The number of brief monographs intended to serve as introductions to complicated topics appears to be on the increase. Professor Spitzer's little book on ionized gases might well serve as a model for such publications, for few, in this reviewer's opinion, succeed so well in cutting through a mass of detail to present the basic physical ideas clearly and simply. An introductory exposition must necessarily omit or dismiss with a phrase many topics that demand pages for adequate explanation, and the author commits many such items to the physical intuition of the reader or to the bibliography.

The interests of simplicity and brevity are further served by the fact that a fully ionized gas in many ways is less complicated than one that is weakly ionized, for the many quantum phenomena characteristic of the latter are missing. Attention can be focussed on the basic problems of particle motion in electric and magnetic fields, particle interactions, and the way in which the combination contributes to macroscopic motion. With these basic concepts in hand, the reader is prepared to look further into astrophysical problems that are the principal interest of the author, or to proceed with the additional complications of the gaseous electronics field.

The book begins with a discussion of motion of charged particles in various combinations of fields of electromagnetic and gravitational origin, and gives as an illustration the Fermi and Alfvén theories of cosmic-ray production. Then follows a discussion of macroscopic motion, with emphasis on the effects of external magnetic fields. The various types of plasma waves, including hydromagnetic (magnetohydrodynamic) are treated briefly. The last chapter concerns the effects of collisions between charged particles, and here most of the results must be taken on faith, as they depend upon calculations that are beyond the scope of the book. In the Appendix the basic equations of motion are derived from the Boltzmann equation. One might wish for some mention of the basic difficulties involved, first in conceptual problems involved in applying the Boltzmann equation, and second in the actual calculations using it.

In summary, this little book is a very readable introduction to the behavior of charged particles at low pressures and high temperatures, and should prove useful as a simple introduction to those unacquainted with the field.

DEPARTMENT OF PHYSICS
THE JOHNS HOPKINS UNIVERSITY   DONALD E. KERR
BALTIMORE, MARYLAND

High Polymers. Volume V. Part III. Cellulose and Cellulose Derivatives. Second Completely Revised and Augmented Edition. Edited by EMIL OTT, HAROLD M. SPURLIN and MILDRED W. GRAFFLIN, Research Department, Hercules Powder Company, Wilmington, Delaware. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1955. viii + 1057–1601 pp. 16 × 23 cm. Price, $12.00.

Rapid growth of the knowledge of chemistry of high polymers has rendered many excellent texts obsolete. Appearance of this revision of Ott's 1943 compendium alleviates this difficulty for cellulose chemistry for perhaps another dozen years. The editors have done a commendable job in compiling the bulk of industrially significant information in the three books. So complex is the subject matter that reviews will rival the books in length if any adequate description were offered.

Like Gaul, the books divide, rather illogically, into three parts. These are the revision of the 1943 edition of Volume 5 on High Polymers. This review covers Part III corresponding to Chapter IX of the original volume on the physical and mechanical properties of cellulose and its derivatives. The book begins with a clear and authoritative discussion of the physical properties of cellulose and its derivatives. It includes solubility information, the thermodynamic properties of those solutions, problems arising in determination of molecular weight and molecular weight distribution. In addition, there are theories of viscosity of dilute solutions of macromolecular compounds, and a discussion of flow properties. Next there is a chapter on the mechanical properties of cellulose and its derivatives, including creep, stress relaxation, deformation, elastic recovery, and that elusive concept, ultimate strength.

The collation of these usually widely scattered data will endear the book to researchers in the field of cellulosics. It is to be recommended to all engaged in technical activities on the numerous end products of cellulose.

As a final bonus there are two indices at the end of Part III. These include an author index and a subject index to the three volumes.

The book is excellently done, and commendably accurate in typography and detail.

PLASTICS DIVISION RESEARCH DEPT.
CELANESE CORPORATION OF AMERICA   O. V. LUKE, JR.
SUMMIT, NEW JERSEY

Essays in Biochemistry. EDITED BY SAMUEL GRAFF. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N.Y. 1956. x + 345 pp. 15 × 23.5 cm. Price, $6.50.

The twenty-five essays compiled in this book and written in honor of Hans Thacher Clarke present a unique coverage of biochemical material which should be of general interest to a variety of disciplines. The essays, written in large part by former students of Hans Thacher Clarke, encompass limited aspects of carbohydrates, proteins, lipids, nucleic acids, enzymes, viruses, porphyrins, hormones, stereochemistry of enzymatic reactions and other special topics. The freedom allowed the writers for speculation and thought projection has added a desirable and not too common personal tint to this remarkable collection of essays. The ideas presented by the writers may serve to stimulate further discussion on controversial and unexplored fields and may also provide fruitful avenues for future research. Much of the subject material included in this group of essays is not covered adequately in textbooks on general biochemistry. Consequently this book should serve a useful function as a supplement to the usual textbooks on biochemistry. Above all, the unrestricted style and freedom of thought depicted in this book may prove to be a rewarding stimulus to others.

THE UNIVERSITY OF ROCHESTER
  SCHOOL OF MEDICINE AND DENTISTRY
DEPARTMENT OF BIOCHEMISTRY
ROCHESTER 20, NEW YORK   GUIDO V. MARINETTI

The Mathematics of Physics and Chemistry. Second Edition. By HENRY MARGENAU, Eugene Higgins Professor of Physics and Natural Philosophy, Yale University, and GEORGE MOSELY MURPHY, Chairman, Department of Chemistry, Washington Square College, New York University. D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, New Jersey. 1956. xii + 604 pp. 16 × 23 cm. Price, $6.85.

The first edition of this book, which appeared during the war years, has found a secure place in the libraries of graduate students in physics and chemistry. The second edition, although containing numerous minor changes and corrections, has been only slightly expanded (∼20 pages) through the introduction of new material, mainly on Laplace and Fourier transforms. Thus this review would not differ materially if it concerned, instead, the first edition.

The authors' aim "to present between the covers of a single book, those parts of mathematics which form the tools of the modern worker in theoretical physics and chemistry," has been largely achieved. The digestibility of the condensation "on the senior and first year graduate level" may be somewhat more in doubt. In any event, the airing of the reviewer's prejudices which follows cannot detract from the main fact that this book is the most comprehensive single volume of its kind in English.

For the most part the treatment is conventional, being designed to fit onto the usual courses in differential and integral calculus. While this may aid the understanding of the mathematical (as distinct from the physical) aspects at the senior level, adherence to this conventional approach postpones the introduction of those tools—such as matrix algebra and group theory—whose use could have greatly simplified the presentation of many earlier topics. For example, angular momentum and spherical harmonics can be seen in their full splendor only in terms of the rotation groups—which, alas, conclude the last chapter. In fact, the connection between conservation laws and invariance

under some continuous group provides one of those all-too-rare revelations which is probably as close to a religious experience as one encounters in science, but this beautiful generalization is not mentioned. By contrast, the Legendre differential equation, while admittedly essential, is comparatively uninspiring. The emphasis on mathematical isomorphism often obscures the physical continuity, and still does not prevent some subjects from recurring in several places (*viz.*, Legendre polynomials). Against the fact that most important proofs are given, it is regrettable that a proof of the Fourier Integral Theorem, such as MacRobert's, which requires only half a page, was not included.

The amount of space devoted to quantum mechanics seems out of proportion, especially relative to that allotted statistical mechanics. Chemists will be dissatisfied that no molecules more complicated than hydrogen are treated, while physicists will miss a discussion of the most fundamental subject of scattering. The authors' hope that this hundred page chapter, supplemented by two or three others, would serve as a text in quantum mechanics courses is probably seldom realized. In the chapter on statistical mechanics, no mention is made of the grand ensemble and its associated partition function, although several pages are devoted to the method of Darwin and Fowler. Indeed, one might wonder why quantum mechanics and statistical mechanics have been singled out for special treatment of their physical, rather than mathematical, content.

Especially noticeable is the omission of any discussion of nonlinear differential equations, particularly those of hydrodynamics and electrodynamics. One might have expected to find these latter subjects also treated under vectors, which find their most elegant applications there. In the discussion of statistics, no mention is made of the extremely useful central limit theorem and its applications. The treatments of the Dirac δ-function and of Green's functions are altogether too brief considering the frequency with which these are met in current literature.

The chapter on matrices, a nice example of lucid condensation, is, however, concerned exclusively with matrices of finite order, for which the basic equation of matrix mechanics, $PQ - QP = h/i$, cannot hold. Incidentally, the statement concerning matrices which commute with a diagonal matrix has been corrected in the second edition, although the error persists concerning the invariance of the trace of a product with respect to permutation of factors (no restriction being made to cyclic permutations).

In summary, this reviewer feels that the greatest shortcoming of the exposition lies in its conventionality, which leads to a lack of portability. There are few points at which the reader feels the subject has been encapsulated for easy retention. As an illustration, the rather complete treatment of the thermodynamic relations culminates in Bridgman's table. Like a table of integrals, this is indeed useful; but how much more useful is a simple four-step rule, such as that of Carroll and Lehrman, which emancipates the student from reliance on a handbook.

Considering the doughnut, the hole represented by these criticisms is comparatively small. The second edition will undoubtedly continue to enjoy the success of the first. It is printed on somewhat better quality paper and, at 1.13 cents per page, is a bargain in today's technical book market.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF CALIFORNIA AT LOS ANGELES, AND
THE RAND CORPORATION   W. G. MCMILLAN
SANTA MONICA, CALIFORNIA

Reduction with Complex Metal Hydrides. BY NORMAN G. GAYLORD, Interchemical Corporation, New York, N. Y., Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1956. xvi + 1046 pp. 16 × 23.5 cm. Price, $15.00.

The reduction of thirty organic compounds by lithium aluminum hydride was reported in 1946. Today more than eight thousand compounds have been reduced by hydride reagents. Thus, it is apparent the complex metal hydrides have found extensive and important applications as synthetic tools in the selective reduction of various functional groups.

The book consists of 1,046 pages which includes the text, ninety-eight tables, literature and patent references, and the index. The coverage of the literature includes "Chemi-

cal Abstracts" as well as a page-by-page examination of thirty journals from 1947 up to January 1953. In addition, a few later references have been included.

Reductions of inorganic and organic compounds by lithium aluminum hydride, aluminum hydride, magnesium aluminum hydride, zinc aluminum hydride, lithium gallium hydride, sodium borohydride, potassium borohydride, lithium borohydride, sodium trimethoxyborohydride and other hydrides are described.

Arrangement of material is based on the reactions of functional groups. Much of the presentation is factual copy of published work which includes the preparation and properties of complex metal hydrides, the reaction with inorganic reactants, reactions with organic derivatives of inorganic reactants, the use of complex metal hydrides as analytical reagents, the mechanism of reduction of organic compounds by complex metal hydrides, the reduction of oxygen-, nitrogen-, sulfur- and halogen-containing organic compounds, the reduction of carbon–carbon multiple bonds, miscellaneous reactions such as the Ziegler olefin polymerization, and experimental conditions for carrying out hydride reductions on a laboratory and commercial scale.

The author well demonstrates his acquaintance with the field of hydride reactions. Some topics are given critical review. These include the mechanism of reduction, the cleavage of the C–O bond in amides, and the cleavage of the

$$-\overset{|}{\underset{|}{N}}-\overset{|}{\underset{|}{C}}-O- \quad \text{and} \quad -\overset{|}{\underset{|}{N}}-\overset{|}{\underset{|}{C}}-S-$$

linkages by lithium aluminum hydride. Also, wherever possible he presents a correlation of so far unrelated works with conclusions based thereon.

The text is well written and presented but the indexing leaves much to be desired. For example, aminoalcohols can be prepared by reduction of fifteen different types of starting materials, but this information can be obtained only by paging through the book. Although the continuing growth of hydride chemistry, especially in the field of "tailor-made" hydrides for selective reductions, has made this book somewhat less valuable, all chemists should benefit tremendously from this stimulating and excellent monograph on hydride reductions.

UNIVERSITY OF ILLINOIS
URBANA, ILLINOIS   ROBERT F. NYSTROM

Proceedings of the Sixth Meeting of the International Committee for Electrochemical Thermodynamics and Kinetics. BY G. VALENSI, Editor-in-Chief, Poitiers, France. Butterworths Scientific Publications, 88 Kingsway, London, W. C. 2, England. 1955. xvi + 567 pp. 17 × 23 cm. Price, 84s.

This volume contains over 50 papers presented at Royaumont and Poitiers in September, 1954, by representatives of fifteen nations. The wide range in subject matter covered in this informative collection makes it a valuable addition to the libraries of a variety of institutions and individual scientists. It also makes it impractical to attempt critical reviews of so many somewhat disconnected topics.

A small but important part is devoted to fundamental principles. The Report of Commission 2, covering 27 pages of parallel texts in French and English, should be studied in connection with earlier recommendations in *Z. Elektrochem.*, **58**, 530 (1954), and is the result of painstaking attempts, on an international basis, to bring logical uniformity into the nomenclature and definitions of electrochemistry. The members of this commission are P. Van Rysselberghe (Oregon) chairman, J. O'M. Bockris (Pennsylvania) formerly of London, R. Defay (Brussels), G. Valensi (Poitiers), and R. Piontelli (Milan) *ex officio*. This report is followed by two papers by E. Lange on the description of mixtures and derived quantities of material. G. Valensi formalizes the distinction between electrovalency and oxidation number, and K. Nagel discusses the definitions of polarization and overvoltage. Some controversial aspects of single electrode potentials receive attention in a study of the temperature coefficients of half cells by M. Bonnemay and a note on electrocapillary curves by G. and E. Darmois.

A short section devoted to experimental methods in electrochemistry contains a progress report of Commission 3 charged with this subject, observations on the use of rotating electrodes by H. V. K. Udupa and B. B. Dey, a note on