at the mercy of unconscious and irresponsible drives. This subtle problem of understanding the basis of policy making may be the most important problem the "behavioral sciences" face in the coming decades.

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Physics

Plasma Spectroscopy. Hans R. Griem. McGraw-Hill, New York, 1964. xii + 580 pp. Illus. $18.50.

The author's professed intention is to provide a reference source in theoretical and experimental spectroscopy for plasma physicists and astrophysicists as well as a textbook for graduate students. It is my opinion that the concepts "textbook" and "reference source" are somewhat contradictory, particularly in this field which is so rich in original literature. The task of writing a reference source in this field is an enormous one that requires a different outline than the one used by the author, and perhaps two to three volumes the same size as this book.

The first nine chapters, which constitute an excellent survey of the basic and refined theories that form the backbone of plasma spectroscopy, also demonstrate that the author is well versed in these theories. Griem very neatly shows that the theories frequently can be simplified without significant loss in accuracy, while still exposing the dominant physical processes. This is indeed very commendable. However, he completely ignores the fact that a theory must be compared with experimental data before it is possible to judge whether that theory is adequate. It is possible to overlook such an omission in a purely theoretical treatise, and perhaps in a textbook, but not in a volume that is supposed to be a reference source in experimental as well as theoretical plasma spectroscopy. Objective critical consideration of the relevant experimental data in conjunction with the exposition of the various theories would add considerably to the importance of the book.

The last seven chapters of the book (about 100 pages) are devoted to practical aspects of plasma spectroscopy. The author discusses light sources, instruments, detectors, and standards, as well as measurements of temperatures, densities, and atomic parameters. He does so rather well, considering the small amount of space assigned to each one of the numerous subtitles in these chapters. The limited space allows only a rather scant treatment of the practical aspects of the plasma spectroscopy, which is acceptable in a textbook but not in a reference source. The author has included rather complete tables of the numbers and coefficients that are important in both theoretical and experimental plasma spectroscopy.

The structure of the book is good. It covers the basic elements of plasma spectroscopy and provides the necessary references to the original work. It is a good graduate textbook for a semester course in plasma spectroscopy but needs to be considerably expanded before it will serve as a reference handbook. It is recommended to physicists who do not have a specialist's training in spectroscopy. It is my hope that the author will expand a future edition to include more critical evaluations of the various theories with respect to the experimental observations as well as more detailed discussions of the practical problems that face the experimentalist.

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Carbohydrate Chemistry

An Introduction to the Chemistry of Carbohydrates. R. D. Guthrie and John Honeyman. Oxford University Press, New York, ed. 2, 1964. viii + 144 pp. Illus. $3.40.

There is a continuing need for a short, compact, up-to-date, textbook account of carbohydrate chemistry. This subject, which represents one of the important areas of organic chemistry and an extensive area of industry, is not well presented in most organic chemistry and biochemistry textbooks. Treatises are much too large and, in most small volumes, the subject matter is irregularly covered.

This second edition of *An Introduction to the Chemistry of Carbohydrates*, a small, modern view of carbohydrates, contains a useful presentation of the subject for the average student who wishes a general simplified presentation. It presents a brief description of the simple sugars, their proof of structure, conformation, and chemical reactions. Oligosaccharides are treated very briefly, as are polysaccharides. I believe this book is the best short account of carbohydrates that is available. My principal criticism is that the organic chemistry of the carbohydrates is not presented in the light of modern reaction mechanism chemistry, but perhaps such explanation may be anticipated in the looked-for third edition.

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Antarctic Research Series

Biology of the Antarctic Seas. vol. 1. Milton O. Lee, Ed. American Geophysical Union, Washington, D.C., 1964. xii + 186 pp. Illus. $10.

The Antarctic Research Series, a new series emanating from the recent IGY program, will report results from all disciplines of Antarctic research.

The first volume, edited by Milton O. Lee, is a collection of eight reports dealing with Antarctic marine life. The titles are as follows: "Primary organic production in the Drake Passage and Bransfield Strait"; "Primary productivity under sea ice in Antarctic Waters, 1, Concentrations and photosynthetic activities of microalgae in the waters of McMurdo Sound, Antarctica, . . . [and] 2, Influence of light and other factors on photosynthetic activities of Antarctic marine microalgae"; "Respiratory metabolism and ecological characteristics of some fishes in McMurdo Sound, Antarctica"; "Temperature responses and tissue respiration in Antarctic Crustacea, with particular reference to the krill *Euphausia superba*"; "Antarctic foraminiferal zonation"; "Improved techniques for benthic trawling at depths greater than 2,000 meters"; and "Catalogue and bibliography of Antarctic and sub-Antarctic benthic marine algae."

Inasmuch as most of these articles are of moderate length and deal with specific problems, they would customarily be published in a variety of scientific journals. The American Geophysical Union is to be commended for preventing this scattering by bringing these articles together in a single volume. This not only facilitates the

task of locating and using the reports, but it also enhances their use in connection with other contemporary studies scheduled for publication in subsequent volumes in the Antarctic Research Series.

Major variations in the format of the articles—such as the omission of an abstract or of a summary or section devoted to conclusions—are disconcerting. Comparison of the papers in this volume reveals considerable range in scope and merit. In a few of the articles the text is not concise, and substandard illustrations (drawings and photographs) are rather common. Pagination is continuous through the first seven articles (pp. 1–109), but for some unexplained reason the eighth (and last) paper begins again with page 1 and continues through page 77. The last page (p. 77) is entitled "Information for authors." This numbering will probably lead to some confusion in subsequent literature citations. There is no index to the volume as a whole; however, the last article, "Catalogue . . . of . . . benthic marine algae," contains a seven-page index to the "Catalogue." Glossy paper together with a very pleasing typography and a good binding give this volume a fine appearance.

Biology of the Antarctic Seas will be valuable to oceanographers in general and to biologists, particularly those with special interests in physiology and algology.

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Linear Algebra

Matrix Algebra for Electrical Engineers. R. Braae. Pitman, London; Addison-Wesley, Reading, Mass., 1964. xii + 162 pp. Illus. $4.50.

Matrices: Their Meaning and Manipulation. W. G. Bickley and R. S. H. G. Thompson. Van Nostrand, Princeton, N.J., 1964. xiv + 168 pp. Illus. $4.25.

These two little books reflect the recent upsurge of interest in linear algebra on the part of scientists and engineers. Each presents a short, somewhat condensed treatment of topics in matrix theory which the authors feel should be of special interest to engineers. In their selection of topics the authors agree not only with each other but generally with their colleagues, if we can assume that the existing literature reflects prevailing opinion. Each book presents the usual basic topics in matrix algebra leading to the notions of rank, nullity, inversion, quadratic forms, orthogonalization, eigenvalues and eigenvectors, and diagonalization methods. Each also gives applications of linear algebra to problems of interest to engineers. Braae's book is slanted toward electrical engineers and presents applications to mechanics, linear programming, and linear network analysis (the latter application leading to a method, "diakoptics," for reducing the size of the computation involved in inverting a matrix). Bickley and Thompson open with brief mention of ten engineering problems that lead naturally to matrices, several of which problems are brought up as illustrations at various places throughout the book. Heavy emphasis is placed on the numerical problems associated with matrix inversion and the determination of eigenvalues and eigenvectors.

The reader who has had little experience in engineering and scant acquaintance with the engineer's special language may find the applications hard going. I did so and can only assume that the engineer will find that they are sufficiently close to his own experience to motivate and sharpen his understanding of the mathematics rather than get in its way. The nonengineer who can already count matrices among his close friends will find in the applications convincing demonstration that linear algebra is the newest "applied mathematics." The unmatrixed nonengineer is in trouble.

Neither book claims to be a mathematical treatise, but it is my opinion that the mathematics in each leaves something to be desired, even by the engineer. Braae presents matrix theory with relatively heavy emphasis on linear transformations of vector spaces. For this the author, an engineer, is to be complimented. However, his terminology is archaic, and there are a number of mathematical errors or inaccuracies which will impair the reader's understanding of the mathematics if he is not mature enough to detect them—for example, the confusion between "subset" and "subgroup" on page 66 and the most unusual definition of the intersection of two spaces on page 41. Bickley and Thompson present matrix theory in the old formalism of rectangular arrays; the word "vector" appears in neither index nor table of contents. Proofs are often incomplete on nonexistent, and the reader is not always warned of this fact. The inexperienced reader will have difficulty distinguishing between bald assertion and logical or heuristic conclusion.

Both books, therefore, combine the appeal of short treatments of a beautiful piece of mathematics written by and for a community which has recently discovered that it is useful and a warning of the dangers inherent in any attempt to teach a person *just* enough mathematics for immediate applications.

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Summer Schools in Physics

Strong, Electromagnetic, and Weak Interactions. A. Zichichi, Ed. Benjamin, New York, 1964. vi + 248 pp. Illus. Paper, $4.95; cloth, $9.

The tidal wave of new summer schools in less and less likely places, which has been a feature of the last few years, especially in particle physics, is leaving behind a flood of published books containing some sort of written version of the lectures presented at these sessions. On the whole, this has been a welcome trend, doing something to alleviate the acute shortage of up-to-date textbooks and review articles in this rapidly expanding field, and some of these lectures have become standard references.

The requirements of comprehensiveness and careful organization are much less stringent for a lecture-note volume than for a textbook. However, this does not imply that these requirements can be abandoned altogether if such a publication is to have any value, other than as a documentary record. The present volume seems to be a case in point. One of the attractive sounding features of the Erice School was the small number of lectures and the emphasis on discussion. It might have given rise to a useful book, had the subject matter been more restricted, and had the style and level of the different contributions been coordinated. As it is, most of the