BOOK REVIEWS

Mamyrin, B. A., and Tolstikhin, I. N. *Helium Isotopes in Nature* (Developments in Geochemistry, 3). Amsterdam and New York (Elsevier Science Publishers) 1984. xiv + 274 pp., 86 figs. Price Dfl. 140.00.

Students of noble gas geochemistry will already have read or referred to this handsome volume with eagerness to discover other less familiar methods and concepts relating to measurements of helium in nature, as undertaken and viewed by Soviet scientists since 1967. The two isotopes of helium exhibit a wide range of values in their ratio, $^3He/^4He$, varying from 10^{-1} in spallogenic helium to 10^{-10} in radiogenic sources. The blossoming of this subject has been very much dependent on the development of sensitive mass spectrometric techniques, and these are described by Mamyrin in the first part of the book. Such machines have been responsible for an explosion of helium isotope data which are fully treated in the second part by Tolstikhin. One important value of this book is gaining easy access to this large corpus of original experimental data. Together with results published in English written journals, Tolstikhin has been instrumental in describing fully the diagnostic distributions of helium isotopes between the major terrestrial reservoirs, and in so doing has been able to address a variety of fundamental earth science problems. These include the processes of early accretion, the origin and history of terrestrial fluids, earth degassing, and the evolution of terrestrial heat flow. Valuable new details are given on the relationships between radioelement contents of rocks and the consequent radiogenic production of helium isotopes. Particularly rewarding is the description of a correlation found between heat flow in the crust and $^3He/^4He$ ratios observed in terrestrial fluids; this notion is related to the geotectonic evolution of the regions investigated and should serve to stimulate earth scientists engaged in understanding the thermal structure of the crust for many years to come. Rare is the book that can do that.

P. J. HOOKER

Zoltai, T., and Stout, J. H. *Mineralogy: concepts and principles.* Minneapolis (Burgess Publishing Company), 1984. x + 505 pp., numerous figs. Price $42.70.

This is a most interesting textbook, rich in the new ideas of mineralogy of the past couple of decades. Teachers of mineralogy will find it invaluable; but introductory-course students, for whom it was written, may well be overwhelmed by its thoroughgoing treatment and rather dense style. They will require careful guidance in selecting readings from its well-stocked pages. It nevertheless constitutes a valuable addition to the range of textbooks available.

Part I of the book (291 pp.) comprises 11 chapters on principles and concepts. With hand specimen recognition criteria safely out of the way in the 15 pp. of Chapter 1, we get down to business with 3 chapters on Symmetry and Crystallography (the notation of symmetry), Symmetry of Crystals (stereograms etc.) and Symmetry and Atomic Bonding (including crystal field theory).

Chapter 5 is regarded by the authors as a key chapter. Here, Crystal Structures are classified into Polyhedral Frame structures (most silicates), Symmetrically Packed structures and Molecular structures. The chapter embodies a long densely written description of crystal structures in terms of stacking of symmetrically packed sheets. These descriptions, as the authors confess, do not lead to any easy visualization of the structures in three dimensions, but are held to be more rigorous for purposes of structural comparison in polytypism etc. It remains to be seen whether this description will displace the pictures based on linked polyhedra at student level. The symbols for the symmetrically packed structures and the Symmetrical Packing Index appear later, in the mineral descriptions of Part II.

Mineral Physics and Symmetry (Chapter 6) deals in 'cause symmetry', 'symmetry of the medium' and 'effect symmetry' to describe thermal expansion, piezoelectricity, magnetic properties, etc. and Chapter 7 is on crystal growth and defects.

Chapter 8, Mineral Chemistry and Stability, is a short flirtation with thermodynamics and Chapter 9 deals with Mineral Associations interpreted through the Phase Rule.

X-ray Mineralogy gives an account of powder photography and diffractometry, the reciprocal lattice and the indexing of powder patterns. Single-crystal methods get brief mention. In Optical Mineralogy (Chapter 11) much space is devoted to calculating the field of a dipole in a crystal, and the optical sign of calcite, but the treatment of the passage of light through a polarizing microscope is poor and the diagram purporting to explain Snell's Law explains nothing (Snell doesn't even make it into the book's index). There is nothing on reflected light, though reflectance is given in mineral descriptions.

In Part II the minerals are described, using tables of properties of individual species (with an optical orientation diagram for most) embedded in a general discussion of each mineral group. These discussions are illustrated by excellent stereoscopically paired drawings of the structures that give a vivid and valuable 3-D picture (these stereoscopic drawings are also a feature of Part I of the book).

The authors are to be congratulated on using SI units, in the face of American conservatism on this issue. Estimates of effective ionic radii by both Shannon and Prewitt and Whittaker and Muntus are conveniently listed in an Appendix.

M. H. BATTEY

Shelley, D. *Optical Mineralogy* (Second edition). Amsterdam, Oxford, and New York (Elsevier), 1985. xviii + 322 pp., 175 figs., 40 colour photos. Price (hardback) US. $37.50.

The flavour of this revised version is much the same as the 1975 edition of *Manual of Optical Mineralogy* (MM 40-800), but the chapter on principles has been enlarged to include a more thorough treatment of retardation, interference figures, and dispersion of the optic axes. The section on techniques is expanded to fill three chapters instead of one, and the use of the spindle-stage is now included.

The division of the book is roughly half on principles, techniques and determinative tables, with the second half being devoted to descriptions of individual minerals or mineral series. The mineral descriptions have been brought up to date and there are more orientation diagrams than hitherto, but information on paragenesis is brief in the extreme.

The text and line drawings are clear and attractively presented and a fold-out chart for interference colours is appended; there are some 130 references and a useful index. In this edition a separate section of 40 photomicrographs in colour (many of them matched pairs respectively in plane- and crossed-polarized light) is included, but unfortunately they are of postage-stamp size and much less useful than if they had been, say, twice as large. This criticism apart, this book can be strongly recommended for first- or second-year undergraduate use; in the reviewer's experience, the first edition was the most popular of several elementary texts for explaining to students the mysteries of optic axial figures and the construction of oriental diagrams, and it is good to have it again available.

R. A. HOWIE

Fander, H. W. *Mineralogy for Metallurgists: an Illustrated Guide.* London (Institution of Mining and Metallurgy), 1985. xx + 77 pp., 213 figs. Price £33·00.

This slim volume is dominated by 136 colour photomicrographs of ore samples, mostly ores in their natural state but some which have also been subjected to beneficiation processes. Each plate is annotated, with brief additional comments highlighting aspects of the mineralogy which could be relevant to the upgrading processes. In addition there is a brief text introducing the methods of study and the types of mineral deposits encountered.

The book was conceived as a textbook for students of metallurgy and as a reference for writers of reports and papers. The photographs are well produced and cover a wide range of ore deposits. Even though the coverage was not meant to be comprehensive there is a distinct bias in the types of deposit covered—perhaps reflecting the author's experiences in Australia. For instance, Au and Sn/W deposits are well represented (making up almost 50% of the total) whilst Ni, Pt, Cr, and U minerals are virtually absent. Although the photos all have scales, the conditions under which they were taken are not always apparent.

I am doubtful whether this volume will serve the needs of a student text in metallurgy or as a reference work. There is not enough detail relating the illustrations to the metallurgical processes which are to be employed and the coverage is not comprehensive enough. The high price for so little information would exclude it from consideration as a student text.

However, notwithstanding its shortcomings, and as someone engaged in teaching mineralogy, I will find this an extremely useful publication for students of geology and mineralogy. It is always an uphill struggle convincing students of the need for detailed descriptions in ore microscopy. This volume is a useful visual representation of the importance of textures and mineralogy in the metallurgical industry and is therefore recommended for all geology libraries. Ironically this does not appear to be the market it was originally aimed at!

D. H. M. ALDERTON

Wolfe, J. A. *Mineral Resources, a World Review.* New York and London (Chapman and Hall), 1984. xvi + 293 pp., 50 figs. Price £10·95.

This claims to be an unusual book and it certainly is. The first part (87 pages) consists of what the