White, J. C., ed. *Applications of Electron Microscopy in the Earth Sciences*. Toronto (Mineralogical Association of Canada), 1985. viii + 213 pp., 71 figs., 139 photos. Price $Can 12 + $2 postage.

This handbook is the proceedings of a short course held in New Brunswick in 1985. Despite the book's title, the chapters are a mixture of reviews of techniques, theory, and applications of TEM with a chapter each on SEM and electron microprobe analysis. The contributions generally reflect the authors' own interests and no attempt has been made to make the coverage comprehensive. In many cases the result is successful; in others less so. A serious omission, in my view, is that of chemical analysis in the TEM, a technique which David Veblen admits in Chapter 3, is vital to the geologist working with chemically complex natural materials. A chapter on convergent-beam electron diffraction (CBD) would not have gone amiss either. As David Veblen also says, CBD has not been widely applied to minerals, but that is all the more reason for its inclusion! Chapters on these two topics would have made the coverage of TEM more complete. If time and space were limited they could have replaced the chapters on SEM (excellent though this one is) and analysis of bulk samples. The latter, after all, had a whole handbook in this series devoted to it in 1974.

There are seven chapters. The first, by A. C. McLaren, includes a simple, clearly written account of image formation, the construction of the TEM, and the reciprocal lattice. There follows a very brief description of the kinematical and dynamical theories of diffraction and image contrast. The second chapter, by D. L. Kohlstedt, covers selected-area electron diffraction and Kikuchi lines, but the treatment is too brief to be very informative to the novice. Two examples of the use of electron diffraction are given. The second part of Kohlstedt's chapter deals with weak-beam microscopy. This technique has not been used a great deal by geologists and its inclusion here is valuable.

D. R. Veblen's chapter on 'high-resolution electron microscopy' is excellent, well written and full of tips and hints on how to get the best, interpretable images—a good account too of the principles of the multislice method.

J. N. Boland's chapter is entitled 'Mechanisms of phase transformations in minerals' and is mostly a review of the theory of phase transformations interspersed with some examples of the use of TEM and SEM. Unfortunately I found it confusing and misleading. For instance we are told that the 'driving force' ΔG_v is an 'imprecise' term used to describe the free-energy change per unit volume. Also that the total free energy change for nucleation is subdivided in a 'somewhat arbitrary manner' into volume, surface, and strain terms. There is nothing imprecise or arbitrary about these terms! The confusion is not helped by the labelling of one of the curves in fig. 4.2 as $V\Delta G_c$ rather than $V(\Delta G_v + \Delta G_s)$! The statement on p. 99 that grain boundary nucleation is favoured at low temperatures is incorrect. So is the statement on the same page that homogeneously nucleated precipitates tend to be smaller than heterogeneously nucleated ones because diffusion is faster to the latter than to the former.

The reader will also be confused by the way the terms homogeneous, heterogeneous, and spinodal are used on page 105. In particular, spinodal decomposition is defined as *metastable* behaviour and as occurring when the barrier to nucleation disappears!

S. H. White's chapter on defect structures is an excellent review of results to date. There are useful discussions on the determination of Burgers vectors and problems of anisotropy, measurement of dislocation density, the estimation of palaeostress, and the recognition of healed fractures.

G. E. Lloyd's review of SEM in mineralogy wisely concentrates on back-scattered techniques and, in particular, on orientation contrast (OC). This latter technique is not one which is familiar to geologists, but as Lloyd shows, it has great potential. As well as pointing out the added complexities that arise in investigating materials of relatively low symmetry, e.g. silicates, Lloyd discusses the care that must be taken with specimen preparation for OC.

The final chapter by W. C. Chauvin attempts the impossible task of covering quantitative energy-dispersive X-ray analysis in the SEM in twenty-four pages. It can only be of use to someone who wants an introduction to the subject. The use of a gold-coated specimen as an example of ED analysis was inappropriate.

This handbook was produced to a tight schedule so that it could be available at the course. Consequently none of the chapters were openly reviewed or proof-read by the authors. Unfortunately this has led to some overlap in subject matter, most noticeably between McLaren and Kohlstedt, typographical errors (including missing lines of text on page 18 and a repeated line on page 167), and use of different symbols for the same function, e.g. extinction distance, by different authors.

In addition to the problems mentioned above, reading the handbook is made difficult by the minute typescript. Also some of the figures are so small as to be illegible. A number of figures also have their captions printed at right angles. The quality of the binding could have been better—my copy fell apart as I was one-third through reading it!

However, despite all its drawbacks, the low price of the handbook makes it a worthwhile purchase for any geologist interested in learning more about TEM or SEM techniques.

P. E. CHAMPNESS

Pies, W., and Weiss, A. *Crystal Structure Data of Inorganic Compounds. Part d1α: Key Element Si.* (Landolt-Börnstein: Numerical Data and Functional Relationships in Science and Technology, New Series. *Group III. Crystal and Solid State Physics. Vol. 7*). Berlin, Heidelberg, New York, and Tokyo (Springer-Verlag), 1985. xxiii+464 pp. Price DM 950.

Not surprisingly, the volume of this series covering compounds with anions containing Si has had to be split into two parts of which this, the first, deals with 'simple silicates' without H_2O. As in the rest of the series, the entries contain (i) formula and mineral name; (ii) space group, cell dimensions, number of formula units per cell, experimental density; (iii) structure type, method used for structure determination and its completeness; and often (iv) additional information on colour, habit, optical properties, phase diagram. References are of course included but as codes which have to be looked up in a separate volume: some may find this irksome, especially when referred on to Structure Reports.

The arrangement of entries is chemical and only a little thought is required to locate the compound or class of compounds one wants. Formula and mineral name indexes have yet to appear and compounds of a particular structure type are inevitably scattered in a chemical arrangement.

A reference series like this one serves two practical purposes: it is a quick route to basic data on a compound and a way into the literature on it. Unfortunately, this careful and thorough compilation does not come cheaply and only the major libraries will be able to afford a full set of this new Landolt-Börnstein. One wonders if compilations like this one, started in the 1970s, may not find themselves overtaken by information technology. The Inorganic Crystal Structure Database (ICSD) and the Crystal Data Identification File are both now available in Britain. Computer searching should be less laborious and, one may hope, cheaper and more versatile. The ICSD contains the full atomic parameters from each structure determination and the data can be manipulated by computer, for example, to work out bond distances or to draw diagrams of the structure. It is hard to see how reference books can compete when their contents are limited by the space available.

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