Book Reviews

Works intended for notice in this column should be sent direct to the Editor (A. J. C. Wilson, Department of Physics, University College, Cathays Park, Cardiff, Great Britain). As far as practicable books will be reviewed in a country different from that of publication.

Advances in X-ray analysis. Volume 6. Edited by WILLIAM M. MUELLER and MARIE FAY. Pp. xii + 480. New York: Plenum Press, 1963. Price $17·50.

Previous volumes in this series have already been reviewed in *Acta Crystallographica*, the last in vol **16**, p. 156. The present volume contains all forty-four papers given at the Eleventh Annual Conference sponsored by the University of Denver in August 1962. As in other recent Denver conferences, there were several invited contributors from outside the U.S.A.

The tendency already noted towards a higher proportion of more fundamental papers is maintained. It would be unfair to try to pick out papers of special merit, but the reviewer found particular interest in contributions on indexing of powder patterns (de Wolff & Berndt), the structure of intermetallic phases (Laves), effect of various methods of cold working on the diffraction pattern of a copper alloy (Welch & Otte), and on precision measurements of lattice parameters by diffractometry (Vassamillet & King). The emphasis on X-ray fluorescence analysis is maintained.

The book is well reproduced by photolithography, and the indexes vastly improved. It can be recommended both to those familiar with previous volumes and to those who wish to make a first acquaintance with the series.

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Mathematical theory of X-ray powder diffractometry. By A. J. C. WILSON. Pp. ix + 128, with 28 illustrations. Eindhoven: Philips Technical Library, 1963. Price D.Kr. 29,–; 30*s*.

The accurate measurement of powder diffraction patterns can, in most circumstances, best be done with a diffractometer. For such work it is not only necessary to have a precisely made and accurately calibrated instrument but there must also be a proper understanding of the aberrations. These are particularly important in the determination of the cell dimensions of perfect crystals and three-quarters of the book is devoted to this problem.

Professor Wilson, his students, and his colleagues of the Philips laboratories have for many years been engaged in systematically investigating the geometrical aberrations, *i.e.* the effects of having a finite source, specimen and receiving slit: and the physical aberrations, *i.e.* the spectral distribution, specimen transparency and the Lorentz-polarization term. To a good approximation the measured intensity profile of a diffraction line is a convolution of the scattering function of the crystal and all the aberration functions. The moments of the intensity profile are then equal to the sum of the moments of these functions which individually are easy to calculate. This result leads naturally to the use of the centroid to define the position of a diffraction line and the variance to define its width. The derivations of these quantities have appeared in a number of papers and all the important ones have now been discussed. Professor Wilson has, in this book, taken the opportunity to present the whole theory in a unified and very lucid way. It includes much material not previously published, particularly the effects of instrumental misalignments. Apart from the centroid the position of the diffraction line can be simply defined by its mode. This quantity is more difficult to calculate but it has certain advantages; it is easier to measure and less dependent on the aberrations. There is some discussion of this in one chapter where it is shown that for small geometrical aberrations the shifts in centroid and peak positions are identical. The relevance of all the calculations to the measurement of lattice parameters is then described in some detail.

The remaining quarter of the book outlines the basic theory of the interpretation of diffraction line profiles from distorted or otherwise imperfect crystals. With recent advances in electron microscopy this technique has ceased to be the best way of examining imperfections but in some circumstances it is still useful. Professor Wilson was prominent in the rigorous development of the subject and this concise account is most interesting.

The book is clearly printed and reasonably priced. It should be read by everyone interested in using diffractometers properly.

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Reports on Progress in Physics. Volume XXVI (1963). Executive Editor A. C. STICKLAND. London: Institute of Physics and the Physical Society.

The present volume contains a number of articles of direct interest to crystallographers or solid-state physicists. R. R. Birss gives a detailed treatment of time

reversal in crystallography and its relation to the so called magnetic groups. The symmetries of property tensors up to rank four are fully and explicitly discussed. The reviewer was particularly attracted by the application of the general theory to such phenomena as piezomagnetism, pyromagnetism and the magnetoelectric effects. The experimental evidence for these phenomena, which are 'forbidden' within the framework of the classical (*i.e.* non-magnetic) point groups, is reviewed.

The article by W. Cochran on lattice vibrations emphasizes theoretical and experimental studies on specific classes of crystals, *e.g.* covalent crystals, ionic crystals, molecular crystals, and metals. The limitations of the classical Born theory and recent developments (shell model for ionic crystals, non-adiabatic effects in metals) are discussed in some detail against the background of the experimental evidence from X-ray and neutron scattering.

E. Menzel contributes a short article on the preparation and the study of nearly perfect metal surfaces. Its main emphasis is on experimental techniques.

A detailed article by A. C. T. North is devoted to the X-ray crystallography of large molecules of biological importance. A survey of the methods that have been developed in order to solve the phase problem for large molecules and complex structures is followed by a description of the most important examples of structure determinations in biological materials, including nucleic acids, fibrous and globular proteins and some of the viruses. The article is written in a style that will also attract non-specialists.

Finally we mention three contributions of interest to solid-state physicists, namely those on the generation of high magnetic fields (D. B. Montgomery), on the theory of irreversible processes (G. V. Chester) and on the electronic properties of liquid metals (N. E. Cusack). The last mentioned article is particularly recommended as a presentation of this rapidly developing field that is well balanced between experiment and theory.

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Clays and clay minerals. Proceedings of the Eleventh National Conference on Clays and Clay Minerals. Edited by W. F. BRADLEY. Pp. ix + 368. New York: Pergamon Press, 1963. Price £5·5·0.

The eleventh annual conference on Clays and Clay Minerals was held in Ottawa, Ontario, on 13–17 August 1962, and this book contains the published proceedings. The main part of the conference was devoted to a symposium on Clay Mineral Transformations at which eighteen papers were presented; sixteen of these are published here in full and abstracts are given of the two others. Almost all the papers are concerned with the mineralogical aspects of weathering. The widespread use of X-ray powder diffraction for identification of fine-grained materials is shown by its use in eleven of the sixteen full papers presented in the symposium. The general session contains thirteen papers of which four appear in abstract only. This session covers a wide range of clay-mineralogical topics ranging from a summary of recent work on the cell dimensions of layer-lattice silicates to a paper on clay mineralogy in building research.

The book, as is usual with this annual publication, is well-produced and has a good nine-page index. The editor and the publishers are to be congratulated on reducing the time-lag between conference and publication from nearly two years for the 1960 conference to fifteen months for the 1962 conference. The papers presented at these conferences are of interest to all working on clays and rapid publication greatly enhances the value of the published proceedings.

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Structure reports for 1953. Volume 17. General Editor, W. B. PEARSON and Section Editors W. B. PEARSON (Metals), J. WYART (Inorganic Compounds) and J. MONTEATH ROBERTSON (Organic Compounds). Pp. viii + 863. Published for the International Union of Crystallography. Utrecht: N. V. A. Oosthoek's Uitgevers Mij, 1963. Price 125 Netherlands Guilders; $35: £12·10*s*.

The volume of *Structure Reports* under review contains the relevant information of crystallographic work published in 1953. Like its predecessors it contains detailed and factual information, concisely presented, of use not only to the specialist but also to those in other disciplines. Nothing that is particularly significant appears to have emerged in 1953 apart from the outstanding contribution towards our understanding the structure of deoxyribonucleic acid, DNA.

These volumes are now under the General Editorship of Dr W. B. Pearson who has, as usual, been assisted by teams of able abstractors. Structures have not been listed according to structure type, as was the case in the original *Structurbericht*, but in each section in order of increasing complexity. This change has been inevitable in view of the complex types now being revealed in all fields. Naturally this had led to a certain simplicity of approach in the presentation of structures and in the manner of their indexing. As more of these volumes appear and the time gap is narrowed in bringing out back numbers to complete the series it seems inevitable that difficulties will be experienced in tracing, for instance, families of structures through *Structure Reports*. It will accordingly be very difficult to see in this monumental collection anything but the details that interest the seeker. What is going to be needed therefore is a more comprehensive