

arbitrary, but it will be complemented by a second volume which should include dislocations, patterns in dendrites, and the properties of ionic crystal surfaces.

For anyone wanting to come to terms with current theories for crystal growth, the book is an excellent starting-point for each of the selected topics. However, it should be stressed that the reader will need a strong stomach for mathematics. Applications of the theories to real, rather than model, systems are rare. Specific test examples include the melting of graphite intercalation compounds, and mercury chain compounds. With such a flavour it is likely that the book will appeal more to physical chemists rather than earth scientists. Despite these drawbacks it should still be useful as a reference book for mineralogists concerned with the fundamental details of crystal growth mechanisms.

R. FREER

MacDonald, E. H. *Alluvial Mining: the Geology, Technology and Economics of Placers*. London and New York (Chapman and Hall), 1983. xvi + 508 pp., 192 figs. Price £35.00.

This book draws together a range of disciplines involved in the search for, evaluation, and exploitation of placer deposits. These include geology, engineering, mineral technology, and economics. Eoin Macdonald, a consulting mining engineer, has aimed his book primarily at the professional or those undergoing professional training.

There are eight chapters on the following topics: (i) placer environments; (ii) placer sedimentation; (iii) geology of placers and their formation; (iv) exploration and prospecting; (v) centrifugal slurry pumps and pumping; (vi) placer mining; (vii) placer minerals processing; (viii) placer valuation. Each chapter is approximately the same length although the last chapter could have been a little more comprehensive bearing in mind the increasing importance of geostatistics in ore evaluation. There are adequate reference lists at the end of each chapter. The text is well organized and readable but occasionally marred by sketchy, inadequately labelled diagrams.

As a student of mining geology and mineral exploration, I found the book, on the whole, worthwhile reading, though I must admit to acute lapses in concentration when it came to the chapter on centrifugal slurry pumps and pumping. Mineralogists, geochemists, and petrologists would probably find the book outside their interest and would certainly be alarmed at a few glaring inaccuracies in citing the chemical compositions of common minerals. For example, ilmenite is given

the formula FeTiO_2 and pyroxene is reported as FeSiO_3 . However, the book is essentially a practical guide for anyone involved in placer mining and in this respect it achieves its purpose. Engineers with a sound geological background or geologists with a thorough grasp of basic engineering principles are perhaps the people who can most readily appreciate the author's desire to seek common ground between geology and engineering as applied to the minerals industry.

A. H. RANKIN

Brooks, R. R. *Biological Methods of Prospecting for Minerals*. Chichester and New York (Wiley-Interscience), 1983. xiv + 332 pp., 72 figs. Price £40.80.

In this updated and expanded version of his *Geobotany and Biogeochemistry in Mineral Exploration* from 1972, R. R. Brooks provides a comprehensive and well-laid-out guide to the subject. A brief introduction covers the role, literature, and research centres of biological prospecting and emphasizes the multidisciplinary nature of the book. The substance of the text is formed of three main parts related to mineral exploration: geobotany, geozoology, and biogeochemistry.

The first includes useful tables of plant indicators of mineral deposits and continues to cover more subtle morphological and mutational changes. Remote sensing is accorded an important place, covering ultraviolet, visible, near infrared, thermographic, and radar spectrometries. The desirability of multiband satellite imagery is stressed.

Geozoology is accorded a new section: it is fairly short since active prospecting by this method is relatively uncommon. Epidemiology is, however, long established although difficult of interpretation.

For many readers, the meat of the book will be found in the largest section, that on biogeochemistry. Starting with a brief description of soil types, he continues with mobilization of minor elements and mechanisms of ion absorption. The complications of hyperaccumulation and exclusion are amongst the factors discussed affecting elemental uptake by plants. A problem with this method can be the increase in degrees of freedom of a system if care is not taken with respect to species, organ, season, and so on. Hence there is a considerable portion on statistical analysis. Those who have read the earlier volume may be a little disappointed by the analytical section. Although some modernization has been achieved by addition of three new methods, much is as before (e.g. the detection limits shown for XRF are identical in spite of a new generation of spectrometers of higher sensitivity).

Further, no consideration is given to the possibility of analysis by this technique of unashed material, and it is stated that soils must also undergo the same treatment.

Overall, this is a detailed and wide-ranging book with interesting case-histories, useful appendices, and almost a thousand references. It gives a realistic assessment of biological methods in mineral exploration, concluding that no one method is always successful and that an integrated approach is likely to give the best result. Prospectors should not neglect this approach or this volume.

T. K. SMITH

Hawkesworth, C. J., and Norry, M. J. (eds.). *Continental Basalts and Mantle Xenoliths*. Nantwich, Cheshire (Shiva Publishing Ltd.), 1983. viii + 272 pp., 80 figs. Price £25.00 hardback. £12.50 paperback. (Available in North America from Birkhauser Boston, Inc., Cambridge, Mass.)

This volume arises from a meeting of the Volcanic Studies Group held at Leicester University in January 1983. It consists of ten reviews of recent work on the origin of basalts and their xenoliths, and the nature of their source materials, discussed from a predominantly geochemical point of view.

The first contribution, by Norry and Fitton, sets out the differences between continental and oceanic basalts, and draws attention to the possible roles of mantle heterogeneity and crustal contamination in determining their differences. These themes are taken up by the other contributors, who use a whole battery of isotopic and trace-element criteria to disentangle the effects of variable sources, differential partial melting, contamination, and fractionation.

Three of the reviews deal with the upper mantle sample represented by xenoliths in kimberlites and alkali basalts. The mantle of the subcontinental lithosphere is different from both the mantle of the suboceanic lithosphere and the mantle of the asthenosphere, being much more heterogeneous and preserving features of much greater age than the other two mantle regions. However, as we get to

know more and more about this part of the mantle, it seems less and less likely that any non-orogenic basalts actually originate within it.

The examples of continental basalts which are discussed in subsequent chapters include the Karoo basalts of southern Africa and the Tertiary lavas of Skye, with briefer references to other flood basalt provinces, such as those of the Deccan and Columbia River, but there is not much discussion of highly alkaline continental basalts such as those of East Africa. The final article reviews the special characteristics of basalts erupted at active continental margins.

This small volume provides an excellent overview of the current state of research in the very active field of basalt petrogenesis. There is a lengthy bibliography at the end, which is very up to date and will be particularly valuable to research students in igneous petrology and geochemistry.

A. HALL

Hubbard, C. R., Barrett, C. S., Predecki, P. K., and Leyden, D. E. (eds.). *Advances in X-ray Analysis*, Volume 26. New York and London (Plenum Press), 1983, xviii + 473 pp., 180 figs. Price \$62.50.

These reports on the annual Denver X-ray Conference form an important series of publications in the X-ray literature.

In 1982 the main thematic topic chosen concerned modern approaches to X-ray powder diffraction, accounting for just over half of the proceedings and for all of the invited talks. This part of the proceedings will inevitably be compared with those of the conference held a few years earlier on *Accuracy in Powder Diffraction* (NBS Special Publication 457). On this topic there were improvements in algorithms and in understanding reported, but in my view, no fundamental discoveries.

The traditional specialist workshops covered several topics. X-ray stress determination formed the second theme of the meeting, with thirteen papers presented, followed by some discussion of fluorescence analysis.

M. HART