BOOK REVIEWS

Deer, W. A., Howie, R. A., and Zussman, J. *Rock-forming Minerals. Volume 1A. Orthosilicates.* London (Longman) and New York (Wiley: Halsted Press), £50·00. x+919 pp., 373 figs., 79 tables.

In the preface to this second edition of the classic DHZ, the authors state that they have maintained the general principles and organization adopted for the first edition. The enormous expansion of mineralogy, crystallography, and petrology in this Golden Age of Earth Sciences has required a tripling of the number of pages for each mineral. I cannot imagine how these three authors can have assimilated so much information in so short a time since publication of the Pyroxene volume, especially as two of them have enormous day-to-day responsibilities.

In the late nineteen-fifties, I could run through all the rock-forming minerals in an advanced course at Penn State. A quarter-century later, I argue with my good friend Peter Wyllie about the content and style of the Advanced Mineralogy class at Chicago. As an experimental petrologist, he wants me to teach all the rock-forming minerals in ten weeks. I want to delve deeply into the new types of information and the new types of thinking about minerals with the aim of stimulating students to invent new ideas for research. Of course, these two needs are almost irreconcilable, and I believe that the best compromise is to teach thoroughly only a few minerals in any year, and to rotate the minerals in successive years. A student fully grounded in the fundamentals can then go to DHZ for a systematic literature survey for any given mineral, and then to *Mineralogical Abstracts* and *Chemical Abstracts* for an update.

Competing with the present volume of DHZ is Volume 5 of *Reviews in Mineralogy* prepared by five authors, and published in 1980 by the Mineralogical Society of America. The same orthosilicates are covered, except that the actinide ones are not given in DHZ 1A. To obtain a detailed comparison, I took at random zircon (DHZ 1A 24 larger typeset pages, 170 references; RM 45 smaller typewriter-offset pages, 160 references). First, less than half of the references are common. Second, the crystal structure section is more detailed in RM, whereas the paragenesis section of DHZ 1A is not explicitly represented in RM. Third, morphology is covered in more detail in RM, and chemistry (two pages of analyses in DHZ 1A). In short, the two treatments have characteristic strengths which tend to occur also for the other minerals, but to different degrees. The overlap between the two volumes is not large enough that either one is sufficient on the library bookshelf: in particular, the treatment of olivine is much more detailed and petrologically oriented in DHZ 1A.

Finally, a few details. To check for accuracy, I examined all references to work done in my laboratory (not for egocentricity—just for ease!). The only error detected was G. instead of C. R. Knowles on p. 737. There are numerous phase diagrams, all newly drafted. The tables of chemical analyses could be compressed (mostly six to the page). Some are marked as electron probe analyses, but others are not; incidentally, I am sceptical of most olivine analyses with $Al_2O_3 > 0.1$ wt. %. The petrogenesis section on olivine is thorough and useful on the whole, but some sections need further interpretation (e.g. Table 29 lumps together some disparate types of meteorites and omits some important ones).

To conclude, this is an important volume which should be in all earth-science libraries and on the bookshelf of professional mineralogists. Many of my research projects arose from reading DHZ 1st edition in the evening, and I look forward to many more happy hours with DHZ 2nd edition. The authors fully deserve the honour they received recently from the Mineralogical Society in London. Good luck for DHZ 3rd edition.

J. V. SMITH

Kostov, I., and Minčeva-Stefanova, J. *Sulphide Minerals: Crystal Chemistry, Paragenesis and Systematics.* Stuttgart (E. Schweizerbart'sche Verlagsbuchhandlung), 1982. 212 pp., 144 figs. Price DM 64.00 ($28.20).

New textbooks in the field of ore mineralogy are to be welcomed, especially when, as in this case, the authors possess a wealth of knowledge and experience of the subject matter. As the title of the book implies, the emphasis is very much on two areas of sulphide studies—crystal chemistry, and what the authors term 'paragenetic trends'.

The first half of this book, following a very brief introduction, is devoted to the crystal chemistry of sulphide minerals. The term sulphides is used in the widest sense so as to include compounds of Se, Te, As, Sb, and Bi and also the sulphosalt minerals. Following an outline of the attempts made by earlier workers to produce crystal chemical classifications of the sulphides, the authors propose their own solution to this problem. Their classification places emphasis on the axial ratios of the unit cell

(or subcell) of the structure as a guide to 'anisometricity'. The structures of individual sulphides and sulphosalts are then discussed in detail within the framework of this classification. This useful review of sulphide crystal chemistry contains a wealth of data and is illustrated with numerous structural diagrams.

The second half of the book is headed 'Phase Equilibria and Natural Assemblages' and starts with an exposition of general principles by which sulphides can be differentiated geochemically and crystallochemically into groups. Six assemblages defined in this way (Pt-Pd, Ni-Co-Fe, Zn-Cu-Fe, Cu-Sn-Pb, Ag-Au, and sulphosalt assemblages) are discussed in turn. Data are presented on the phase relations in the relevant systems and naturally occurring associations are briefly described. The former are illustrated with the appropriate phase diagrams and the latter with photomicrographs of polished sections. Again as in the section on crystal chemistry, a large amount of information has been brought together and, although individual occurrences are only briefly described, the salient points are covered and references to more detailed accounts are provided.

A final section comprised of just over three pages is entitled 'Systematics' and attempts to combine the crystal chemical and geochemical classifications into an overall classification scheme for the sulphide minerals. In what is, in effect, a twenty-eight page appendix to this chapter and to the book as a whole, all sulphide and related minerals known up to the end of January 1981 are listed within the framework of this classification. As well as mineral name and formula, symmetry and unit cell parameter data are also provided. More than four hundred references are listed at the end of the book and there is an index of mineral names which also lists the major lines in the X-ray powder diffraction pattern. Unfortunately, there is no general subject index.

This book is well produced with few typographical errors and an attractive binding. For a slim volume, it contains much valuable information on the crystal chemistry, phase relations and occurrence of sulphide and sulphosalt minerals. Anyone involved in research on the sulphide minerals will require a copy on their bookshelf.

D. J. VAUGHAN

Henderson, P. *Inorganic Geochemistry*. Oxford (Pergamon Press), 1982. 353 pp., 104 figs. Price £21·00 (£9·25 in flexicover).

There is no shortage of books on geochemistry, the shortage has been in geochemistry books that could be recommended, notably for those reading the subject at anything beyond an introductory level. The 'classic' texts by Goldschmidt (and by Rankama and Sahama), both now out of date and out of print, have not been replaced by comparable modern accounts of the subject. The only other book that could reasonably claim to be a standard textbook for the subject—Mason's *Principles of Geochemistry* first published in 1952—although revised and updated, cannot be regarded as an advanced textbook covering recent developments in the subject. Hence the publication of an entirely new textbook in geochemistry by one of the foremost researchers in the field is an event of some importance.

The book addresses itself to 'senior undergraduates in the Earth sciences and for students doing postgraduate courses in geochemistry . . . the seasoned researcher and to the university lecturer'. A threefold division of the subject is made: (1) the chemical composition and nature of the Earth, Moon, and meteorites; (2) chemical principles in igneous and metamorphic systems; and (3) aqueous systems for continental and oceanic waters. Within these major divisions are several chapters on specific aspects of geochemistry, presenting concise and comprehensive summaries of current thinking in these fields.

Part One includes chapters on meteorites, cosmic abundances, and the Earth—including discussion of the chemistry of the major divisions of core, mantle, and crust. There is also a most welcome chapter summarizing the implications of recent discoveries on the geochemistry of the Moon. This is an excellent account of a topic where our knowledge has been transformed in recent years, and geochemist and non-geochemist alike may consider buying the book for this chapter alone.

It is in Part Two that one sees most clearly the evidence of original thinking and a new approach to the subject. Chapter 5 presents the data of element distribution and chapters 6, 7, and 8 evaluate the structural, thermodynamic and kinetic controls of element distribution. These last three chapters are written at an advanced level and are substantially more 'quantitative' in approach than anything previously attempted in a standard textbook. They should be of great value to researchers in the field and will do much to encourage a more rigorous treatment of geochemical data. Much of the discussion in these chapters uses examples of igneous rock processes, and as the author points out, our knowledge of element mobility during metasomatism is much more limited. Part Two of the book also includes a chapter on some geochemical uses of isotopes, which has been a significant and regrettable omission from most previous geochemistry textbooks. Isotope geochronology is