escent paints, aluminium oxide layers, textiles and papers with special gloss effects, display a marked dependence of the brightness and the colour hue on the illumination and observation angles. Carl Zeiss has developed the **GK 311/M all-round goniospectrometer** to measure this dependence.

The new unit measures the reflectance indicatrix, *i.e.* the spectral reflectance as a function of the illumination and observation angles at small angular intervals and with high repeatability. The main features of this measuring system are the processor-controlled measurement run including 100 different measuring geometries and the short measurement time (approx. 2 s/measuring geometry).

The GK 311/M all-round goniospectrometer

The versatile high-precision angle adjustment and the high angular resolution due to small aperture angles (repeatability of 0.01°) make the GK 311/M ideal for use as a reference unit in research and development. All angle settings are motorized and microprocessor controlled at intervals of 5°. The illumination angle covers a range of 25 to 135° from the sample plane, with an observation angle of 45 to 155°.

The light reflected back from the sample is analysed in a high-resolution dual-beam diode array spectrometer. The evaluation is performed by a PC and includes the spectral reflectance with a pixel spacing of 5 nm, tristimulus values and colour differences.

Carl Zeiss, Postfach 1380, 7082 *Oberkochen, Germany*

Crystallographers

This section is intended to be a series of short paragraphs dealing with the activities of crystallographers, such as their changes of position, promotions, assumption of significant new duties, honours, etc. Items for inclusion, subject to the approval of the Editorial Board, should be sent to the Executive Secretary, International Union of Crystallography, 5 Abbey Square, Chester CH1 2HU, England.

J. Appl. Cryst. (1993). **26**, 499

Professor John William White, CMG, Professor of Physical and Theoretical Chemistry in the Australian National University, Canberra, was elected a Fellow of the Royal Society on 11 March 1993. He was distinguished for his contributions to the use of neutron-scattering methods for the study of the structure of crystals and liquids. He combined great theoretical understanding of the properties of atoms when irradiated by beams of neutrons with imaginative use and sophisticated development of the technique to obtain new understanding of the structure of molecular crystals and the structure and dynamics of adsorbed monolayers.

International Union of Crystallography

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Executive Secretary
It is with deep regret that the death of J. N. King is announced. Jim joined the Union as the first Executive Secretary in 1969 and gave loyal service until his untimely death on April 12. He had known about his illness for about fifteen months but had continued working with remarkable fortitude almost until the end. A full obituary will appear in *Acta Crystallographica* Section A in due course.

Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (R. F. Bryan, Department of Chemistry, University of Virginia, McCormick Road, Charlottesville, Virginia 22901, USA). As far as practicable, books will be reviewed in a country different from that of publication.

J. Appl. Cryst. (1993). **26**, 499–500

Synchrotron radiation crystallography. By *Philip Coppens*, with contributions by *David Cox*, *Elias Vlieg* and *Ian K. Robinson*. Pp. x + 316. London: Academic Press, 1992. Price £45.00. ISBN 0-12-188080-X.

Crystallography in general, and X-ray crystallography in particular, have been with us for a very long time. Indeed, determination of the structures of crystals with small and medium-sized unit cells has become a widespread and almost routine technique. Why then synchrotron-radiation crystallography – and what is it? The special characteristics of synchrotron radiation are its high intensity, narrow collimation, polarization, wide spectral range and time-pulsed structure. The use of these special features in applications that either cannot be done as well, or cannot be done at all, with conventional sources, is what constitutes the relatively new subject of synchrotron-radiation crystallography. This book aims to collect together up-to-date descriptions of many of these special applications. It is not meant to be comprehensive, nor is it an introductory text. The intended audience is not specified but the book is aimed, in essence, at the research scientist with a working knowledge of crystallography who wishes to learn in depth what synchrotron radiation can contribute to conventional crystallography and how it may be used to extend the subject into new areas. It is densely packed with useful information but the presentation and the typography are clear – at least to readers with a significant background knowledge of the subject. Well chosen references to the original work are given and in my judgement the book is both very successful and timely in bringing together a coherent account of an exciting and rapidly developing subject or, more accurately, collection of subjects. In reality, this is not one book but three, each of which I will comment on in turn. The first, comprising the *Introduction* and seven chapters, is by Philip Coppens. The *Introduction* (14 pp.) outlines the reasons for choosing the topics of the book in relation to the properties of synchrotron radiation. It also includes brief descriptions of X-ray diffraction from single crystals of very small size (*e.g.* linear dimensions of 10 μm or less) and the importance of the measurement of very weak and high-order reflections. Chapter 2 (17 pp.) deals with the properties of synchrotron radiation, including insertion devices, and Chapter 3 (25 pp.) deals with optical elements of diffraction beam lines, with discussion of various kinds of monochromators and mirrors. Chapter 4 (24 pp.) is devoted to synchrotron data measurement and is a brief practical guide to incident-beam monitoring, counter dead time, polarization, different diffractometer scans and area detectors.

Chapters 5 to 7 each deal with a specific scientific application. Chapter 5 (22 pp.) is concerned with the importance of accurate data and how this is characterized, followed by discussion of the determination of experimental charge densities, where the improvements now becoming possible through the ability to measure accurately weak and high-order reflections using synchrotron radiation are illustrated by recent data. Chapter 6 (31 pp.) is about anomalous scattering; its origin, experimental determination and use – now made easily possible by the continuous nature of the synchrotron-radiation

spectrum. Descriptions are given of element- and valence-specific diffraction, the anisotropy of X-ray absorption and the tensorial properties of X-ray scattering and, finally, of the use of anomalous scattering in phase determination, especially for macromolecules. Chapter 7 (21 pp.) presents a number of types of kinetic experiment that use the time structure of the synchrotron radiation with a variety of external triggers or perturbations. It is essentially a description of experimental methods and includes a few examples. The last of Coppens's chapters (23 pp.) is about multiwavelength methods; both single-crystal (Laue) studies and energy-dispersive powder diffraction, which use the continuous wavelength spectrum of synchrotron radiation. The latter is only done with synchrotron radiation, while the Laue method, the oldest X-ray diffraction technique, is undergoing a strong resurgence, with new developments in quantitative applications studying, for example, time-dependent phenomena in protein crystallography.

Philip Coppens is a man with deep understanding of his subject and extensive first-hand experience. This has enabled him to address the important topics and problems and help the reader to understand them. He is mostly concerned with basic principles but quotes specific examples to illustrate his points. He is a man of few words and the style is cryptic and notelike, moving abruptly from one subtopic to another. For myself, I would have preferred more signposts, more links and more 'editorial' comment, such as more extensive discussions, culled from the author's expertise and experience, about present and future developments. But these are minor cavils about a clear and authoritative text.

The two remaining chapters are essentially additional minibooks. Chapter 9, written by David Cox, is, at 69 pp., by far the longest in the book. Its subject is 'Powder diffraction and structure determination' and the topic is covered in some depth. The style of writing is much more relaxed than in the earlier chapters and the explanations and connections are much fuller. Adequate cross references are made to topics discussed earlier in the book. Experimental techniques and data analysis are covered. There is an excellent discussion of the variety of systematic errors that may arise and the applications of the technique are illustrated by well chosen examples, including the use of anomalous scattering. Pattern decomposition, Rietveld refinement and structure-solution methods are all discussed and it is made clear how neutron powder diffraction (for good reasons) led the way in the use of powder-diffraction methods in structure determination and refinement. The use of synchrotron radiation in this context was slower to be developed but is now becoming a very powerful and important tool. David Cox's vast experience and expertise in powder diffraction shine through and make this a clear and authoritative account of the subject.

The final chapter (45 pp.) on two-dimensional crystallography is written by Elias Vlieg and Ian K. Robinson. Again, the authors are leading practitioners of their subject and they too have written an up-to-date and authoritative account. In this case, the field is one that has grown up (at least in respect of the use of X-rays) since the advent of synchrotron-radiation sources. This is very much a stand-alone review and uses kinematical diffraction theory to derive from first principles the scattering amplitudes and structure factors for bulk (three-dimensional) crystals, as a prelude to dealing with surface diffraction. Here, the shapes and intensities of the reciprocal-space diffraction features are clearly dealt with in relation to the determination of surface structures. A description of experimental techniques (among the most complex and sophisticated of synchrotron experiments) leads to a discussion of a variety of examples and an extensive list of references. The excitement and future promise of this new field are well captured by the authors.

The book is completed by three brief Appendices: *A*, which gives characteristics of synchrotron sources with $E > 1$ GeV; *B*, which gives electron binding energies (eV); and *C*, which gives natural linewidths of atomic energy levels (eV).

In summary, I can say that three books in one, all by leading exponents in their fields and all presenting – albeit in somewhat different styles – up-to-date accounts of what is happening in synchrotron-radiation crystallography, must be a good buy for those with a serious interest in the subject.

ALAN J. LEADBETTER

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Books Received

J. Appl. Cryst. (1993). **26**, 500

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.

International tables for crystallography. Vol. C. **Mathematical, physical and chemical tables.** Edited by *A. J. C. Wilson*. Pp. xxix + 883. Dordrecht: Kluwer Academic Publishers, 1992. Price Dfl 400, US$ 244.00, £139.00. ISBN 0-7923-1638-X. Because of the special character of this work, and in lieu of a review, a detailed table of its contents is provided in *Acta Cryst.* (1993), A**49**, 371–373. Individuals may purchase this volume, for personal use, at a substantial discount. Details are given in the advertisement facing *Acta Cryst.* (1992), A**48**, 956.

Introductory solid state physics. By *H. P. Myers*. Pp. xi + 546. London: Taylor and Francis, 1990. Price £18.00 (paperback). ISBN 0-85066-761-5. A review of this book, by B. J. Hickey, has been published in the January 1993 issue of *Acta Crystallographica* Section A, page 215.

Protein structure – new approaches to disease and therapy. By *Max Perutz*. Pp. 326. Oxford, New York: W. H. Freeman, 1992. Price £32.95 (hardcover), £21.95 (paperback). ISBN 0-7167-7021-0 (hardcover), 0-7167-7022-9 (paperback). A review of this book, by Charles M. Grisham, has been published in the May 1993 issue of *Acta Crystallographica* Section D, page 355.