Laboratory Notes

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A systematic method for aligning double-focusing mirrors

A comprehensive description of an alignment procedure for double-mirror (Franks) cameras is presented.* It is intended to serve as a practical laboratory guide. The method is summarized in a flow chart and illustrated by beam photographs and intensity profiles. Principals underlying the method are explained. Detailed procedures are given for the initial alignment of the mirrors, optimizing the focus and shape of the beam, adjusting the reflection and take-off angles, defining and guarding the beam, and monitoring the process with a fluorescent screen, photographs and an X-ray counter. In the double-mirror system, which was originally constructed by Kirkpatrick & Baez (1948) and developed by Franks (1955), X-rays emitted from a localized source can be focused by total reflection from two orthogonal curved mirrors to form small intense beams with narrow angular divergence. Double-mirror cameras are now commonly used for diffraction studies requiring high order-to-order resolution.

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Kirkpatrick, P. & Baez, A. V. (1948). *J. Opt. Soc. Am.* **38**, 766–774.

*The complete description of this procedure has been deposited with the British Library Lending Division as Supplementary Publication No. SUP 36934 (22 pp.). Copies may be obtained through The Executive Secretary, International Union of Crystallography, 5 Abbey Square, Chester CH1 2HU, England.

Crystallographers

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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 of the International Union of Crystallography (J. N. King, International Union of Crystallography, 5 Abbey Square, Chester CH1 2HU, England).

Dr **Julio Garrido**, who died on 14 May 1982 at the age of 70, was one of the pioneers in X-ray crystallography in Spain. Professor S. Garcia-Blanco writes that having achieved his doctorates in Natural Sciences and in Physical Sciences, he published his first book *Los Rayos X y la estructura fina de los cristales* in 1946. The first paper published in *Acta Crystallographica* in 1948 *Observations sur la Diffraction des Rayons X par les Cristaux de* ClO_3Na was by Garrido. He carried out a large number of fundamental X-ray investigations. He was Adjunct-Director of the Documentation Scientific Centre of CNRS (France) and Vice-President of the Societé française de Cristallographie. He collaborated in the preparation both of *International Tables* and *Structure Reports* for the International Union of Crystallography. He was elected academician of the Real Academia de Ciencias Exactas, Fisicas y Naturales of Spain. His greatest interest in crystallography was widely known and appreciated in Latin American countries where he dedicated many years of study and research. He was Director of the UNESCO Technical Assistance agency to Latin America in Montevideo (Uruguay). By his death crystallographers have lost an invaluable colleague.

Professor **C. N. R. Rao**, Indian Institute of Science, Bangalore, has been elected a Fellow of the Royal Society of the United Kingdom.

In March 1982 Dr **Ajit Ram Verma**, who is well known for his manifold contributions in the field of crystal growth and polytypism, retired from active service as Director of the National Physical Laboratory, New Delhi, India, which he headed for 17 years.

Notes and News

Announcements and other items of crystallographic interest will be published under the heading at the discretion of the Editorial Board. The notes (in duplicate) should be sent to the Executive Secretary of the International Union of Crystallography (J. N. King, International Union of Crystallography, 5 Abbey Square, Chester CH1 2HU, England).

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Formation of the British Crystallographic Association

The following note by Professor D. M. Blow, Chairman of the UK National Committee for Crystallography, has been reprinted from the *Royal Society News*, by kind permission of the Royal Society:

For many years the organisation of crystallography at a national level in the UK has been split between a number of scientific societies. The two largest groups are the Crystallography Group of the Institute of Physics and the Chemical Crystallography Group of the Royal Society of Chemistry, but a number of other societies cover crystallographic aspects of metallurgy, materials science, geology and biophysics. The UK Crystallographic Council provided a loose link between groups of crystallographers but it could not provide a speedy, collective response of UK crystallographers on, for instance, draft Health and Safety Executive legislation or EEC directives. Nor did its structure allow it to undertake activities with financial responsibilities, such as the organisation of a European Crystallographic Meeting in the UK.

The British National Committee for Crystallography, in addition to its duties as corresponding body to the International Union of Crystallography, provided a forum where matters concerning crystallography in the UK could be discussed. But it was not appropriate for it to deal with internal national matters. On the initiative of the National Committee, a working party was set up with the aim of establishing a new independent body covering all areas of crystallographic interest, to present the views of crystallographers collectively, to organise meetings of a crystallographic nature and to act as a centre for the dissemination of information on crystallography both within the profession and to a wider audience.

This initiative gained strong support. Particular help was given by the committees of the two largest groups in devising a system for incorporating their activities into the new Association. The British Crystallographic Association was inaugurated on 5 April 1982 at a meeting in Durham. The elected Officers of the new body are: President: Sir David Phillips, Professor of Molecular Biophysics in the University of Oxford and Biological Secretary, Royal Society; Vice-President: Professor Dorothy M. Hodgkin, Emeritus Professor in the University of Oxford; Treasurer: Professor C. A. Taylor, Professor of Physics at University College, Cardiff, in the University of Wales; Secretary: Dr A. C. Skapski, lecturer in physical chemistry at the Imperial College of Science and Technology, London.

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European Crystallographic Committee Cooperation Schemes

The European crystallographers, through the European Crystallographic Committee, invite colleagues in developing countries to join in co-operation schemes.

The purpose of these schemes is to exchange information and to assist in data collection by automatic diffractometers and micro-densitometers.

Active crystallographers, who are interested, are invited to contact any one of the following persons, who will try to organise contacts with appropriate partners.

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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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Diffraction for materials scientists. By *Jerold M. Schulz*. Pp. 287. Englewood Cliffs, New Jersey: Prentice-Hall, 1982. Price US $ 47.20.

Diffraction of periodic waves such as X-rays, neutrons, electrons, phonons, *etc.* is much used by materials scientists in order to obtain information about various structural features of all kinds of materials. The underlying scattering theory is formally the same in all these cases. It is the aim of the present textbook to provide, first, a straight forward and clear description of the fundamentals of scattering theory, and then to show how any specific application can be directly deduced from theory by specifying the fundamental relations in the appropriate way.

According to this aim the first chapter gives an introduction to the fundamentals of the kinematic diffraction theory starting from first principles and providing the mathematical aids necessary in order to follow every step of the deductions. In a particular section the implicit assumptions underlying the kinematical theory are emphasized and are contrasted with the suppositions leading to the dynamical theory which is treated in a later chapter. The second chapter deals with scattering by gases and liquids. In the third chapter diffraction theory is applied to crystalline materials. Starting from the concept of the reciprocal lattice and the Ewald construction, the rotating-crystal method, the powder method, and the Laue method are treated, followed by sections on the structure factor, the effects of temperature, absorption, and geometrical intensity factors. Chapter five is devoted to crystal-structure analysis. The fundamentals of crystallography are treated briefly, followed by sections on the Patterson function and on Fourier syntheses. The phase problem is dealt with by the heavy-atom method, the replaceable-atom method, and by direct methods. Further sections are concerned with thermal motion, difference Fourier maps and refinement. The sixth chapter deals with disordered crystals such as solid solutions, spinodal decomposition, stacking faults, thermal diffuse scattering, and phonon spectra. The seventh chapter, finally, deals with particle-size broadening and small-angle scattering.

The fourth chapter leaves the basis of the kinematical theory and deals with dynamical scattering theory. After developing the fundamentals of the theory, these are applied to understand image formation in electron microscopy and X-ray topographical methods which are also treated briefly in this chapter.

It is the declared aim of this textbook to give a mathematically closed and didactically well elaborated introduction to scattering and diffraction theory, starting from fundamental physical principles and developing the theory step by step, providing also the mathematics needed. In the reviewer's opinion this aim has been fully met. The text is well illustrated by numerous figures. The fundamental relations of diffraction theory deduced especially in chapters one and four (kinematical and dynamical theory) are specified step by step, thus leading the reader continuously from the general principles to specific applications. Each chapter is followed by a number of problems which the reader should be able to solve himself following the same lines of argument as shown in the text.

According to the concept of the book, applications of the general scattering theory to specific problems are meant as examples which should enable the reader to treat other problems by himself or to use successfully the more specific literature, a selection of which is given in bibliographies at the end of each chapter. The author has not tried to deal with all possible applications of diffraction theory which are of interest in the various fields of materials sciences. This would simply not be possible within the 287 pages of the book. So, for example, X-ray stress analysis or preferred orientation analysis (textures) are just mentioned in the introduction but not treated in detail.

A short selection of numerical tables such as scattering factors and absorption coefficients is added at the end of the book and an index helps the reader to find the most important items in the text.

In summary, it can be said that the book meets its aim to be a concise and didactically well elaborated introduction to the fundamentals of diffraction theory as needed by the materials scientist. It should be useful to students, lecturers and research workers.

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