Notes and News

Synchrotron Radiation News

A new magazine with this title has just been published by Gordon and Breach. Volume 1, which will comprise six bimonthly issues, is being distributed free of charge to over 5000 synchrotron users worldwide. The editorial to the first issue states that the backbone of the coverage will be provided by correspondents at each facility who will report regularly on local developments. In addition, issues will include teaching and historical articles, conference reports, book reviews, a calendar of events and a letters and comments section.

Sample copies of Volume 1 and subscription details for Volume 2 may be obtained from the Editorial Office, Gordon and Breach Science Publishers S.A., PO Box 401, 2130 AK Hoofddorp, The Netherlands.

Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (R. O. Gould, Department of Chemistry, University of Edinburgh, West Mains Road, Edinburgh EH9 3JJ, Scotland). As far as practicable books will be reviewed in a country different from that of publication.

Rotations, quaternions and double groups. By S. ALTMANN. Pp. xiv + 317. Oxford: Clarendon Press, 1986. Price £35.00.

This book is one of the first in the world scientific literature to give a wide coverage of numerous algebraic and geometric problems being used in various areas of physics and crystallography. There is a preface at the beginning in which the author outlines the main object of the book and the audience it is intended for.

The contents given below show the scope of this book: 0. *Notation, conventions - How to use this book.* 1. *Introduction* (the history of the problem is shown and the detailed contents of the book are given). 2. *All you need to know about symmetries, matrices and groups.* 3. *A primer on rotations and rotation matrices.* 4. *Rotations and angular momentum.* 5. *Tensor basis: introduction to spinors.* 6. *The bilinear transformation: introduction to SU(2), SU'(2) and rotations. More about spinors.* 7. *Rotations and SU(2). The stereographic projection.* 8. *Projective representations.* 9. *The geometry of rotations.* 10. *The topology of rotations.* 11. *The spinor representations.* 12. *The algebra of rotations: quaternions.* 13. *Double groups.* 14. *The irreducible representations of SO(3).* 15. *Examples and applications.* 16. *Solutions to problems.*

It is clear that the book can be divided into two parts according to its contents. There are ten chapters (2-12) in the first part. These chapters describe the orthogonal operators and symmetry groups. A scrupulous analysis of the properties of the orthogonal, unitary and hermitian matrices is also given there. The rotation operators, their linkage with the product of angular-momentum operators, the key problems of the general theory of the group projective representations and the bilinear and spinor representations are also discussed in these chapters.

The second part contains three chapters (13, 14, 15) in which the general theory of double groups and the irreduc-

ible representations of orthogonal matrix groups of third order are given. The projective and irreducible representations of some crystallographic point groups and corresponding double groups are also shown in these chapters.

We should emphasize that one of the most characteristic features of this book is that these two parts are closely connected by means of Chapter 12 which gives the general theory of quaternions.

It is the solution of two major problems that helps the author to show the close connection between the rotation groups and double groups. On the one hand, he shows that rotation around an axis can be represented as the transformation of a pure quaternion by means of some other quaternion. On the other hand, the author shows that the transformation of the double group can be represented as the multiplication of the pure quaternion by some other quaternion.

The book is well written because it is based on the author's lectures and the problems discussed in the author's monographs. It can be used as a textbook for those who are interested in operator rotations, quaternions and double groups. Many articles on these problems are summarized in the book. There is a good bibliography (138 references) and a good index.

It is important to note that the problem of quaternion linkage with rotations has been thoroughly discussed in many journals and even in the popular literature, but the modelling of double groups by means of unitary module quaternions has been badly neglected until now.

The book constitutes a good guide, containing illustrations and a great number of problems whose solutions can be found in Chapter 16. The book is suitable for advanced students and for specialists in the problems of solid-state physics and quantum physics.

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