still basic reading for students of petrology is adequate comment on its importance in the development of the subject. Not only are the questions discussed by Bowen a major preoccupation of petrologists today, but, more important, the philosophy and methods of their examination pioneered by Bowen are still the basis of much current research. Recognition of this contribution is the theme of the book, which gives each contributor opportunity to state his specialist viewpoint on the present interpretation of a part of Bowen's original thesis.

There have, of course, been far-reaching advances in petrology, and the earth sciences in general, over the past fifty years and adherence to the framework of Bowen's volume does not necessarily provide the best basis for a coherent overall review of modern petrology. That, however, is not the objective of the book; but the authors on occasion do find themselves obliged to extend the scope of interpretation of Bowen's chapter headings in order to discuss the present state of play.

G. M. Brown, writing on the diversity of igneous rocks, emphasizes that Bowen was concerned with crystal fractionation as the main mechanism of producing diversity and with basalt as the key parental magma, whereas we are now more appreciative of the variety of igneous rock associations and the meaning of their tectonic settings. In particular, emphasis must be put on high-pressure melting processes as a source of diversity additional to crystal fractionation, as is done by D. C. Presnall who broadens the chapter on fractional crystallization to include partial melting and fractional fusion.

Rival mechanisms to crystal fractionation, notably liquid immiscibility and assimilation, were so effectively discussed by Bowen that for many years there seemed little else to be said. On liquid immiscibility E. Roedder comments that although Bowen put the subject to rest he would have written a very different chapter had the present body of data been available; nevertheless the uncertainties and doubts of interpretation of both the experimental and natural examples are evident from Roedder's careful review. A. R. McBirney covers the physico-chemical principles established by Bowen as governing assimilation processes, but inevitably finds it difficult to assess the importance of large-scale operation of the process as a major petrogenetic factor, particularly with respect to the calc-alkaline rocks.

There are somewhat esoteric discussions of crystallization in silicate systems and the reaction principle, by A. Muan and E. F. Osborn, with particular attention paid to the effects of oxygen fugacity and the role of iron oxides. Osborn uses at length his model of calc-alkaline rock genesis as a mode of illustration. A more general approach is adopted by I. Kushiro who provides an excellent brief review of fractional crystallization of basaltic magma and as assessment of the importance of the process in comparison to partial melting.

The longest chapter in the book is that by I. N. Irvine on crystal accumulation and sorting, both central to Bowen's petrogenetic scheme and subjects of current speculation. Doubts and questions concerning cumulate theory leave a dilemma, but Irvine concludes that accumulation involves little crystal settling and that mechanical sorting is probably not as important as Bowen thought.

In the search for the liquid line of descent, R. E. Wilcox reviews variation diagram techniques and their computor extensions, some indication of the complexities of silicate glasses is given by I. S. E. Carmichael, and the susceptibility of glasses to potassium enrichment by reaction with meteoric waters is considered by D. B. Stewart.

J. Gittins contributes a very readable account of the feldspathoidal alkaline rocks in relation to the residua system. As elsewhere in the book a major difference from the original is in the consideration of volatiles, components which C. W. Burnham concludes do not merit the status of a Maxwell demon, at least not quite.

Further chapters are contributed by H. S. Yoder on melilite-bearing rocks, D. R. Wones and E. D. Jackson on fractional resorption, and F. Chayes on classification of volcanic rocks. P. J. Wyllie gives the final summary chapter on differences between petrogenesis today and in 1928.

The volume is a worthy tribute to a great petrologist; it is well produced, reasonably priced and provides enjoyable authoritative reading on a range of relevant petrological processes. With eighteen contributors, however, it cannot match

the unity and clarity of presentation achieved by Bowen and the original will still be a classic when this is outdated.

P. E. BROWN

Reading (H. G.), Editor. *Sedimentary environments and facies.* Oxford (Blackwell Sci. Publications), 1978. xii + 557 pp., 495 figs. Price (paper) £13·00.

This excellent textbook includes chapters by ten prominent sedimentologists: John D. Collinson, Marc B. Edwards, Trevor Elliott, Hugh C. Jenkyns, Howard D. Johnson, Andrew H. G. Mitchell, Nicholas A. Rupke, Bruce W. Sellwood, Roger Till, and Harold G. Reading (M.A. 80-1208). Each chapter, excluding introduction and final analysis, is written to a common formula. Present day environments and processes are described together with the sediments that characterize them. Examples of ancient sedimentary rocks of the same association are then considered in considerable detail. Literature references are collected together in a single, comprehensive list at the end of the text with only a few suggestions for further reading included with each chapter.

The second chapter (Reading) is devoted to a discussion of the facies concept: construction, interpretation, and environmental controls. The succeeding chapters describe specific environmental situations: alluvial sediments in Chapter 3, lakes in Chapter 4, and deserts in Chapter 5; all three being contributed by Collinson. Chapter 6 deals with deltas and deltaic sediments (Elliott), Chapter 7 with clastic shorelines (Elliott), and Chapter 8 with arid shorelines and evaporites (Till). Shallow marine environments are considered in Chapters 9 and 10, the former (Johnson) devoted to siliciclastic seas, the latter (Sellwood) to carbonate environments. Deep clastic seas (I am not quite sure about some of the terminology here) are described in Chapter 12 by Rupke and glacial environments by Edwards in Chapter 13. Reading then combines with Mitchell in a useful discussion of sedimentation and tectonics before a finel summary titled 'Problems and Perspectives'.

The authors are quite clear about their objectives: 'The purpose of this book is to show how ancient environments may be reconstructed by interpreting first the process or processes which gave rise to facies and then the environment in which the process operated'—p. 2. I am sure these have been admirably achieved. I should have liked, however, to see more references to compaction (especially differential compaction) which seems to me to be one very important aspect of environmental reconstruction.

The great strength of this textbook lies in the fact that it is a text and not just a collection of papers contributed by experts on their specialities. The editor must be congratulated on achieving such homogeneity of approach. The book is profusely and excellently illustrated and produced to the high standards we have come to expect from Blackwell. It covers a smaller part of the total field of sedimentology than competitor texts, but I would (and do) recommend it wholeheartedly not only to sedimentologists but to any geologist who wishes to catch up with the tremendous advances that have been made in the last 15 years.

C. D. CURTIS

Bischoff (J. L.) and Piper (D. Z.), Editors. *Marine Geology and Oceanography of the Pacific Manganese Nodule Province* (Marine Science, vol. 9). New York and London (Plenum Press), 1979. xii + 842 pp., 297 figs., 6 microfiche cards (in pocket on inside back cover). Price $49.50.

This book provides a welcome addition to the literature on marine geology and oceanography in that it provides an up to date detailed analysis of geological and oceanographic factors pertinent to the exploitation of manganese nodules in the northeastern equatorial Pacific, the area from which they will first be mined. No previous publication has dealt in such detail with the environment of ore grade nodule formation, and editors Bischoff and Piper are to be congratulated on drawing together the diverse information important in this regard.

Somewhat over half of the book [M.A. 80-1201] is devoted to studies in the DOMES (Deep Ocean Mining Environmental Study) area in the northeastern equatorial Pacific, where integrated studies on the water column, the biomass, sediments, and nodules, have been carried out under the auspices of the US National Oceanic and Atmospheric Administration. This study points the way to how non-engineering problems related to nodule mining should be approached, and will serve as a model for future investigations. The latter part of the book deals with a more diverse collection of topics, some, but not all, of which are also specific to the northeastern equatorial Pacific. These include sections on sea-floor geology, nodule chemistry, and nodule growth rates. Most of these describe studies carried out in the northeastern equatorial Pacific other than the DOMES investigations, and include important chapters on sediment redistribution and manganese nodule resources in the region. The northeastern equatorial Pacific papers are balanced by a selection on nodules and sediments from other regions, including aspects of the French, German, Russian, New Zealand, and Japanese nodule programmes