Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (J. H. Robertson, School of Chemistry, University of Leeds, Leeds LS2 9JT, England). As far as practicable books will be reviewed in a country different from that of publication.

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Novel application of anomalous (resonance) X-ray scattering for structural characterization of disordered materials. By Y. WASEDA. Pp. vi+183. Berlin: Springer, 1984. Price DM 23.00, US $ 8.40.

It is straightforward to obtain a composite radial distribution function for a disordered material by Fourier transformation of a diffraction pattern. To partition this function into the contributions of the different kinds of atom pairs is less easy. This book explains how anomalous scattering changes these contributions and permits them to be resolved when experiments are done at several wavelengths. It also surveys much of the recent work with this technique at synchrotron radiation sources.

Also reviewed, in less detail, is some of the basic theory of diffraction and of anomalous scattering. Techniques for measurement of anomalous scattering, EXAFS spectroscopy, pulsed-neutron time-of-flight diffraction and energy-dispersive X-ray diffraction are reviewed briefly. Appendix 4 includes 50 pages of tables and plots of f' and f'' for all elements from Li to Cf, for energies 1 to 50 keV, recalculated by the author from the cross-section curves of Cromer & Liberman.

This book is recommended as an introduction to its rather specialized main subject and as a guide to the relevant literature (up to about 1981). The more general parts may be useful as orientation for a student, but are too superficial to be of much interest to the specialist in some other application of anomalous scattering. Appendix 4 may be reason for some to keep it conveniently at hand.

D. H. TEMPLETON

Department of Chemistry
University of California
Berkeley,
CA 94720
USA

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Liquid crystals and ordered fluids. Vol. 4. Edited by A. C. GRIFFIN and J. F. JOHNSON. Pp. 1157. New York: Plenum Press, 1984. Price $135.00 ($162.00 outside US and Canada).

This volume is a collection of the proceedings of a symposium on *Liquid Crystals and Ordered Fluids* sponsored by the Division of Colloid and Surface Chemistry and held at the national spring meeting of the American Chemical Society in Las Vegas, Nevada, USA, 29 March–1 April 1982. Volumes 1 to 3 report the proceedings of previous meetings of the same title, which were held in 1969, 1973 and 1977. The proceedings of this latest meeting are concerned mainly with thermotropic liquid crystals, though a few papers describe work on lyotropic liquid crystals. The coverage is representative of the main thrust of current liquid-crystal research, which is directed towards the design, synthesis and characterization of liquid crystals with a view to their use in electro-optic displays. This is a camera-ready copy. But it is well typed and easy to read.

Conference proceedings make compulsive scanning. One hopes and, indeed, expects to learn about 'new' developments. But in this case I find most of the research has been published elsewhere in a more complete and scholarly form. This is, of course, to be expected as the proceedings have been published some two years later than the actual conference. It is not my intention to criticize the editors; in fact, they have done an excellent job. Such delays are, however, unavoidable in view of the amount of work that goes into the publication of such a large volume. We must, therefore, question the utility of publications such as this one! At $162.00 it is a very poor buy at best. Certainly, the price is beyond the pocket of most scientists. Moreover, the spiralling cost to institutions of maintaining a well founded library and the consequent need for selectivity in purchases makes one hesitate before recommending the librarian to purchase outdated conference proceedings. Clearly, some kind of international computer data-base library is needed for the speedy and convenient access to conference proceedings

N. BODEN

School of Chemistry
University of Leeds
Leeds LS2 9JT
England

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Surface crystallography: an introduction to low energy electron diffraction. By L. J. CLARKE. Pp. xiii+329. Chichester: Wiley, 1985. Price £31.50.

Low energy electron diffraction (LEED) has two main applications to surface crystallography: the determination of the geometrical arrangement of atoms at well-ordered surfaces and the identification of defects (*e.g.* steps, antiphase domains) at disordered ones. The first application involves extensive measurement of integrated beam intensities and intensity analysis using dynamical (multiple scattering) theory. The second application involves measurement of the angular distribution of intensity including the angular intensity profiles of LEED beams. Although the dynamical theory is again needed in principle, valuable results are obtained in this case using the much simpler kinematical (single interatomic scattering) theory. The book

under review gives an authoritative and readable introduction to the first of these applications and an incomplete but still useful introduction to the second. The book begins with a complete systematic account of surface crystallography and ends with a survey of other methods of investigating crystal surfaces.

The chapters on the scattering of electrons by crystals, multiple scattering calculations and comparison of theoretical and experimental results provide a clear introduction to LEED intensity analysis using dynamical theory. Here, and in a chapter on temperature effects, the presentation maintains a nice balance between an exposition of the principles involved and the less interesting but very important details of methodology such as reliability factors. Elsewhere in the book, especially in the chapter on experimental methods, the presentation is a bit uneven, so that it is not always easy to distinguish between examples and an exhaustive list. For example, methods of crystal temperature measurement are surveyed in some detail but without mention of infrared pyrometry, which is actually quite useful for LEED. It might have been better to limit this part of the text strictly to LEED experimentation and supplement it with a complete set of literature references to related topics such as temperature measurement.

In dealing with applications of kinematical theory, the author has attempted to compress into one chapter an already vast and rapidly growing subject matter. While most of the important applications are mentioned and the examples are well chosen, the book would have been improved by an expanded presentation with more examples, including in particular the analysis of complex LEED patterns such as those for gold crystal surfaces. In this context it would have been worthwhile to discuss the use of kinematical LEED in conjunction with techniques sensitive to short-range correlations - *e.g.* low energy ion scattering or electron energy loss spectroscopy.

The final chapter gives a useful comparison of LEED with other techniques but unfortunately one of these, X-ray diffraction using synchrotron radiation, came on the scene too late to be included. Nevertheless, readers contemplating a detailed study of the LEED structure determination method might want to consider the possibility that it will be supplanted soon by X-ray diffraction.

Despite an occasionally uneven level of presentation and a few important omissions, the book succeeds in its main objective in giving a clear and authoritative introduction to LEED.

E. G. McRAE

AT&T Bell Laboratories
Murray Hill
NJ 07974
USA

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X-ray crystallography. By E. M. UYGUR. Pp. x+318. Published by METU, Ankara, Turkey, 1983 (available from the Metallurgical Engineering Department). Price US $5.00.

This book, which is based on 'class notes developed over many years of teaching of X-ray diffraction and crystallography courses' by the author, would be better titled *Elements of X-ray diffraction.* The rather general title of *X-ray crystallography* would demand a more comprehensive coverage, which the book lacks. I would particularly like to stress the fact that there is not even a cursory treatment of the determination of crystal structure and the phase problem, which is a vital area in X-ray crystallography.

The geometry of crystals, symmetry mapping and projections are routinely discussed in the first three chapters. This is followed by a treatment of generation and properties of X-rays in Chapter 4. Chapters 5 and 6 deal with X-ray diffraction proper and the experimental techniques.

Except for the drawback mentioned earlier the sections covered have been treated with clarity with good examples and illustrations. The book should find use as a supplement to standard texts in X-ray diffraction and crystallography.

R. SRINIVASAN

Department of Crystallography & Biophysics
University of Madras
Guindy Campus
Madras-600025
India

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Books Received

The following books have been received by the Editor. Brief and generally uncritical notices are given of works of marginal crystallographic interest; occasionally a book of fundamental interest is included under this heading because of difficulty in finding a suitable reviewer without great delay.

Niels Bohr centennial conferences, 1985: Recent developments in quantum field theory. Edited by J. AMBJØRN, B. J. DURHUUS and J. L. PETERSEN. Pp. viii+298. Price Dfl 105.00. **Nuclear Structure 1985.** Edited by R. BROGLIE, G. HAGEMANN and B. HERSKIND. Pp. xviii+614. Price Dfl 195.00. **Semiclassical descriptions of atomic and nuclear collisions.** Edited by J. BANG and J. DE BOER. Pp. ix+487. Price Dfl 165.00. Amsterdam: North-Holland, 1985.

Solid state physics. 2nd ed. By J. S. BLAKEMORE. Pp. x+506. Cambridge University Press, 1985. Price Hardcover £40.00, US $27.95, Paperback £9.95 (not available in USA).