

most liable to be confused with the mineral being described, in some instances either a more detailed account of the distinguishing features or a more frank statement that the optical distinction is difficult or equivocal would have been helpful. An example is cummingtonite and tremolite, where the high 2V and frequent fibrous nature makes determination of the sign difficult, and refringence can be very similar as regards thin-section appearance. Many descriptions are, however, excellent, e.g. the difficulty of distinguishing talc and muscovite is quite bluntly stated.

Many of the minerals are accompanied by black-and-white photographs of their thin-section appearance, and this is most disappointing as indeed almost all such photographs are—exceptions including the excellent illustrations of plagioclase extinction angle determination (albite and Carlsbad–albite methods) and a number of other minerals with birefringence of about 0.010 which only require black and white. I really think that black-and-white photographs yield such an unsatisfactory result that unless colour is available (as with the recent book by MacKenzie and Guilford: *Mineral. Mag.* 43, 1075) the appearance can be quite misleading. For instance, that of chlorite (p. 291). One appreciates that with the price already £20 it would have been undesirable to increase it further with costly illustrations.

It is regrettable that the amphibole description should retain terms formally abolished by the IMA in 1977, such as barkevikite and basaltic hornblende, and use classifications of the alkali amphiboles glaucophane–crossite–riebeckite, and the calcic amphiboles tremolite to ferroactinolite, which conflict with the approved recommendations for amphibole nomenclature, but it is appreciated that optical properties are less and less clearly diagnostic of many amphibole varieties.

Part II is comprehensive and enables most non-opaque minerals to be tracked down and includes occurrence and a reference to the literature for each mineral. Minerals which are close to the boundary between anisotropic and isotropic, biaxial and uniaxial, positive and negative occur under both of the relevant headings to assist in identification.

The only typographical error noted was in the footnote on p. 140. The book is well produced with excellent binding and certainly fulfils the authors' claim to replace now out-of-print texts of comprehensive optical mineralogy such as Winchell and Winchell and Larsen and Berman. It will be a must useful laboratory and library reference book and is reasonably priced for almost 700 pages. It is strongly recommended.

B. E. LEAKE

Cronan, D. S. *Underwater Minerals*. London and New York (Academic Press), 1980. xvi + 362 pp., 93 figs. Price £24.80.

During the past few years there has been an increasing interest in underwater mineral deposits. This has been accompanied by an explosion of literature on the subject, scattered in diverse journals, theses, and reports. This book attempts to pull together the literature and to provide an up-to-date text for both undergraduate and postgraduate students.

The first few chapters deal rather briefly with placers and aggregates, authigenic minerals, and phosphorites; in each there is a mixture of brief descriptions of the various mechanisms involved and mention of actual localities, but somehow not enough of either, though the authigenic section (which deals with zeolites, baryte, and feldspars) has some inspiring SEM photographs. It may be sufficient to say that the cassiterite deposits of south-east Asia have been well reviewed in the literature and need not be considered in detail here, but in this case it is perhaps unfortunate for a student reader that two of the three references are to papers in *Geol. en Mijnb.* and the third to *Tech. Bull. ECAFE*, not a selection always easily available to undergraduates.

In the succeeding chapters on manganese nodules and encrustations and on metalliferous sediments the author gets more into his stride and produces pertinent and useful summaries of recent research and current views. The distribution, mineralogy, growth characteristics, bulk geochemistry, and formation of ore-grade deposits of manganese nodules are discussed in detail in a relatively lengthy section (pp. 61–169) and this is followed by an equally informative section (pp. 170–227) on metalliferous sediments, with details of those from the Red Sea and the mid-ocean ridges. In both chapters the concepts are reinforced by geochemical and analytical data. There is a brief section on sub-surface deposits, including those of continental shelves and of the deep-sea floor, and a useful discussion on the interrelation between sub-sea mineral deposits and their relationship to ocean evolution and developing mid-oceanic ridges. The remaining chapters deal with exploration methods, both direct by various sampling and analytical techniques, and indirect using geophysical and geochemical methods, and exploitation or its possibility, using various ingenious concepts. Some 600 references are listed and 103 analyses of manganese nodules are given in an appendix.

The book is well produced and well illustrated with photographs and diagrams. It is eminently

readable and fairly free of minor errors, and should certainly be available in all industrial and university libraries catering for resource scientists.

R. A. HOWIE

Lynch, A. J., Johnson, N. W., Manlapig, E. V., and Thorne, C. G. *Mineral and Coal Flotation Circuits; their Simulation and Control* (Developments in Mineral Processing, vol. 3). Amsterdam and New York (Elsevier Sci. Publ. Co.), 1980. xiv + 292 pp., 168 figs. Price Dfl. 130.00 (\$63.50).

This is Volume Three in a series called Developments in Mineral Processing. It is written by an Australian team who are well known in the field of mineral flotation.

Any froth flotation process is a complex system: it is a very difficult system to simulate but mathematical models of flotation circuits have slowly been developed in an attempt to achieve better control of industrial flotation plants and of the products that are obtained.

Many mineralogical features, such as grain-size distribution, particle shape, particle composition, particle texture, etc., are very important in the flotation process, but these features are only briefly mentioned in the book. Other physical and chemical variables of flotation circuits, such as flow rate, solids density, reagent concentration, etc., are, however, dealt with in much greater detail. The techniques used for simulating the performance of a flotation circuit are discussed at length: the use of these techniques for designing and for optimizing automatic control systems for flotation processes forms the main theme of the volume.

This is a book for the specialist mineral processing engineer who will find it extremely interesting and useful. It is not a book, however, for the general reader or even for the mineralogist who is interested in mineralogical developments within the mineral industry.

M. P. JONES

Trümpy, R. *Geology of Switzerland: A Guide-Book. Part A: An Outline of the Geology of Switzerland*. Basel and New York (Wepf & Co.), 1980. 104 pp., 46 figs., 1 coloured pl. Price Sfr. 35.00.

Part B: Geological Excursions. Ibid., 230 pp., 204 figs. Price Sfr. 73.00. Parts A and B together Sfr. 98.00.

This two-volume work undoubtedly provides the most authoritative, up-to-date, and reasonably concise review of the geology of Switzerland and

how to see it. It is written in English, with English and French or German figure captions. The form of the publication was, in large part, determined by the organizers of the International Geological Congress in Paris, at whose request it was prepared.

The first volume (104 pages) is subtitled 'An outline of the geology of Switzerland'. It forms a general introduction to the Field Trip Guide which makes up the second part of the publication. The first volume is also being published simultaneously by the International Geological Congress as part of *The Geology of Western Europe*.

Although much of this volume is taken up with a discussion of the Alps, there are good sections on both the Molasse and the Jura. It is largely the work of Rudolf Trümpy, who in his introduction emphasizes that he is attempting a review rather than a synthesis. Five other workers have made briefer contributions—Bernoulli on the Southern Alps, Trommsdorf on Alpine metamorphism and intrusions, Grunenfelder and Koppel on geochronology, and Muller on crustal structure. The volume is profusely illustrated with black-and-white maps and sections, invariably clear and well drawn, and with one coloured foldout containing three cross-sections of Switzerland at a scale of 1:500 000. This part concludes with a short list of about twenty references.

The second part contains itineraries and locality descriptions for sixty-one days in the field in Switzerland. These are arranged into seven itineraries which provide an extremely comprehensive coverage of the geology. Thirty-two different authors have contributed sections of the guide book. Necessarily their approach is somewhat variable; some rely on the first volume to give the background and setting for their excursion, others provide substantial introductions; some provide reference lists; some provide detailed locality maps. All, however, provide numerous excellent illustrations; there is scarcely a page without one or more cross-sections, tables, or maps.

Even for those who never take this guide into the field, it must serve as an invaluable source volume for information on the local Swiss geology. For those who intend to use it as a guide it clearly supersedes anything at present available, and is in that sense essential.

There is no question that this pair of volumes should be available in every geological library likely to be used by those with an interest in the Alps, except that those purchasing the *Geology of Western Europe* will already have the material of the first volume and may wish to buy only the second volume containing the itineraries.

E. R. OXBURGH