

structural progress appear to have unduly little treatment, but it is expected that they will feature in another volume. (The subject of polymorphism, for example, including much about the feldspars is to appear in Volume 3). In the section on amphiboles the 'curvature' of the chains is mentioned but the paper (1949) which first demonstrated this is not mentioned in the 1954 volume or here; a group of several more recent papers on the structures of amphiboles in the German literature, and an important one on their crystal chemistry in *Acta Crystallographica*, are also not mentioned in the present volume.

After dealing with crystal structures section *A* ends with chapters on crystallo-chemical aspects of isomorphism and on epitaxy. In section *B*, structural work on clay minerals is well represented. There are chapters on the principal clay mineral groups: kandites, smectites, mica-like clay minerals, and vermiculite; there is also a chapter on mixed-layer clay minerals.

The title of section *C* 'Silicate dispersoids', and the way in which this term is interpreted, allows a very wide range of topics to be dealt with in this part of the book. Among these are: colloidal solutions and sols; flocculation; optical properties of colloidal suspensions; X-ray and other investigations of colloids; hydrogels; various aspects of adsorption on silica and silicate gels. Also included are discussions of solid dispersed phases in solid dispersion media. Thus under 'optical properties of colloidal suspensions' there is discussion of structure defects and their role in coloured and luminescent materials. Also in section *C* is a chapter entitled 'Electron microscopy of dispersed systems', but this in fact deals partly with general techniques of electron microscopy and electron diffraction (*e.g.* the carbon replica method); in this and in some of the detailed studies mentioned, the chapter seems to be only marginally concerned with 'dispersoids'. There is a large section of over a hundred pages dealing with clay-water systems.

Silicate Science is not an easy book to read. This is partly because of the advanced nature of the subject matter and partly, unfortunately, due to unskilled use of the English language. Many phrases are clumsily constructed and sometimes quite wrong words are chosen. The meaning is often obscured because of this, and the difficulties which result will be greatest for foreign readers with imperfect understanding of English, who will not be able to guess so readily what the author is trying to say.

There is no doubt, however, that this book will be widely used by all concerned with silicates, and it will be appreciated as one which brings together results on natural and synthetic materials which are otherwise largely treated separately in mineralogical, ceramic and chemical publications. The detail with which structural information is given is considerably greater than that contained in the typical abstract journal. The coverage of literature from all countries is very good and that from the U.S.S.R. is particularly well represented. References are well documented, and at the end of the book there are four kinds of index: author, subject, compound, and mineral.

Such an enormous compilation could not have been produced without errors; there are indeed, in marked contrast with the 1954 book, a large number of minor errors. The figures are of very varying quality; they are mostly photographic reproductions of figures published in journals, and their quality is often somewhat poorer than that of the originals which themselves were sometimes not too good. If a work such as this were to be produced with per-

fect attention to all details its publication would be so delayed as to make it very much out-of-date on appearance, if indeed it appeared at all. The enormous value of this work, in collecting, arranging and summarizing related topics from such a wide field, is marred but not substantially reduced by the irritating rather than damaging blemishes.

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Advances in X-ray analysis. Volume 7. Edited by W. M. MUELLER, G. R. MALLET and M. J. FAY. Pp. x + 662. New York: Plenum Press, 1964. Price \$22.50.

The annual conferences on applications of X-ray analysis held in Denver are now well established, and the volume under review contains the proceedings of the twelfth, held on 7-9 August 1963. Volume 6 was reviewed in *Acta Cryst.* 17, 791 (1964).

Volume 6 contained 44 papers and 480 pages. Volume 7 contains 53 papers and, in spite of the recent increase in the size of the page, 662 pages. The emphasis on X-ray fluorescence analysis is maintained, though there is still no mention of it under any likely heading in the subject index. There is also an impressive group of papers on electron-probe analysis, which does appear in the index.

Conference proceedings are notoriously difficult to review. Papers that particularly attracted the reviewer's attention dealt with the use of peaks and mid-points of chords at half height for lattice-parameter determination (Parrish, Taylor and Mack), a graphical method of indexing powder photographs (Schieltz), and a double-crystal X-ray spectrometer based on the Philips diffractometer (Wittels, Sherrill and Kimbrough). Other reviewers could reasonably choose quite a different selection.

This volume needs no recommendation to those already familiar with the series. Those unfamiliar with it may like to know that the book is well reproduced by photolithography, and that it contains numerous figures, a few in colour.

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Fundamentals of transmission electron microscopy. By R. D. HEIDENREICH. Pp. xiv + 414. New York: Interscience, 1964. Price 109s.

This is a book which will be welcomed by all those — and especially metal physicists — who want to get the most out of the application of the electron microscope in their various researches. When the author uses the word 'fundamentals' in his title, he very much means what he says. The treatment commences from the elementary interactions of electrons with atoms and proceeds *via* an exposition of wave mechanics and electron diffraction to a detailed discussion of diffraction contrast in crystals. Anyone looking for a description of the design, construction and operation

of the electron microscope will not find it here, but what he is given is almost all the information needed for interpreting electron images as to contrast and resolution.

Starting from the belief that 'the ultimate goal of electron microscopy is the elucidation of atomic and molecular structures', the author's aim has been to develop 'a coherent, physical approach to the understanding of contrast ... whether the objects are plant cell walls or crystals containing stacking faults', making clear that the basic processes of image formation are the same in both amorphous and crystalline specimens. In this aim he has largely been successful, although it may legitimately be doubted whether, as he hoped, the lesson will be intelligible to biologists and chemists as well as to physicists, at least unless they have had a good grounding in physical optics and the calculus. There is, however, one shortcoming of some importance in the treatment, in that he does not give a detailed account of the anomalous-absorption theory of electron transmission in crystals. In consequence he is unable to deal adequately with the contrast effects caused by lattice defects in thick films, and in regard to the intensity distribution in absorption bands, his alternative explanation by a three-beam theory does not account for the observed variation with thickness, as does the anomalous-absorption approach. However, Dr Heidenreich is frank about the personal nature of the treatment put forward; he states: 'The reader is referred to the original publications in this somewhat

controversial area', and he gives the main references, except for the important papers by Yoshioka.

Apart from this omission, the treatment is extremely thorough. The text is well planned and lucidly written. The mathematics, where sampled, proved to be commendably free of proof-reading lapses, despite its volume and complexity. There is a wealth of diagrams, many of them cleverly planned and beautifully executed to illustrate three-dimensional situations. On the other hand, the micrographs are not always reproduced with enough definition and contrast to convey the intended information. There are also fifty pages of appendices containing tables of crystallographic data and electron-scattering amplitudes, as well as a more detailed discussion of some topics mentioned in the text, such as the phase effects of electron-lens aberrations and the determination of Burgers vectors.

Very few could have conceived such a book and still fewer could hope to carry it out so successfully. In effect Dr Heidenreich has tried to do for electron microscopy what Pinsker's book did for electron diffraction some ten years ago, *i.e.* to expound clearly its quantitative basis. In doing so he helps to clarify those areas where understanding is still weak or inadequately tested, and incidentally provides an invaluable reference book by gathering between two covers a literature which is widely scattered. It is safe to predict that his book will quickly become the bible of all those working in quantitative electron microscopy.

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Reports on progress in physics, Volume XXVII.

Ed. A. C. STICKLAND. Pp. iv+551. London: The Institute of Physics and the Physical Society, 1964. Price £6.

The present volume contains again a number of reviews of interest to the crystallographer and solid-state physicist. In the first place we have to mention A. F. Devonshire's *Some recent work on ferroelectrics*. It treats selected topics (among others the recently discovered SbSI), particularly if interesting from the theoretical viewpoint. R. E. Howard and A. B. Lidiard give a thorough and authoritative account of the transport of matter in solids (80 pages), emphasizing particularly the standpoint of the thermodynamical theory of irreversible processes, with numerous sidelights on the description of the transport phenomena in terms of crystal defects. H. K. Henisch discusses electroluminescence with a view for the limitations of our present understanding and pointing out the need for further investigations. He mentions briefly the modern topic of junction lasers, which, among numerous other subjects, is also treated in an 85-page contribution by J. E. Geusic and H. E. D. Scovil on microwave and optical masers.

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