

International Union of Crystallography

Announcements of Forthcoming Meetings and Short Courses

Readers of *Acta Crystallographica* are reminded that information about forthcoming meetings of interest to crystallographers, including meetings of scientific societies, congresses, summer schools, etc., is published regularly in the *Journal of Applied Crystallography*. In each issue, in addition to details of any new meetings, a calendar of events is published, giving abbreviated notices of all meetings announced in the current or earlier issues of the journal. Details of meetings for inclusion, subject to the approval of the Editorial Board, should be sent to Dr J. N. King, Executive Secretary, International Union of Crystallography, 13 White Friars, Chester CH1 1NZ, England. Announcements of meetings are not normally published in *Acta Crystallographica*.

International Tables for X-ray Crystallography

Volume I of *International Tables for X-ray Crystallography* is out of print. The Executive Committee of the Union has decided not to reprint this volume because the new volumes on symmetry tables are well under way. The first volume in the new series, on direct space, will contain much more information than the old Volume I and is expected to be published in 1977. Further details of the availability and the price of the new volume on direct space will be announced nearer to the date of publication.

The remaining volumes in the present series continue to be available. Volume II (*Mathematical Tables*) and Volume

III (*Physical and Chemical Tables*) cost £9.50 each whilst Volume IV (*Revised and Supplementary Tables for Volumes II and III*) costs £11.50. Copies may be obtained at the special reduced prices of £5.00 for Volume II or III and £7.00 for Volume IV by *bona fide* crystallographers, who must give an undertaking when purchasing that the volume is for their personal use only. Orders may be placed direct with the publishers, The Kynoch Press, Witton, Birmingham B6 7BA, England, or with Polycrystal Book Service, P.O. Box 11567, Pittsburgh, Pa. 15238, U.S.A., from whom prospectuses may also be obtained.

Symmetry Aspects of M. C. Escher's Periodic Drawings

This extremely popular book by Professor Caroline MacGillavry has been reprinted for the Union and is now available from Bohn, Scheltema & Holkema, Scientific Publishers (formerly Oosthoek, Scheltema & Holkema), Emmalaan 27, Utrecht, The Netherlands, at a price of 40 Netherlands Guilders. The book contains 42 plates (30 black-and-white and 12 in colour) of periodic drawings by the Netherlands artist M. C. Escher. Their symmetry aspects are discussed by Professor MacGillavry. Apart from its artistic value, the book is of great use for teaching purposes. An identical edition, entitled *Fantasy and Symmetry* is being published simultaneously in North America by Harry Abrams, Inc. and copies may be ordered through Polycrystal Book Service, P.O. Box 11567, Pittsburgh, Pa. 15238, U.S.A., or any bookseller.

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.

Crystal physics – macroscopic physics of anisotropic solids. By H. J. JURETSCHKE, edited by F. M. H. VILLARS. Pp.xvi + 220 Fig. 28, Tables 25. London: Addison-Wesley, 1975. Price (cloth) £10.75, (paper) £6.90.

Hellmut Juretschke, a name well known to crystal physicists, should be congratulated for this neat little book on the macroscopic physics of anisotropic solids, which developed out of a series of lectures at the Polytechnic Institute of Brooklyn. The book adds itself to the fairly numerous textbooks on the field – the classic book by Nye, the more recent books by Bhagavantam and Mason and (in part) the book by Birss and the very recent book by Wooster – but it has clear, distinguishing features of its own and is rich in stimulating material.

The choice of topics is conventional and includes, in order, crystal symmetry, the mathematical description of crystal properties, tensor symmetry and linear vector spaces, electric polarization, magnetic symmetry, electrical conduction, thermoelectricity, crystal optics, second-order optical effects, elasticity, piezoelectricity and some higher-or-

der interactions (in particular third-order elasticity). The discussion of each physical property includes a review of the basic physics of the interaction in question, a discussion of the symmetry restrictions governing the effect and some applications that emphasize the role of anisotropy. The selection of specific points taken up for each topic is fairly unconventional, and was governed mainly by the questions that the author and his students wanted to have clarified. Each chapter (except Chapter 1) includes a set of (about ten to twenty) problems, of varying degree of difficulty, which fill in details of derivations skipped in the text, illustrate specific applications, or extend the arguments of the text to wider ranging situations. At the end of each chapter there is a brief list of references to other treatments of the subject matter in other textbooks or in treatises (except for Chapter 13 where only original papers are quoted), while a small sampling of the original literature pertinent to each chapter is given in a list of additional readings at the end of the book. There is finally a set of six appendices on the symmetry operations of the crystallographic point groups and their generating elements, the linear combinations of tensor components transforming in invariant sub-

spaces under the operations of the rotation group in three dimensions, the characters of various representations of this group, the character tables of the crystallographic point groups, and the symmetry elements of the magnetic point groups.

The writer has enjoyed, for instance, the simple derivation of the crystallographic point groups given in Chapter 2, the clear discussion of the direct-inspection method given in Chapter 3 with the useful distinction of two aspects of the method [the transformation of tensor components as coordinate products (§ 3.6) and the adoption of convenient generating symmetry elements and reference frames (§ 3.7)] and the appealing discussion of magnetic symmetry given in Chapter 6. The writer has enjoyed rather less, for instance, Chapter 7. Here the illustration of the logic of the proof of Onsager's relations is not self-contained and yet no reference is given to more complete discussions (such as those contained in Callen's *Thermodynamics* or in De Groot's *Thermodynamics of Irreversible Processes*); the discussion of electrical transport in a magnetic field in §§ 7.5 and 7.6 is rather less effective than that given, *e.g.*, in Landau and Lifshitz's *Electrodynamics of Continuous Media* (which is not even quoted among the pertinent references); and the very brief section on transport in magnetic materials seems hardly sufficient to introduce this complex topic.

A careful perusal of several chapters and appendices reveals also that the book lacks a final polish. The writer has come across some conceptual pitfalls, some relevant omissions and a number of bothersome misprints. A few examples will suffice to illustrate the point. It is not quite true, for instance, that the methods presented in Chapter 3 cannot be used to obtain the schemes of tensor components for isotropic or axially symmetric bodies, as the author asserts on p. 26, nor is it quite true that the explicit schemes of tensor components cannot always be constructed from a complete knowledge of the tensor invariants, as the author asserts on p. 31. No mention, and thus no direct use, is made of the very useful theorem by Hermann on the cylindrical symmetry of a tensor property of rank n around a symmetry axis of order higher than n , which is given some relevance in the excellent review by Jagodzinski and Wondratschek in *Handbuch der Physik* VII (1) (see Satz 17.1 and p. 53) quoted by the author in the principal bibliography of Chapter 4. No mention is made also of the very few papers in which group theory was first adopted to obtain explicit schemes of tensor components, even though the method presented by the author in § 4.2 follows closely the method originally proposed by the writer in *Nuovo Cimento* (1952) for crystallographic groups, and extended by the author himself to infinite groups. Other relevant omissions are, *e.g.*, on p. 31 where it is not explained how the schemes given for the second and third-order tensors follow from the invariants constructed on p. 30, and on pp. 33, 34 and 37 where no mention is made of Schmidt's orthogonalization procedure which is most useful in carrying out the calculations required. Among the bothersome misprints, one might mention only the legend at the side of equations (3.6a) and (3.6b), the E matrices for 3^2 and $2'$ on p. 42, the last term on the right-hand side of equation (7.50), the lacking definition of ω for group 23 in Appendix 5, and the incorrect listing of the symmetry operations of the magnetic point groups mmm , $\bar{6}/m$ and $\bar{6}/m$ in Appendix 6. Finally the references in Chapter 3 to the textbooks by Nye, Bhagavantam and Mason are somewhat peculiar since they refer to chapters of these books which do not

discuss the general effect of rotational symmetry on tensor properties and the direct-inspection method, and the references in Chapter 4 to the review by Jagodzinski and to Chapters 4, 6 and 7 of Bhagavantam's textbook are also somewhat peculiar since neither Jagodzinski nor Bhagavantam discuss in detail group-theoretical techniques to obtain explicit schemes of tensor components.

One should stress that the minor faults of the book that we have discussed do not, of course, reduce significantly its overall value, and they could, in fact, be easily amended in the successive editions that one feels sure the book will have.

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Surface and defect properties of solids, Vol 4. By M. W. ROBERTS, J. M. THOMAS and other Reporters. Pp. ix + 250. A Chemical Society Specialist Periodical Report. London: The Chemical Society, 1975. Price £ 10.50.

This is the fourth book of a series addressed to workers in the physico-chemical properties of surfaces and interfaces. It consists of six separate chapters, all of them written by expert researchers in the field. The general approach is on the side of a timely account of the state of the art rather than on scholarly completeness. Everywhere the book includes an ample set of references, extending up to 1974.

The first three chapters deal preferentially with surface studies whereas the rest is concentrated mostly on defects. Among the former, we find first a report by R. Kellerman and K. Klier on transition-metal ion complexes in zeolites. The report lays stress on the ability of zeolites to stabilize metal ions in unusual chemical environments. A critical assessment of recent work for each separate element of the $3d$ series (except V and Sc) is included. The work has obvious implications in the field of catalysis, in which the following report falls. This report, by J. R. H. Ross, deals mainly with the catalytic activity associated with the steam reforming of hydrocarbons. Possible mechanisms associated with these catalytic reactions are discussed. Nowadays, the sentiment has grown strong that surface spectroscopy can be a powerful technique in the study of catalysis. However, most of the studies carried out so far (of which the ones reviewed in Ross's paper are an example) have made little use of it. The next report, by R. W. Joyner and M. W. Roberts, is very relevant to this point. The report describes briefly the fundamentals of Auger electron spectroscopy and, subsequently, gives a number of examples of its applications to surface chemistry. In connexion with catalysis, a subsection is devoted to the study of reaction kinetics and the potentialities of the methods can be inferred therefrom. Concerning the treatment of the Auger process itself, it is worth pointing out that, apart from the usual basic elementary facts, some topics in course of current development (like relaxation effects, interfacial peaks, *etc.*) are mentioned in the report. Even though not treated in detail, its mere inclusion could well arise interest