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.