

## 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,-; 30s.

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