

postgraduates commencing research who are concerned with the solid state. With regard to undergraduate users, those with good physics and mathematics will find it ideal; others will find it useful, but heavier going.

Technical production of this book is excellent, with clear text, diagrams, tables, and plates. It is a pity, however, that the plates are presented with little comment, few of them being referred to in the text.

The subject matter of this book has been of long-recognized importance for metallurgists, but is increasingly relevant for mineralogists also, since clues to the history of minerals are to be found not only in their chemistry and over-all crystal structures, but also in micro-textural features and imperfections. The imperfections so far most studied by mineralogists are stacking faults in layered minerals, but other kinds of imperfection, both in layered and other minerals, can be observed by modern electron-microscope techniques. For minerals, as compared with metals, the techniques are probably less straightforward, and because of their generally more complex crystal structures, interpretation may be more difficult. Even so, those involved in this growing field of interest will find the book invaluable.

J. ZUSSMAN

WEDEPOHL (K. H.), executive editor. *Handbook of Geochemistry*. Vol. I and Vol. II/1. Editorial Board: CORRENS (C. W.), SHAW (D. M.), TUREKIAN (K. K.), and ZEMANN (J.). Berlin, Heidelberg, and New York (Springer-Verlag), 1969. Vol. I: xv+442 pp., 60 figs., cloth-bound. Vol. II/1: x+586 pp., 172 figs., loose-leaf binder (Vols. I and II/1 are not sold separately). Price DM224, \$61.60 (Subscription price applicable on orders for the whole Handbook DM 179.20, \$49.30).

The broadening of the range of analytical methods available to the geochemist over the past fifteen or twenty years, and in particular the increasing application of sophisticated radiochemical and isotopic methods has led, since the appearance of the standard works of V. M. Goldschmidt (1954) and of K. Rankama and T. G. Sahama (1950), to a torrent of fresh data on the abundances and distribution of the elements in all kinds of terrestrial and extra-terrestrial materials. Widely variable in quality and significance as these data are, and widely scattered over a steadily increasing number of scientific periodicals, the editors and contributors to the work under review have set themselves a formidable task, the completion of which will surely earn the gratitude and admiration of all concerned with the chemistry of the Earth and the planets.

Earlier standard works in geochemistry, including Vernadsky's classic and Mason's extremely successful introductory text as well as those mentioned above, strove to clarify the underlying principles of the subject as far as the available analytical results and knowledge of such topics as crystal structure and crystal chemistry then permitted. Goldschmidt's achievement, in particular, was and is a cornerstone, and although capable of revision in detail, his posthumously completed book will long retain its special place in the literature of geochemistry. The present work is in no sense a substitute for Goldschmidt in what might be called the philosophy of the subject, but will, on its ultimate completion, provide a far more accurate and up-to-date source of factual information. Its title—a *Handbook*—is well chosen.

At the same time, the first volume of the work does provide a very valuable source of general ideas and principles necessary to the understanding of modern geochemistry. Instead of a unified treatment of the Goldschmidt type, this volume offers a series of chapters by various authors, naturally varying in approach and in emphasis.

C. W. Correns's introductory chapter ('The discovery of the chemical elements. The history of geochemistry. Definitions of geochemistry', pp. 1-11, 2 figs.) makes interesting reading, if a little disjointed and incomplete.

J. Zemann in Chapter 2 ('Crystal chemistry', pp. 12-36, 8 figs.) gives a compact but not altogether satisfying review of the principles of internal symmetry and bonding in crystals, and some related topics. The treatment, while brief, is a little ponderous in style; crystal field and ligand field theory is accorded only half a page.

K. B. Krauskopf in Chapter 3 ('Thermodynamics used in geochemistry', pp. 37-77) gives an elegant and lucid exposition of the simpler thermodynamic concepts essential to the geochemist, treated with a minimum of mathematics.

K. Keil's Chapter 4 ('Meteorite composition', pp. 78-115, 6 figs.) offers a very clear classification of meteorites, modified after Prior and Mason, and a good discussion of the problems and confusions. Useful lists of known meteorites, with their skeleton mineralogy, and summary tables of the minerals reported in meteorites are presented.

G. G. Goles in Chapter 5 ('Cosmic abundances', pp. 116-33) presents a reasoned discussion of solar element abundance estimates, with his own preferred values, and of meteorite and solar system abundances. Although brief, this is a critical and well-documented review.

Chapter 6, by U. Schmucker ('Geophysical aspects of structure and composition of the Earth', pp. 134-226, 32 figs.) provides a quick reference for many topics of importance to geochemistry in the broad sense. It is critical in approach, thorough, and lucid, although it is perhaps surprising to find over 90 pages devoted to geophysics in a handbook of geochemistry, while crystal chemistry, for example, is dealt with in 25 pages.

Chapters 7, 8, and 9 deal with the 'Composition and abundance of common igneous, sedimentary, and metamorphic rocks', the first two by K. H. Wedepohl and the latter by K. R. Mehnert. Wedepohl's chapter on igneous rocks (pp. 227-49, 1 fig.) concentrates on the abundant types, using Streckeisen's classificatory scheme and is designed 'only as a reference on rock names for authors and readers of Part II of this Handbook'. Sedimentary rocks are similarly dealt with (pp. 250-71) and average compositions of selected types are tabulated. Mehnert's chapter on the metamorphic rocks (pp. 272-96, 2 figs.) provides a lucid review of a series of complex topics, including granitization, and is in itself a valuable introduction for the non-specialist.

K. K. Turekian's Chapter 10 ('The oceans, streams, and atmosphere', pp. 297-323, 9 figs.) is a very useful contribution, and includes in Table 10-7 a comprehensive estimate of the composition of sea water critically compiled from all the available modern sources. A similar, but necessarily more approximate table is presented for stream waters.

D. M. Shaw in Chapter 11 ('Evaluation of data', pp. 324-75) presents a rigorous discussion of the evaluation of analytical precision, accuracy, and sensitivity and a

summary of the most commonly useful statistical procedures. This is followed by a brief treatment of petrochemical calculations, including igneous and metamorphic norms and the interpretation of silicate mineral analyses. Statistical tables and tables for converting oxide weight percentages to gram-atoms $\times 10^4$ are appended.

Finally, A. Heydemann in Chapter 12 (pp. 376-412) provides 23 sets of tables of various kinds of use to the geochemist.

Each chapter has its own bibliography and the volume is completed by author and subject indices.

The first instalment of Volume II of this work, which will appear sporadically, begins the systematic compilation of geochemical data for most of the elements, arranged in order of increasing atomic number (see M.A., abstr. 70-90). A standard layout will make for reasonably homogeneous treatment, and it is this part of the work which will be most used and is most eagerly awaited by working geochemists. Few of the sections in this first instalment are complete and it is impossible yet to judge the effectiveness of the whole.

Of the elements dealt with so far, the sections on Be, C, O, As, Sn, Sb, Re, Pt metals, Bi, Th, and U are complete or virtually so; considerable gaps remain to be filled in the cases of B, V, Fe, and Ag. Each element will be treated systematically: crystal chemistry; natural isotopes; abundances; behaviour in magmatogenic processes, weathering and alteration of rocks; biogeochemistry; economic importance and so on. This second part of the work will eventually fill three or four loose-leaf binders, and when complete will certainly be a most valuable mine of information. The problem will be to keep it reasonably up to date.

The production of the whole work is of a high standard, clearly and attractively printed and set out. Perhaps not unexpectedly, certain chapters in Volume I carry clear evidence of having been translated from the German and are by no means free from minor errors and misprints. On the whole, however, the impression is of a carefully thought out and well-presented compendium. It is to be hoped that Volume II will be completed within a reasonable time, and that the work will receive from all interested in geochemistry the warm welcome it deserves, despite its very high price.

E. A. VINCENT

FRANTSESSON (E. V.). *The Petrology of the Kimberlites*. Trans. from the Russian by D. A. Brown. Canberra (Department of Geology, Australian National University), 1970. vi+194 pp., 69 figs. Price \$4.00.

After a five-and-a-half page introduction and a short geological description of the Siberian Platform kimberlitic and alkaline-ultrabasic volcanism a comprehensive account of the terminology and classification of kimberlitic rocks is given. This section deals with the complex problem of defining kimberlites when other alkaline-ultrabasic formations, plus carbonatites, are associated.

The petrography of kimberlite and eruptive breccias of porphyritic alkaline-ultrabasic rocks follows the classificatory schemes and in this section analyses of