International Union of Crystallography

Forward Planning of Inter-Congress Meetings

The Executive Committee of the IUCr is anxious to encourage Inter-Congress meetings to avoid future Triennial Congresses becoming excessively large and cumbersome to handle. A Sub-Committee on the Union Calendar has therefore been set up [see *Acta Cryst.* (1969). A**25**, 719] to implement this policy. Its function is to gather information on proposed or prospective meetings, coordinate the long-term planning of meetings which the Union organises or co-sponsors, and actively to encourage the initiation of small or intermediate-sized meetings in fields where development is significant.

Since it is the aim of the Sub-Committee to plan at least three, and preferably more, years ahead, it is advisable to have early advice of meetings, being planned or in prospect, which might appropriately come within the category of Union sponsorship or co-sponsorship in terms of their content, location, size and date. It would therefore be appreciated if bodies such as Commissions of the Union, National Committees for Crystallography, regional associations and other bodies which are contemplating or have begun the planning of a future international meeting on crystallography or with a major content of crystallography would contact the Sub-Committee Chairman, Dr A. McL. Mathieson, Division of Chemical Physics, CSIRO, P.O. Box 160, Clayton, Victoria 3168, Australia.

The Sub-Committee would be pleased to receive advice of provisional details of proposed Inter-Congress meeting as soon as possible and it will also consider requests for Union co-sponsorship of these meetings. Nominal financial support could be available in some cases.

Commission on Crystallographic Computing

It is proposed to set up a bank of trial structures for testing direct methods. It is frequently found that a new method may be effective for the one or two structures to which it is first applied but that the overall pattern of success is less encouraging when a larger number of trials are made.

The bank of trial structures will cover a range of space groups and structural complexity. The structures should be those which have been difficult to solve, perhaps showing only a few atoms in the first E map, or those which direct methods failed to solve but were subsequently solved in some other way.

Any crystallographer having the data and solution for such a structure in invited to contact Professor M. M. Woolfson, Department of Physics, University of York, Heslington, York YO1 5DD, England, giving as complete a description as possible of the structural problem. If the problem seems suitable for inclusion in the bank then further information will be requested.

Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (M.M. Woolfson, Physics Department, University of York, Heslington, York YO1 5DD, England). As far as practicable books will be reviewed in a country different from that of publication.

Introduction to anisotropic elasticity theory of dislocations (Monographs on the physics and chemistry of materials). By J. W. STEEDS. Pp. 270. Figs. 95, Tables 24. Oxford Univ. Press, 1973. Price £8.35.

For many years discussions on the elastic properties of dislocations and on the interpretation of the contrast of their images in transmission electron microscopy or X-ray topographs were based on the elastic-isotropy approximation. This was good enough for qualitative studies, but as soon as quantitative comparisons could be made, it was realized that the use of anisotropic elasticity is absolutely necessary, even for cubic materials. This is particularly true, among other cases, in the computer-aided simulation of dislocation images in electron microscopy or X-ray topographs which can be brought to the point where they are almost indistinguishable from the observed ones. The anisotropic problem for straight dislocations was first solved in 1953 but the mathematics involved is complicated and the resolution of a sixth-degree equation is required. J. W. Steeds has simplified the notations and the approach to the problem and shown that under certain symmetry conditions analytical solutions can be found. The major part of the book is concerned with the application of these solutions in several examples of slip systems in cubic crystals. The case of hexagonal and lower-symmetry crystals is also considered in some detail. Extensive tabulations of anisotropic parameters are given in an Appendix for metals, alloys, intermetallics and semiconductors. The whole book should be very valuable not only to students but also to researchers in many fields of material science.

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Physical processes in lasers. Vol. 56. Edited by D. V. SKOBEL'TSYN. Pp.ix+181. Figs. 109, Tables 12. New York: Plenum Press, 1973. Price $34.00.

The high pulse powers emitted by the first solid-state lasers represented a dramatic step in the intensities available from optical sources. The technique of Q-switching – initially with rotating mirrors or elaborately synchronized switching devices – marked a further enormous step in pulsed power. The discovery that bleachable dyes such as rhodamine 6G could effect Q-switching provided a simple, powerful laser tool for high-intensity studies. In this volume, A. S. Markin considers in detail spectral composition of the output, mode discrimination and locking and the characteristics of the

Q-switched pulses from systems (Nd glass and ruby) in which bleachable dyes are used.

The other two papers are concerned with the investigation of stimulated emission in pinched discharges and with the detailed physical processes occuring in pulsed gas-discharge lasers.

As is usual in the proceedings of this series, the articles are comprehensive and authoritatively written.

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Solid-state theory in metallurgy, By PETER WILKES. Pp. xii+453, Figs. 210, Tables 18. Cambridge Univ. Press, 1973. Price (cloth) £8·95, (paper) £3·20.

This is a book on solid-state physics written by a metallurgist for students in metallurgy and materials science.

The first part contains a simplified introduction to quantum theory to establish a basis for the subsequent discussion of electrons in metals. The free-electron model and properties are also treated here. That part of statistical physics that leads to the distributions of Fermi–Dirac, Bose–Einstein and Maxwell–Boltzmann is included.

The second part of the book is devoted to the crystal lattice and covers crystal binding, lattice symmetries, reciprocal space and crystal defects. There is also a chapter on experimental methods for investigating crystal structure, and finally an exceedingly simplified chapter on Fourier analysis.

In the third and final part the author returns to the electron problem: the effect of the periodic potential is now taken into account. To begin with this is done in an elementary way as a descriptive extension of the free-electron model. This is followed by a discussion of the important nearly-free electron theory containing recent development of pseudo-potential theory; electron microscopy is also included.

The aim of the book is supposed to be to bridge the gap between solid-state physics and metallurgy. I think that this is an important task but also a difficult one, especially if it must be carried out within the limits of ordinary undergraduate courses. It takes time, for example, for students who do not have a deeper knowledge in mathematics and the foundations of theoretical physics to obtain an understanding of quantum physics. What one can hope for is that the students should gain an insight intro the microscopic properties of matter and a feeling for the bases of the macroscopic characteristics. In that respect this book seems rather promising. The very simple treatment of quantum mechanics is just enough to make it possible to read the book, although I think that the third part can be rather arduous. The text covers many important aspects of solid-state physics in a concise and lucid way. I would, however, object to the presentation of some mathematical details, what I sometimes find too unorthodox. Instead of making the text simpler they can be confusing. Further, the definition of the Dirac δ-function in the chapter on Fourier methods should perhaps have been given in more detail. This certainly offers a good illustration of the great difficulties one has to face in the preparation of a text like this.

I am looking forward to trying out this book in our materials physics courses.

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The molecular replacement method. A collection of papers on the use of non-crystallographic symmetry. Edited by M. G. ROSSMANN. Pp. viii+267. New York: Gordon & Breach, 1972. Price $ 15.00, £ 6.25.

The molecular replacement method was first proposed by the editor of this volume in 1960. It consists of three separate steps:

A. The calculation of a rotation function which should show the relative orientation of crystallographically independent molecules or subunits of molecules within one crystal lattice or between different crystal forms.

B. The determination of the translation between the molecules or subunits.

C. After successful application of steps *A* and *B* the positions of the molecules or subunits in the crystal lattice are known. The condition that the electron-density distribution within them is identical should be sufficient to solve the molecular replacement equations leading to a complete set of phases for an unknown protein.

In collaboration with others, Rossmann has tenaciously worked on improving the method. Step *C* has not yet been accomplished for the solution of an unknown protein structure, although elegant approaches to the solution of structures with non-crystallographic symmetry have been developed by Crowther. Step *A* however is now accepted as a useful method to determine non-crystallographic symmetry and to relate molecules of the same protein or similar proteins from different species.

For those who wish to familiarize themselves with the molecular replacement method this volume gives an easy access to the relevant papers, including many applications. It is only a pity that the interests of the potential readership have been rather neglected. The manuscript languished somewhere between the publishers and binders for a period of two years, approximately 1969–1971. Fortunately the editor has added the important articles that were published in this period in an appendix.

The editor has presented with this book an important branch of protein crystallography and it deserves a better layout than the rather shabby one designed for it by the publishers.

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