

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.

Optique – formation et traitement des images. By M. FRANÇON. Pp. xiii + 159. Paris: Masson & Cie. 1972. Price 58F.

It is quite remarkable how much information is packed into this small volume and one might even consider recommending it as a set of revision notes for second or third year students in the U.K. in spite of it being in French. It would also be an admirable book for a researcher faced with the need to use some aspect of modern optics but not having met it before. This is optics in a modern context based on Fourier transformation and transfer functions and with its relevance to information theory strongly underlined.

The first four chapters are concerned with interference and diffraction from the 'Franges de Young' to 'Diffraction par un réseau à deux dimensions'. Chapter five is devoted to partial coherence and in ten pages gives a masterly summary of the essentials. Chapter six deals with the special problems of interference in polarized light expounded in a very clear and concise way.

The second part of the book is devoted to image formation and includes chapters on image filtering, holography, interferometry, autocorrelation functions and finally a brief glimpse of some of the new optical phenomena which can be observed using laser sources including non-linear optics.

The diagrams are clear but there are no photographs. Nevertheless I found this a most attractive book and it is one of the very few in existence which manage to deal with optics in a modern and realistic way and yet remain readable and relatively free from elaborate mathematics. A very useful appendix provides a summary of essential Fourier transform theory. I strongly echo the hope of the author that the reader 'en fermant ce livre, poursuivra plus avant l'étude de cette belle science qu'est l'optique'.

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Crystal structure analysis: a primer. By JENNY PICKWORTH GLUSKER and KENNETH N. TRUEBLOOD. Pp. xv + 192. Oxford Univ. Press, 1972. Price £4.75, (Paper cover £2.10).

This book is designed to serve as an introduction to the principles of structure analysis by X-ray diffraction from single crystals and is intended for undergraduates and for graduate students who do not intend to specialize in crystallography but who wish to understand the concepts on which the method is based.

The analogy between light microscopy and X-ray diffraction is clearly described at the beginning of the book and is

referred to regularly. The main part of the text is divided into three parts. Part I deals with crystals, diffraction from crystals and the experimental techniques and apparatus used. Part II is concerned with the examination of the diffraction pattern, the phase problem, space groups and symmetry and the derivation of a trial structure by Patterson synthesis and direct methods. Part III deals with methods of structure refinement and with structural information. The last quarter of the book is given over to appendices dealing with the more mathematical aspects of the subject, an excellent bibliography and a glossary of crystallographic terms.

In a book of less than two hundred pages on a subject which has so many facets omissions are inevitable but it is to be regretted that so little mention is made of the limitations of the method, scattering from perfect and mosaic crystals, the kinematic and dynamic theories, extinction and series termination effects.

However, this book can be highly recommended as an undergraduate text book and will be of interest to any scientist who desires an introduction to structure determination. The writing, printing and diagrams are first class.

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Theory of thermal neutron scattering. By W. MARSHALL and S. W. LOVESAY. Pp. xxiii + 599. Oxford Univ. Press, 1971. Price £12.00.

The appearance of this book reminds this reviewer of a quip made some years ago by the late, esteemed crystallographer Isidor Fankuchen upon the appearance of a masterful, highly mathematical treatise on the theory of X-ray scattering. Someone had commented that this was the best thing written in English and Fan's retort was that he had trouble recognizing it to be in English! Well, this new volume by W. Marshall and S. W. Lovesay, both distinguished and qualified theorists who have been close to neutron-scattering developments over the years, fits somewhat the same mould. Fortunately, mathematical development is international in character and the interspersed language is not all-important – seriously, the English here is very good as befits the British authors and publisher. Of more importance, the theoretical treatment of many neutron-scattering topics is collected here in the finest form to date and the authors are to be commended for this community service. The reading is very heavy more often than not and this volume should see infrequent withdrawal from the non-specialist's book shelf. To the specialist, however, working directly in the field, be it experimental search or theoretical interpretation, this treatise should serve as a standard reference source from which professional morsels can be plucked from time to time.

It is sometimes said that the treatment of neutron diffraction and scattering by condensed atom structures is simpler than that of the older sister radiation, X-rays. This volume will go far in dispelling this notion and in showing that the neutron people experience all of the complexity that X-ray people do, and then some. Rather naturally it is this extra complexity that serves as the principal theme of the book. The authors treat the additional effects of incoherence, inelasticity, magnetic interaction, polarization dependence, and polarization changes upon scattering. In many cases the authors have, of course, extracted treatment from the research literature, but as well, some aspects seem to have originated from dark corners in their own notebooks. As befits the book title, there is very heavy emphasis on mathematical development but not without a sprinkling of key-experiment results. All together, the material presented represents a complete and authoritative presentation of neutron-scattering topics. Anyone dealing seriously with the unique applications of neutron-scattering in magnetic crystallography and the dynamics of condensed systems will find it all here in good useful form.

Although not recommended for the non-specialist, it should be a must for the serious beginner or experienced researcher in spite of the rather high book price. After all, it is well worth substituting for a voltmeter or a half hour of computer time even in these crowded-budget days.

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Cristallographie et structure des solides. Par D. WEIGEL. Pp. vi + 147. Paris: Masson, 1972. Prix 56 F.

Le premier tome comporte, en plus d'une introduction, 5 chapitres:

- Notions sur la théorie des groupes.
- Les 32 groupes ponctuels de symétrie cristallographique.
- Les 11 groupes de Laue, les 14 réseaux de Bravais, les 7 systèmes cristallins.
- Les 230 groupes spatiaux de symétrie.
- Lecture des tables internationales de cristallographie. Exemples de structures de cristaux.

L'ouvrage présente un exposé déductif de tous les groupes de symétrie possibles dans les cristaux truffé d'exemples, d'applications, d'exercices dirigés, voire d'extensions à des problèmes d'absorption infrarouge et de chimie quantique.

La méthode déductive ressemble à celle utilisée notamment par Hilton dans l'ouvrage *Mathematical crystallography*. Ainsi présentée, la cristallographie géométrique constitue une préparation utile à l'étude de la physique cristalline et de certains problèmes de spectroscopie.

En revanche, comme cela arrive souvent dans les ouvrages modernes, l'aspect éducatif de l'histoire de la cristallographie, la morphologie avec ses méthodes de calcul, la cristallographie chimie, l'étude des macles et l'épitaxie sont laissés dans l'ombre. Sans doute, l'objectif de l'auteur n'est-il pas de présenter ces chapitres de la cristallographie.

On retiendra donc que les deux tomes de l'ouvrage constituent essentiellement un ouvrage de cristallographie structurale qui formellement mathématise sans nécessité et

sans intérêt une partie de la cristallographie qui n'en a nul besoin. L'ouvrage est cependant appelé à rendre des services à tous ceux qui s'intéressent à cette partie fondamentale de la cristallographie.

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Symmetry of crystals. By E. S. FEDOROV. Translated from the Russian by DAVID and KATHERINE HARKER. Pp. x + 315. A.C.A. Monograph No. 7, Pittsburgh: Polycrystal Book Service 1971. Preis \$25.00.

Die Werke des grossen russischen Kristallographen Fedorov sind den nicht-russischen Kristallographen nur schwer zugänglich. Dies beruht einmal auf der fremden Sprache (dieser Grund ist für deutschsprachige Leser nicht so schwerwiegend, da z.B. in der *Zeitschrift für Kristallographie* in allen Bänden von 17 (1890) bis 54 (1915) mit lediglich vier Ausnahmen Arbeiten von Fedorov oder Referate über solche Arbeiten erschienen sind), zum anderen aber auf der anderen Denkweise und damit den anderen Schlussverfahren der russischen Kristallographen allgemein. Um eine Einarbeitung in diese Begriffswelt sowie ein Verstehen der Ergebnisse und der Wege zu ihnen zu erleichtern, wurden in der vorliegenden Übersetzung fünf Monographien Fedorov's, die 1949 von der Akademie der Wissenschaften der UdSSR unter dem Titel *Simmetriya i struktura kristallov* herausgegeben worden waren, ins Englische übertragen.

Die einzelnen Monographien beschäftigen sich scheinbar mit recht verschiedenen Themen, doch sind sie, aufeinander aufbauend, eng miteinander verknüpft. Die erste (23 S.) bietet eine Entwicklung der analytischen Geometrie und ihrer für das folgende notwendigen Formeln. Schon hier empfindet man die Schwierigkeiten, die allgemein beim Studium älterer Werke auftreten: die Nomenklatur ist ungewohnt, sie erscheint umständlich und ist damit für den jetzt lebenden Kristallographen nicht leicht verständlich. Tatsächlich aber werden die Formeln durchsichtiger und die Zusammenhänge klarer, wenn es gelingt, sie in die heutige Ausdruckweise zu transformieren. Dies ist allerdings teilweise recht mühsam, so dass zum Verständnis ein wirkliches Durcharbeiten des Stoffes unumgänglich ist. – Die zweite Abhandlung (26 S.) beschäftigt sich mit der Symmetrie endlicher Figuren und liefert die möglichen (auch nicht-kristallographischen) Punktgruppen. Daran anschliessend werden im Abschnitt 'Die Symmetrie der regulären Systeme von Figuren' (sinngemäss etwa 'Symmetrie der kristallographischen Konfigurationen') auf 82 S. die 230 Raumgruppen abgeleitet und zusammengestellt. Diese Aufstellung wird in der nächsten Arbeit (44 S.) mit den Resultaten von Schoenflies verglichen. Hierbei werden die Definitionen, die Ableitungsstandpunkte und die Ergebnisse ausführlich in gegenseitiger Beziehung analysiert, mitunter findet man auch historische Bemerkungen eingestreut. Zum Verständnis des ganzen Bandes ist dieser Teil besonders wichtig, er gestattet eine Parallelisierung der Begriffsbildungen und Nomenklaturen beider Autoren und damit an manchen Stellen die Klärung von unvollständigen Definitionen und unklaren Schreibweisen der vorigen Kapitel.

Die fünfte Monographie nimmt den grössten Raum ein