

other microbeam techniques such as S.T.E.M. (scanning transmission electron microscopy) or the laser microprobe.

The first three chapters deal with the techniques of microanalysis; the last three are all concerned with applications. J. C. Rucklidge describes modern microprobe instrumentation and includes short sections on automation and energy-dispersive analysis. The chapter by G. Springer explains the commonly used ZAF matrix corrections and, more briefly, the Bence and Albee alpha coefficient method, the limitations of which are pointed out. This chapter also includes two recent modifications that have been applied in the absorption correction. Chapter three by D. G. W. Smith contains a detailed description of the way that an energy dispersive system is selected and how it may be set up in order to produce quantitative analysis. All the important instrumental parameters are discussed in detail. G. Plant starts with a concise account of the disadvantages of mineral analysis based on separated fractions and describes the particular advantages of the electron microprobe. This is followed by reviews of selected papers under the headings of cathodoluminescence, mineral identification, mineral analysis, new minerals, rare earth elements in minerals, zoning in minerals, and chemical-bonding studies. There is also a brief description of some S.E.M. applications and a somewhat longer section on applications of the ion microprobe. D. B. Clarke reviews petrological applications using both qualitative and quantitative methods as examples. He deals with identification, zoning, reaction phenomena, geothermometry and geobarometry, and phase-equilibria studies among other topics. The final chapter by D. C. Harris is concerned with the economic applications of the electron probe. A short description of the types of investigation where the probe may be useful is followed by a more detailed treatment of four examples.

Placing the references at the end of each chapter has resulted in considerable duplication, which could have been avoided by putting them at the end of the book. There are seven short appendices the most useful of which deal with the selection of standards for mineralogical microanalysis. It is disappointing that there is no discussion of the sensitivity and accuracy of the analytical techniques.

A book of this size cannot give comprehensive coverage to such a large subject. However, it can be recommended as an introduction to the techniques and applications of electron-probe microanalysis and it is excellent value at its price. Some sections, in particular the chapter on energy-dispersive analysis, are more detailed and will appeal to the more experienced microanalyst.

P. SUDDABY

Eberhart (J.-P.). *Méthodes Physiques d'Étude des Minéraux et des Matériaux Solides*. Paris (Doin Éditeurs), 1976. xiv+508 pp., 203 figs. Price F 580.00.

There are now available to the mineralogist and petrologist several texts (in English) dealing with the application of physical, chemical, and physicochemical methods to the investigation of minerals. The work under review restricts itself to purely physical methods and moreover to those involving X-ray, electron, or neutron beams.

Fundamental principles concerning electromagnetic radiation and particles, solid materials, and the interaction between them, occupy the first part (114 pages) of the book. This includes treatment of the phenomena of scattering, emission, and absorption. The second part (51 pages) describes the production and measurement of X-rays, electrons, and neutrons, and the third and major part (310 pages) describes the various methods. There are chapters on: X-ray diffraction including the Laue, rotating crystal, and powder methods; structure determination by X-ray and neutron diffraction; electron microscopy; electron diffraction; X-ray

fluorescence analysis; electron probe microanalysis; chemical analysis by electron spectroscopy of photoelectrons and of Auger electrons; scanning electron microscopy; ion probe microanalysis.

For each method, theory and instrumentation are treated in considerable depth (precision and sensitivity, limitations, advantages, and disadvantages are well explored) and a brief section indicates some examples of applications to minerals. Each chapter has a bibliography leading the reader to more specialized books, and there are appendices on 'reciprocal space' and Fourier Transforms. The book concludes with a subject index and a list of published papers referred to in the text.

Books on techniques are bound to be a little behind the 'state of the art' and this one, with few references later than 1972, somewhat more so. For example, in discussing mineral identification by X-ray diffraction it does not refer to the change of management and title of the ASTM scheme to JCPDS (Joint Committee on Powder Diffraction Standards), and more important, to the newer developments like computer searching and the Mineral Data publications. Also, the now important energy dispersive method is not mentioned in the chapter on electron probe analysis (though it is dealt with in principle elsewhere).

An outstanding feature of this book is the high standard of its production. Text and figures are clearly and elegantly presented, the use of black and red in headings and drawings being particularly effective. Another outstanding feature is the price! Reviewers are becoming inured to high prices and are making fewer remarks about them, but this book is so ultra-expensive (even making allowance for the depressed state of sterling) as to bring forth comment once more. One wonders not which individual can afford it but which institutional libraries will buy it!

J. ZUSSMAN

O'Donoghue (M.), Editor. *The Encyclopedia of Minerals and Gemstones*. London (Orbis Publishing), 1976. 304 pp., 63 figs., 450 coloured photos. Price £7.95.

This richly illustrated book aims to present a simple and clear exposition of the nature, occurrence, and properties of minerals and to give detailed information on all the mineral varieties important to the collector or lapidary. The text consists of eight chapters contributed by individual experts (M.A. 77-1370), together with a glossary, mineral identification tables, and a bibliography. It would be easy to compare this work with the genuinely encyclopedic volume of Roberts, Rapp, and Weber (M.M. 40-105) with over 2800 entries at many times the price, but the intended market is different: the present book is aimed for those who know nothing about minerals or gems and for the experienced mineral collector. Nevertheless the text is authoritative and includes chapters on the geological relationships to be found among rocks and minerals with details of rock classification, economic minerals, the preparation and cutting of gemstones, and the cleaning and storing of minerals. Unfortunately throughout these chapters there is no reference to the numerous excellent colour photographs interspersed in the text. In the main section, 'The mineral kingdom', which contains information on the composition, properties, occurrence, and uses of over a thousand species, this matters not at all as each photograph has a caption with locality details (but no indication of true size of the specimen). But it is the excellent Italian colour printing of the well-chosen mineral specimens that will appeal to most mineralogists—and applying the acid test of whether the well-crystallized species can be identified readily by a glance at their photographs, the reproduction sets a uniformly high standard of fidelity.

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