

Book Reviews*

Symmetries in Physics: Group Theory Applied to Physical Problems. By Wolfgang Ludwig and Claus Falter (Westfälische Wilhelms-Universität). Springer Verlag: New York. 1988. xi + 461 pp. \$59.50. ISBN 0-387-18021-4.

This book, part of the Springer Series in Solid-State Sciences, is a textbook on group theory aimed primarily at physicists, but with a good deal of appeal to physical chemists as well. The mathematical parts show a rather high level of sophistication, but the book is nevertheless oriented toward applications, and many of the applications taken up are of chemical interest. It can be a worthwhile addition to the library of the chemist who is fairly sophisticated mathematically and interested in taking up group theory, or of deepening his/her understanding of the subject, for the purposes of applying it in chemistry.

As examples of the degree of sophistication required to approach this book, I mention that set theoretic language is used freely throughout, and that representations, etc., are sometimes referred to as being defined "over a field", though if any use is actually made of fields other than the real or the complex numbers I did not notice it. In another sense, though, the discussion is rather informal and intuitive. Most topics, including the basic group definitions, are approached through examples rather than through a postulational approach, so that the reader is always aware of the physical (or chemical) motivation for the study of each subject. Each topic is ultimately formulated with a high degree of mathematical precision, but proofs are sometimes omitted, including (surprisingly to me in a book at this level) the proofs of Schur's lemma and the orthogonality theorem.

After setting forth the basic definitions, the book proceeds to discuss those finite and denumerably infinite groups most important for applications, including point groups and crystal space groups, as well as the permutation groups. An attractive feature is the inclusion from the beginning of magnetic and double groups. Here and in other chapters, there are figures which significantly aid the understanding, and tables listing the important properties of the groups discussed. Representation theory is then taken up, first in general and then the representations of the groups previously described. The theory of projection operators is developed, as well as the Wigner-Eckart theorem, and extensive use is made of both of these in the applications that follow.

There is a lengthy chapter on molecular spectra, with carefully worked-out examples involving both vibrational and electronic problems, including degeneracies, selection rules, etc., and permutation symmetry in many-electron systems. Other topics included are ligand field theory, the Jahn-Teller effect, and time-reversal symmetry.

This is followed by a discussion of applications to crystals, again a very thorough treatment with worked-out examples.

The remaining chapters, devoted to Lie groups, their representations, and applications, is perhaps of less chemical interest, but includes a discussion of the three-dimensional rotation group and its application to atomic spectra.

In summary, this book can be recommended with no more than minor reservations to the chemist who has the necessary mathematical sophistication and desires a general text on group theory, either for reference or for study.

C. Alden Mead, *University of Minnesota*

Studies of the Surfaces of Solids by Electron Spectroscopy: Recent Trends. By Ronald Mason, N. Sheppard, M. W. Roberts, and J. M. Thomas. Royal Society of Chemistry: London. 1986. v + 284 pp. £49.00 (U.K. addresses); £52.00 (Overseas addresses). ISBN 0-85403-269-X.

This is an interesting collection of 20 articles by many of the pioneers and leaders in various electron spectroscopies and in the theory thereof. The spectroscopies covered range from an overview of X-ray photo-

emission by Siegbahn to energy loss spectroscopy by Sheppard et al. and Ibach et al. to surface EXAFS by Lamble and King to surface microscopy by Venables et al. and Thomas et al. In turn, the many authors have used these spectroscopies to focus on the physics and chemistry of clean and reconstructed surfaces and surfaces with a wide range of reactive and nonreactive adsorbates. Complementary papers focus on the theory of surfaces and surface processes and offer balance to the experimental work. This collection of papers, and the inclusion of comments and discussion following many of them, show very clearly that electron spectroscopy as used in surface science is dynamic and active, with a long list of accomplishments and an exciting future.

The papers are well written and edited. Most contain brief introductions and general remarks that ease the non-expert into the subject matter of the paper. The level of presentation is sophisticated. They should be of interest to both experts and non-experts.

John H. Weaver, *University of Minnesota*

Books on Applied Subjects

Radon and Its Decay Products in Indoor Air. Edited by W. K. Nazaroff and A. V. Nero, Jr. John Wiley & Sons: New York. 1988. xxiii + 518 pp. \$75.00. ISBN 0-47162-810-7.

This book is intended to provide analytical insight on a comprehensive front about a problem whose importance to society has only recently been realized. It consists of 12 contributed chapters, ranging from an overview to detailed treatment of sources, characteristics, health concerns, and control. An appendix on measurement techniques is included.

The Bird of Time: The Science and Politics of Nature Conservation. By N. W. Moore. Cambridge: Cambridge and New York. 1987. 290 pp. \$49.50 (cloth); \$15.95 (paper). ISBN 0-521-25259-8 (cloth); 0-521-33871-9 (paper).

This is a long essay, or series of essays, that starts with considering time—its passage and extent. A section is then devoted to the experience of the past in conserving habitats: heathlands, hedges, ponds, etc. Another section considers the past with respect to experience in controlling disease and pollution. Finally a section called "Towards the Future" takes up prediction, communication, education, etc. The approach is gentle, yet incisive. The author ties his generalities to highly specific things, such as "Zinc Smelting in Brussels", and examples of the effects of pesticides on particular creatures. The connection with the real world is subtly underlined by many little sketches of plants and animals. It is also a serious book, and it includes a bibliography of 173 references as well as a substantial index.

Volumes of Proceedings

Ion Exchange for Industry. Edited by Michael Streat (University of London). Ellis Horwood Limited: Chichester. 1988. xi + 658 pp. \$94.95. ISBN 0-7458-0353-9.

The content of this volume consists of "the published papers presented at the Fifth International Ion Exchange Conference", held in 1988. Both oral and poster presentations are included.

The Molecular Immunology of Complex Carbohydrates. Advances in Experimental Medicine and Biology 228. Edited by Albert M. Wu (Texas A&M University). Plenum Press: New York and London. 1988. xiv + 868 pp. \$135.00. ISBN 0-306-42818-0.

An international symposium held in 1985 in Texas is the origin of the 36 typescript papers that make up this volume. They are grouped under the headings: "Antibody Specificity, Epitope and Lectinology", "Complex Carbohydrates as Antigens", "Glycoconjugates as Cancer/or Tumor Antigens", and "Structural Analysis of Hapten Moiety of Complex Carbohydrate Antigens". A 30-page appendix is titled "A Guide for Carbohydrate Specificities of Lectins" and contains 161 references. Well indexed.

*Unsigned book reviews are by the Book Review Editor.