

alleled the great experimental discoveries in what has come to be called "molecular biology." The phenomenal success of quantum mechanics in the description of the physical properties of solids, liquids and gases in terms of their atomic and molecular constitution, aided in recent years by fast computer calculations, strongly suggests that the same fundamental methods will ultimately be successful in unraveling the mysteries of the molecules at the basis of the behavior of living organisms.

The present volume surveys some developments in this general field. It is a translation of the French work "*Mécanique Ondulatoire et Biologie Moléculaire*," edited by Louis de Broglie. A volume in the *Adiwe International Series in Biology*, it consists of twelve separate essays by as many authors. There is nothing to indicate the origin of the essays, but their style suggests that they are based on a conference in France organized by de Broglie. The authors are for the most part French, though there is one British contribution as well as one from Sweden. The professional associations are not provided in every case, though most of the French authors would appear to be connected with such organizations as the Institut Henri Poincaré, the Institut de Biologie Physiochimique, the Radium Institute and the Faculty of Pharmacy of Paris. The only name well known to American physicists is Leon Brillouin.

The book exhibits both the merits and defects usually associated with a collection of this kind. For the expert it provides a good summary of rather recent results on some highly specialized but important problems in theoretical biological research, accompanied by useful bibliographical references. For the general reader, it unfortunately fails to contain any real thread of continuity of background material, such as for example one finds in the recent book *Bioenergetic* by A. L. Lehninger. Indeed a perusal of the latter work could make the reading of the book under review much more meaningful for the average physicist.

Perhaps one exception to this criticism is found in the general article by Didier Bertrand on "Chemical Constitution and Biological Activity." In this the author presents in persuasive

fashion a review of the inadequacies of the conventional organic-chemistry terminology (structural formulas, etc.) in facing the problems of biological activity. He also indicates fairly clearly with a few well chosen examples how quantum mechanics, with its ability to calculate charge and field distributions by the method of molecular orbitals, may be able to shed light on the interactions of macromolecules. The reviewer found this the most readable article in the collection.

Only about half of the papers contain specific reference to quantum mechanical calculations. The others contain summaries of experimental results on enzyme action and biological catalysis in general, the study of carcinogenesis and methods of chemotherapy. Physicists will find special interest in Leon Brillouin's article on macromolecules and semiconductors.

Though the translation into English is in general adequate, there remain numerous careless errors of spelling and grammar that detract from the attractiveness of the volume.

* * *

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X rays, electrons, neutrons

DIFFRACTION METHODS IN MATERIALS SCIENCE. By J. B. Cohen. 357 pp. Macmillan, New York, 1966. Cloth \$8.95, paper \$4.95

by Martin E. Straumanis

The present book is the second of the "Macmillan Series in Materials Science." As can be easily understood. "Materials Science" is now a collective word for the chemical, physical, mechanical and crystallographic properties of various crystalline and amorphous substances, inorganic as well as organic. Diffraction methods can be applied for the investigation of all of these substances, including gases, and numerous books are written to cover the separate topics. Was it necessary to write one more? The answer will be given at the end of the review.

The title of the book is somewhat misleading as it does not cover the application of visible light: Only x-ray, electron and neutron diffraction meth-

ods are described. Hence, the book starts with the "Principles of Crystallography" (pp. 1-60). Then follow the chapters "The Nature of Diffraction" (61-120), "The Production of Radiation Useful for Studying the Structures of Materials" (121-147), "Recording the Diffraction Patterns" (148-226), "The Interaction of X-rays, Neutrons and Electrons with Atoms" (227-266), "The Integrated Intensity" (267-284), "Equipment for Measuring Intensities" (285-296), and "Imperfections" (297-338). There are three appendixes at the end of the book and an index. Each chapter concludes with problems (answers on some problems are given in appendix B) and with additional references for further reading.

As can be seen from these contents, the book covers a very wide range of diffraction phenomena, including their explanation and application. Therefore, a very concise treatment is expected and is found. Nevertheless, the book is easily readable, however, only to those who have some knowledge in the whole subject matter. I have worked in x-rays since 1934, and it is my opinion, based on experience, that with rare exceptions, a student can not use a book like the present one alone as a guide when applying, for example, x rays in his research, because it is simply too short. With the exception of a few chapters, for example that on the application of Laue patterns, there are not enough explanations for the experimental solution of problems. The book may be useful if a student has an experienced instructor who introduces him to all the details not mentioned in the book. Otherwise he has to consult many of the books frequently mentioned by the author (those of Azároff, Buerger, Cullity, Guinier, Feynman, Klug, and Alexander and of other authors) and the International Tables of Crystallography, for the use of which there are good comments in the text.

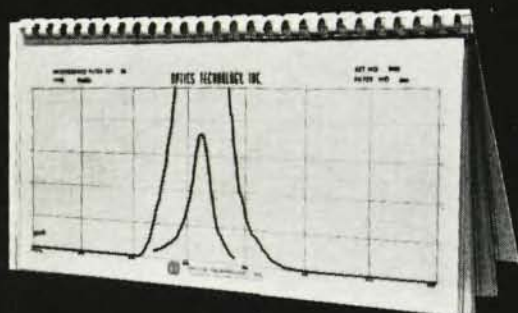
Thus, the book gives a good overlook over the large field of x-ray diffraction combining it with the respective phenomena observed with electrons and neutrons. For instance the chapter "X-ray Scattering Factor" is followed by "Electron Scattering Factor" and "Neutron Scattering Factor," which can be appreciated by



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many of the readers and justify the writing of the book. On the other hand, some of the applications of x rays are not covered at all, for example scattering by gases, measurement of stresses. The usefulness of the book could be improved very much by a detailed subject index. There are many instructive problems, some of them difficult and time consuming to solve, at the ends of the chapters; they appear to result from the author's teaching at Northwestern University.

* * *

Martin E. Straumanis is professor of metallurgy and research professor of materials at the Graduate Center for Materials Research, University of Missouri at Rolla.

Practical math for use

MATHEMATICAL METHODS IN THE PHYSICAL SCIENCES. By Mary L. Boas. 778 pp. Wiley, New York, 1966. \$11.95

by Jacques E. Romain

Reviewing this book was a rather lengthy task as the reviewer was so engrossed in his reading that he had a recurring tendency to forget he was reviewing and keep reading for his own pleasure. Boas's students (she is presently teaching at DePaul University in Chicago) are lucky fellows: Not everyone enjoys such a vivid and practical introduction to applied mathematics. It is a good fortune for present-day students (and instructors) all over the country, and abroad as well, that the result of the author's teaching experience and unique ability for lively, attractive and to-the-point presentation are now available in book form.

The book, which is intended for students with one year of calculus, does not claim to study every field in detail. It is not written for abstract mathematicians even though it would be a good idea for pure-math students to have a look at it and become quickly aware of the practical use of what they are taught. The purpose is to enable the reader to develop a basic competence in the areas that will be relevant to his later physical work, essentially by giving careful definitions, stating the necessary theorems and the simpler relations (many without proof), and by stressing the use and usefulness of the

methods, the particular techniques and their limitations.

The reader who has digested this book will not know everything of the theory and rarer details of any of the topics covered. But he will know principal available techniques for dealing with physical problems, with a clear notion of what these techniques can and cannot do; he will be supplied with examples of applications and shortcuts and will be cautioned against pitfalls, and he will know where to find more on the subject if necessary. The book is particularly well suited to self-study, thanks to the numerous stimulating examples that are worked out to illustrate possibilities and difficulties and to the impressive collection of problems, a good many of which have numerical answers given in an appendix.

The topics covered are infinite series, complex numbers and functions, determinants and matrices, partial differentiation and multiple integrals, vector and tensor analysis, Fourier series, differential equations, calculus of variations, special functions, integral transforms (Laplace and Fourier), probability and essentials of elementary statistics.

* * *

The reviewer formerly taught mechanics, theoretical physics and applied mathematics. Presently he is a scientific adviser in the same fields.

Modern infrared

INFRARED INSTRUMENTATION AND TECHNIQUES. By A. E. Martin. 180 pp. American Elsevier, New York, 1966. \$12.00

by Stanley S. Ballard

All workers in laboratory phases of infrared instrumentation will find this book of great value, and so will those who are involved with the so-called field applications of infrared technology. Martin is head of the infrared department of the Grubb-Parsons firm in England and is in a most knowledgeable position to write on the subject of instruments for the infrared spectral region.

The major part of the book is devoted to succinct descriptions of modern infrared spectrometers and spectrophotometers. It appears that this



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