

ment of this enol ether with diethyl ether, previously saturated with 72% perchloric acid, resulted in nearly quantitative hydrolysis to 5 α ,22 β ,25D-spirostane-3-carboxaldehyde (IV), as a mixture of epimers (m.p. 160–170°, $[\alpha]_D^{25}$ -57.4°, ν_{\max} 2693, 1731 cm.⁻¹. Calcd. for C₂₈H₄₄O₃: C, 78.45; H, 10.34. Found: C, 78.59; H, 10.45).

This reaction sequence, when applied to the synthesis of the expected aldehydes from cyclohexanone and from acetophenone using a 100% excess of the reagent (II), resulted in incomplete reaction and lower over-all yields. Thus, from cyclohexanone, was obtained cyclohexanecarboxaldehyde 2,4-dinitrophenylhydrazone (40%), m.p. 172–173° alone or admixed with an authentic sample.³ Acetophenone was converted in similar over-all yield to hydratropaldehyde semicarbazone, m.p. 150–151° (lit.,⁴ 153–154°), which was further

(3) Kindly furnished by Prof. W. S. Johnson.

(4) C. F. H. Allen and J. van Allan, *Organic Syntheses*, **24**, 87 (1944).

identified by direct conversion to the 2,4-dinitrophenylhydrazone, m.p. 134–135° (lit.,⁴ 135°).

The above synthetic method for the transformation $\text{—C=O} \rightarrow \text{—CHCHO}$ promises to offer certain advantages over the established glycidic ester sequence⁵: (1) milder reaction conditions; (2) avoidance of certain side reactions⁶; (3) possible utility of the enol ether intermediate as a "protected" aldehyde group or (4) as a starting substance for alternative transformations.

(5) Honben-Weil, "Methoden der Organischen Chemie," Vol. VII, part 1, Georg Thieme Verlag, Stuttgart, 1954, p. 326.

(6) W. S. Johnson, J. S. Belew, L. J. Chinn and R. H. Hunt, *This Journal*, **75**, 4995 (1953).

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
EASTERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION
PHILADELPHIA 18, PENNSYLVANIA
SAMUEL G. LEVINE

RECEIVED OCTOBER 22, 1958

BOOK REVIEWS

Organic Electrode Processes. By MILTON J. ALLEN, Director of the Physical Research Laboratories, Ciba Pharmaceutical Products, Inc., Summit, New Jersey. Reinhold Publishing Corporation, New York, N. Y. 1958. xiv + 174 pp. 16 × 23 cm. Price, \$6.50.

The publication of Dr. Allen's monograph fills a long-felt need for an introduction to the techniques and applications of electrochemical methods to organic chemical reactions. Earlier works on the subject are out of date so that the beginner in the field has no helpful place to turn for advice. Perhaps the lack of such an aid accounts for the fact that organic chemists have been notoriously slow to use electrochemical methods, even when they were the methods of choice for the preparations at hand.

An analysis of the references cited in this monograph confirms the impression which one gains by a non-systematic approach to the literature of the field. Prior to 1890, organic chemists explored electrochemistry and came up with one generally used preparative method, the Kolbe synthesis. The period between 1890 and 1910 was the "golden age" of electro-organic chemistry with widespread and systematic exploration of the possibilities of the method. Thereafter, interest slowly waned and, after a brief revival in the 1930's, reached its lowest ebb in the 1940's. Now it is on the way up again, due to the stimulus of new and more powerful techniques.

One of the main reasons for the waning of interest in electrochemistry on the part of organic chemists, in the opinion of the present reviewer, is the fact that older procedures failed to give selectivity between various possible reaction courses, with the result that yields frequently were unsatisfactory. In his classical paper in 1898, Fritz Haber pointed out the reasons for this and the solutions in the form of controlled potentials, along with controlled acidities and temperatures. However, because of the clumsiness of Haber's apparatus for securing potential control, his methods were not widely adopted.

With the coming of modern instruments for automatic control and recording, the difficulties inherent in the Haber system disappeared and organic electrochemistry became a flexible and powerful tool for the solution to problems in synthetic organic chemistry. Allen's monograph collects and collates the information necessary to success in the application of this tool.

The inadequacies of the field as well as its strong points are revealed in the present work. Our knowledge is greatest in the field of reductions, yet even here few mechanisms have

been worked through to satisfactory conclusions. This means that the systematic organization which becomes possible only with an understanding of mechanisms remains mostly for the future.

The situation with respect to oxidations is even less satisfactory. Here the two most satisfactory preparative methods are anodic halogenation and the Kolbe synthesis. The tremendous variety of possible oxidations usually has not been sorted out to ensure control in the desired direction. Anodic processes still need their Fritz Haber!

Thus Allen's monograph represents not only an excellent guide to the beginner who must master the techniques but a clear challenge to the expert in mechanisms to exploit his methods in the elucidation and organization of a field that will amply repay directed research efforts.

DEPARTMENT OF CHEMISTRY
THE JOHNS HOPKINS UNIVERSITY
BALTIMORE 18, MARYLAND
ALSOPH H. CORWIN

Source Book on Atomic Energy. Second Edition. By SAMUEL GLASSTONE, Consultant to the United States Atomic Energy Commission. D. Van Nostrand Co., Inc., 120 Alexander Street, Princeton, N.J. 1958. 641 pp. 15 × 23.5 cm. Price, \$4.40.

This second edition of Glasstone's "Sourcebook of Atomic Energy" enlarges and brings up to date the excellent first edition, which since its appearance in 1950 has sold 50,000 copies. It would require a shelf of texts to exhaust the subject matter of the topics treated in the book. These range from the foundations of atomic theory to health physics, with sections on natural radioactivity, properties and measurement of radiations, isotopes, the fundamental particles, nuclear forces and nuclear structure, fission, nuclear reactions, the new elements, cosmic rays and strange particles, and other subjects. The author has succeeded in giving an introduction to each of these which makes an integrated whole bound together with the threads of basic principles.

The book is not a popularization of "atomic energy" for the lay reader but rather a scientifically sound introduction to the areas covered. It is written with Glasstone's usual ability for lucid presentation of complex matters. The reader new to these fields will get a maximum yield of information and understanding per I.Q.-hour invested.

In reading this book one senses warmly the philosophical, dramatic and human aspects of the discoveries through

which atomic science has evolved. These are conveyed through quotations from the scientists involved, through accounts of those who had "near misses" of big discoveries, and through mention of the prophets who were overlooked because the time was not yet ripe, or their thinking not sufficiently quantitative, to make their predictions "efficient in the stream of science."

This book is excellently suited to serve as an auxiliary text in any beginning course in any area of nuclear science. It should be of great value as a reference to any teacher of general chemistry or physics or physical chemistry whose course touches on nuclear science, and also to science editors and executives who encounter a need for the facts and principles of the field. Its strength lies in its exposition of historical developments and basic principles rather than in any description of techniques and procedures.

Use of the book as a reference is greatly facilitated by a good index, a convenient paragraph numbering system, and a frequent use of cross references within the text.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF WISCONSIN
MADISON 6, WISCONSIN

JOHN E. WILLARD

velocity they occasionally use the term "true" Michaelis constant which like "true" substrate is probably a dangerous thing to do. The treatment of enzyme kinetics is not very sophisticated, but a wide range of kinetic subjects is discussed.

There are a few places where the physical chemistry leaves a little to be desired; for example on p. 153 an activation energy is given which is less than the positive enthalpy change for the over-all reaction and on page 547 a process is referred to as unimolecular when it is meant that the rate is proportional to concentration. One notable omission from the book is consideration of the kinetics and mechanisms of the enzymatic degradation of macromolecules.

The authors are to be complimented on the excellent job they have done of sifting and winnowing the very large literature on enzymes to make available this amount of information in one volume. This is a book which will be a valuable addition to the library of anyone interested in enzymes.

CHEMISTRY DEPARTMENT
UNIVERSITY OF WISCONSIN
MADISON, WISCONSIN

ROBERT A. ALBERTY

Enzymes. By MALCOLM DIXON, Sc.D., F.R.S., Reader in Enzyme Biochemistry in the University of Cambridge, Fellow of King's College, Cambridge, and EDWIN C. WEBB, N.A., Ph.D., Lecturer in Biochemistry in the University of Cambridge. Academic Press, Inc., 111 Fifth Avenue, New York 3, N. Y. 1958. xxxiii + 782 pp. 15 X 23 cm. Price, \$16.00.

Dixon and Webb have undertaken the task of writing a book on enzymes dealing with the general principles of the subject at the research level. The result is a comprehensive treatise which will be of great value to serious students and experienced researchers alike. Separate chapters describe enzyme techniques, isolation, kinetics, reactions, specificity, mechanisms, inhibitors, cofactors, structure, formation, systems and biology. This is a wide range of topics but each is treated in a thoughtful manner with many specific examples.

The authors apparently have been stimulated to invest the very large amount of work which was clearly required to produce this book because they believe that the subject of enzymes "has now reached a very interesting stage, when a rich harvest may be expected in the near future." They feel that "the mechanism of action of enzymes is in itself one of the most fascinating fields of scientific investigation being pursued at the present time."

A novel feature of the book is a complete list of the 659 enzymes known in the summer of 1957 and the reactions they catalyze. The prosthetic groups and cofactors are indicated and also whether the enzyme has been crystallized. The references given in this table are to the best accounts of which the authors are aware, often review articles or later papers which give adequate references to the earlier literature. Over 400 of these enzymes are referred to in the text to illustrate points of interest. The book also contains other tables of information which have not been available before in such convenient form; these include specificity of some peptidases, enzyme systems with reactions written out and distribution of some enzymes in animal tissues.

The references referred to are collected in a bibliography of over 2,300 references at the end of the book. This large bibliography is of special value since the authors have endeavored to select those references which will enable the reader to obtain the additional information which he may require on any topic mentioned.

The longest chapter in the book is on enzyme kinetics. After discussing experimental problems a number of mechanisms are treated on the assumption that the equilibria are adjusted rapidly. It would appear advantageous to introduce the steady state treatment of these mechanisms earlier since the results are more general and the derivations are often not appreciably more difficult. While the authors do recommend that the term Michaelis constant be used for the substrate concentration required to attain half maximum

The Effects of Radiation on Materials. Edited by J. J. HARWOOD, U. S. Office of Naval Research, HENRY H. HAUSNER, Consultant to The Martin Company, J. G. MORSE, Nuclear Division, The Martin Company, and W. G. RAUCH, U. S. Office of Naval Research. Reinhold Publishing Corporation, 430 Park Avenue, New York, 22, N. Y. 1958. v + 355 pp. 16 X 23 cm. Price, \$10.50.

This book is a collection of eleven papers presented at a colloquium on the "Effects of Radiation on Materials" held at Johns Hopkins University in March, 1957. The area of investigation treated in these eleven papers is enormous, including the theory of radiation damage to solids; experimental techniques in radiation studies; effects of radiation on metals, alloys, inorganic dielectrics, semiconductors, engineering components of reactors, organic substances and polymers. Further, the authors are decidedly men of competence in their respective fields. However, it seems to the reviewer that the book does not meet well the requirements of any of the various audiences for whom it was originally designed. This is perhaps a result of the multiple purpose nature of the colloquium; it is stated in the foreword that the presentations were designed to appeal to research scientists, engineers, manufacturers and college students. From the viewpoint of a person desiring an introduction into the various fields, the introductory portion of each paper is too brief, the specialized concepts in each area inadequately defined. The specialist in one of the fields desiring an introduction into another will find in most cases too great a portion of the papers expended in a listing of radiation effects rather than on an enlightening, over-all view. The specialist seeking information in his own field will generally have available a more adequate review than the brief article found here. In general, the reader has the impression that as a colloquium with the authors present, the material presented is very valuable; but as a book, too much is put into a small space with no opportunity given to ask questions of the authors. (The reviewer notes in passing that an inclusion of the discussion or part of the discussion at the end of each paper might have been of great value.)

The book, however, does serve one purpose very well. The bibliographies at the end of each article and the comprehensive bibliography at the end of the book on the "Effect of Irradiation on Solids" are quite complete and up to date as of March, 1957. Thus, the book can serve as a handy reference list for workers in the various fields.

This book points up sharply the need for a comprehensive text at the post-graduate level on radiation and its effects on materials.

SOLID STATE DIVISION
OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE

D. K. HOLMES