

tion of the velocity constants k_1 and k_2 . If $(M) = M_0$ and $(A) = A_0$ when $t = 0$, and $(A) = A_\infty$ when $(M) = 0$, it can be shown that

$$k_2/k_1 = (M_0 - A_0 + A_\infty) / (A_0 \log(A_0/A_\infty) - A_0 + A_\infty) \quad (3)$$

Since end-group estimation gives $A_0 - A_\infty$, this equation enables k_2/k_1 to be evaluated.

The experimental conditions can be adjusted so that the concentration of initiator (A) is approximately constant, when it can be shown that there is a maximum rate given by

$$[d(M)/dt]_{\max}^2 = \frac{1}{27} k_1 k_2 A_0 (2M_0 + k_1 A_0 / k_2)^3 \quad (4)$$

A simpler procedure, however, is to use the preformed polymer to initiate the polymerization, so that the second step (equation (2)) is isolated. The molar concentration of polymer (X_0) , is thus constant, and the rate of disappearance of carbonic anhydride is given by

$$-d(M)/dt = k_2 X_0 (M) \quad (5)$$

The kinetics of the polymerization of sarcosine

carbonic anhydride (I) is being investigated. The polymer (II) used for initiating is obtained as a colorless, hygroscopic solid by the action of dimethylamine on the anhydride (I) in dioxane.

The polymerization in nitrobenzene is followed manometrically by the evolution of carbon dioxide. In accordance with equation (10) the reaction shows first-order dependence on (M) ; this confirms the assumption that k_2 is independent of the molecular weight of the polymer, for molecular weights between about 500 and 5000. Preliminary measurements indicate that the velocity constant, k_2 , can be expressed by the equation

$$k_2 = 1600e^{-5,800/RT} \text{ liters mole}^{-1} \text{ sec.}^{-1}$$

The low value of the frequency factor is noteworthy.

We hope to extend this investigation to other carbonic anhydrides and to co-polymerizations.

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S. G. WALBY
J. WATSON

RECEIVED APRIL 20, 1948

NEW BOOKS

Chemical Insect Attractants and Repellents. By VINCENT G. DETHIER, A.M., Ph.D., Professor of Zoology and Entomology, The Ohio State University; formerly Entomologist, Inter-Allied Malaria Control Commission, Gold Coast, B. W. A. The Blakiston Company, Philadelphia, Pennsylvania, 1947. xv + 298 pp. Illustrated. 15.5 × 23.5 cm. \$5.00.

The manner in which various chemicals attract or repel insects is of considerable interest to both chemists and entomologists working in economic entomology, to students of insect ecology and to others. The subject has also intrigued biologists not so well acquainted with the peculiarly specialized behavior of the insect world. Although the literature on attractants and repellents is extensive, most of the effort has been expended on research by the trial-and-error method, with not enough consideration of the chemical, physical, physiological and botanical factors involved. In an effort to remedy the situation and to impart a greater impetus to research in this field, Dr. Dethier has undertaken the difficult task of assembling and correlating the widely scattered literature. In this respect he has done a commendable piece of work.

The text is not a compilation of formulas of attractant and repellent substances. Rather it represents a theoretical approach to the study of the subject. The book is divided into ten chapters. An introductory chapter is followed by six that deal specifically with attractants, one with repellents, and two that are devoted to a more general discussion. There are approximately 750 literature citations.

Although the importance of research on insect repellents, especially for those insects that transmit disease, such as malaria-carrying mosquitoes, is pointed out, no mention is made of the extensive studies carried on during the recent war by the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture;

neither are the excellent fundamental studies on repellents by DeLong at the Ohio State University, nor is adequate treatment given the work of Granett at Rutgers University. The important subject of mothproofing warrants more than a brief paragraph. The book contains numerous errors in chemical nomenclature and in the structural formulas of compounds. These errors might have been avoided if the manuscript had been submitted to an organic chemist for review. Nevertheless the book is a valuable one and meets a definite need for both the chemist and the entomologist.

H. L. HALLER

Fundamentals of Photographic Theory. By T. H. JAMES, Ph.D., and GEORGE C. HIGGINS, Ph.D., Research Laboratories of Eastman Kodak Company. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y., 1948. vii + 286 pp. 14 × 22 cm. Price, \$3.50.

The recognized standing of the authors, not to mention cooperation by members of the Eastman staff, arouses in the reader expectations which are not disappointed. By concentrating upon black and white photography, exclusive of cameras or accessories, a coverage of the central theme admirable from physical, chemical and psychophysical standpoints is achieved. Consistent use of the sensitivity-speck basis for the latent image, together with the Gurney-Mott hypotheses, resolves in plausible fashion a great variety of complicated or at first sight contradictory phenomena. The chemistry of essential dark-room procedures is set forth in detail, but some will regret the omission of intensification, reduction and toning. Conflicting theories are critically examined in the light of data and of physico-chemical generalizations. Objective and subjective evaluations of photographic images are

carefully distinguished, then aptly correlated. Outstanding is the graphic solution of the complete problem of tone reproduction, first suggested by L. A. Jones, which gives due weight to the sensitivity relations of the human eye. A short list of well-chosen references is found at the end of each chapter.

Few photographers are sufficiently equipped, instrumentally or through training, to put the entire book into practice. But it is at least consoling to realize that as an art photography has anticipated not a few theoretical conclusions.

GEORGE S. FORBES

Radioactive Tracers in Biology. An Introduction to Tracer Methodology. By MARTIN D. KAMEN, Associate Professor of Chemistry, Chemist to the Edward Mallinckrodt Institute of Radiology, Washington University, St. Louis, Missouri. Academic Press, Inc., 125 East 23rd Street, New York, N. Y., 1947. xiii + 281 pp. 38 figs. 16 × 23.5 cm. Price, \$5.80.

This long-needed book on tracer techniques reviews the pertinent underlying concepts of nuclear physics, surveys contemporary tracer methods, and indicates their potentialities and limitations. As the Academic Press' first volume in a series of monographs on Organic and Biological Chemistry, which has subsequently come under the editorship of Louis F. Fieser and Mary Fieser, Dr. Kamen's book was an immediate sell-out. Doubtless the second printing, which buyers are now awaiting, will include corrections of numerous misprints and small errors which inevitably resulted from Dr. Kamen's speed record of less than three months for the actual writing of the entire book. If this speed left rough spots, nevertheless all the new workers in the many fields of application of radioactive isotopes should read Dr. Kamen's book, and will be grateful to him for providing it.

The first four chapters, of nearly a hundred pages, contain the essential facts necessary to the worker in any field of science or engineering who would use radioactive tracers. The balance of the book specializes these principles to specific applications in the life sciences, especially in studies of intermediary metabolism where radioactive tracers are an indispensable tool. Every new user of radioactive isotopes should certainly become conversant with the contents of this book. Seasoned workers will feel the book is introductory, but a small reader-survey has shown this reviewer that engineers, some chemists, radiologists, and physicians find the book advanced enough to require at least one or two rereadings.

Recently there have been a number of Isotope Conferences on a variety of scientific subjects, at each of which much time was consumed in reviews of elementary principles because this material was not conveniently available. The planners of future Isotope Conferences should presuppose that the audience and the conferees have at least mastered the topics presented in Kamen's book, and should now pitch their programs at the intermediate level instead of at the introductory level.

Among detection techniques, Kamen rightly advocates simple devices such as the Lauritsen electroscope wherever they can be used. The detailed instructions for building a Geiger-Müller counter were cogent in June, 1946, when the manuscript was completed, but since then a large variety of counters and electronic auxiliaries have become available commercially. Most new workers will prefer to buy rather than to build. Similarly, the home-made standards using uranium oxide should now be replaced by radium D-E beta ray standards distributed by the National Bureau of Standards.

The description of general methods and techniques deals primarily with C^{11} and C^{14} which are taken as prototypes of all other isotopes. Thus C^{11} presents the difficulty of a short half-period (twenty minutes), but emits easily detected energetic positron beta-rays (maximum energy 0.98 Mev) as well as the corresponding annihilation radiation (0.51 Mev) which can be measured readily

using gamma-ray detecting instruments. Whereas C^{11} requires cyclotron production and, like other positron emitters, cannot be prepared by irradiation in a uranium pile, the long-lived C^{14} is now readily obtainable from the pile. However, the long half-period of C^{14} is associated, as usual, with a very low energy radiation (maximum energy of beta rays 0.15 Mev) which makes its detection correspondingly difficult. Also the very long half-period (5000 years) of C^{14} argues against its use in many investigations, especially in human subjects, because of the persistence of its radiation and the possible accumulation of biologically harmful total radiation doses.

Unfortunately, an extensive table of radioactive isotopes and their properties was not included in the first printing. A 4-page table of organic syntheses with radioactive isotopes is provided and should prove valuable and convenient for reference.

ROBLEY D. EVANS

Organic Analytical Reagents. By FRANK J. WELCHER, Ph.D., Associate Professor of Chemistry, Extension Division, University of Indiana. D. Van Nostrand and Co., Inc., 250 Fourth Avenue, New York, N. Y. Vol. I, xv + 442 pp. + 63 tables, 1947; Vol. II, xi + 530 pp. + 69 tables, 1947; Vol. III, xi + 593 pp. + 111 tables, 1947; Vol. IV, xiii + 624 pp. + 68 tables, 1948. All 15 × 23 cm. \$8.00 per volume; price for set \$28.00.

The first half of the twentieth century has been characterized by an extraordinary increase in the rate of magnitude of production of scientific data. In the field of organic chemistry, for example, this has resulted in the discovery and/or synthesis of an appalling number of new compounds. Unfortunately, however, the extension of prior means and the development of new tools for recording and organizing this mass of information has not kept a corresponding pace. Consequently, there has now resulted a condition in which new evidence daily accumulates that unless systematic, convenient and economically practicable means for location and evaluation of all the facts relevant to a desired compound or method are soon developed, further progress will be seriously retarded or even significantly impaired. For this reason all means whose objectives are primarily to systematize, classify, coordinate and organize this flood of data comprise a contribution to scientific progress which may (at its best) be just as valuable as the original components of the discoveries themselves. This four-volume work by Dr. Welcher represents an example of an effort to overcome in a particular area the serious inadequacies mentioned.

The principal objective of this work has been to assemble in one place a description of all organic compounds used through 1945 in the analysis of inorganic substances and to discuss their mode of employment. The scope of the book does *not* include application of organic reagents to the detection, determination, or identification of organic compounds.

The four volumes comprise a total of sixty-seven chapters; these cover 827 organic reagents and require 9042 citations of the literature. The organization is such that all information relative to a particular compound is brought together in one place, extensive diversification in its uses being there systematically subclassified. Chemically related reagents are grouped together in chapters within which the sequence is alphabetical. With the text for each reagent is associated the corresponding series of citations to the original literature. Each volume includes an alphabetical name index of the organic reagents and also a subclassified index in which, under headings representing applications, the various reagents of the particular volume are alphabetically listed. However, no cumulative master index covering all four volumes is given.

Since the arrangement of topics is somewhat arbitrary it can, perhaps, best be surveyed by a review of the chapter sequences and headings. Volume I begins with

five short general chapters as follows: electronic theory of valence, coordination compounds, chelate compounds, types of chelate rings, and the effect of structure on solubility. The subsequent twelve chapters are devoted to hydrocarbons, substitution products of hydrocarbons, alcohols, phenols, miscellaneous phenolic compounds, aminophenols, phenolsulfonic acids, 8-hydroxyquinoline and its derivatives, azo derivatives of 8-hydroxyquinoline, ethers, aldehydes and ketones.

Volume II comprises ten chapters treating the following: organic acids, halogenated acids, hydroxy acids, amino acids, miscellaneous acids, acyl halides, acid anhydrides, esters, amines (255 pages) and quaternary ammonium compounds.

Volume III contains nineteen chapters headed as follows: pyridine and its derivatives, quinoline and quinoline derivatives, dipyridyl and related compounds, pyrazolone derivatives, miscellaneous heterocyclic nitrogen compounds, dioximes, acyl oximes, hydroxyoximes, isonitroso compounds, nitrosophenols, miscellaneous oximes, cupferron and neocupferron, nitrosoamines, rhodanine and its derivatives, carbazides and thiocarbazides and semicarbazides, carbazones, thiocarbazones and miscellaneous imino compounds.

Volume IV concludes the set with seventeen chapters dealing with acidic nitro compounds, arsonic acids, dithiocarbamates, xanthates, miscellaneous sulfur compounds, sulfonic acids, sulfuric acids, seleninic acids, alkaloids, diazonium compounds, carbohydrates, miscellaneous natural substances, miscellaneous compounds, lake-forming dyestuffs, hydroxyanthraquinone dyes, miscellaneous dyes and dyes used in the detection of nitrite.

For the preparation of the various organic reagents the author, guided by the principle that it be the most adaptable in the average chemistry laboratory, has selected only one. This severe restriction is to be deplored as in some cases organic chemists would regard the choice as inadequate. The organic nomenclature is generally definite, but some peculiar sequences are employed. References to Beilstein are associated with many (but not all) compounds, but much inconsistency exists in the method. Although reference is made to the main series of Beilstein's fourth edition, references to the equally important first supplementary series are not always included and the even more important second supplementary series seems to have been ignored.

The set of books will be of most value to chemists concerned with inorganic analysis.

ERNEST H. HUNTRESS

The Chemistry of Acetylenic Compounds. Vol. I. The Acetylenic Alcohols. By A. W. JOHNSON, Ph.D. with a foreword by Sir Ian Hellbron, D.S.O., D.Sc., F.R.S. Edward Arnold and Co., London, England. Longmans, Green and Company, New York, N. Y., 1946. xvii + 394 pp. 14.5 × 22 cm. Price \$9.50.

This first volume of a projected three volume set dealing with the acetylenic compounds presents an excellent discussion of the chemistry of the acetylenic alcohols up to September, 1945. The author has subdivided the acetylenic alcohols into three groups, (I) compounds containing one acetylenic bond and one hydroxyl group, (II) compounds containing one acetylenic bond and more than one hydroxyl group and (III) hydroxyl compounds containing more than one acetylenic bond. Each group of

compounds is discussed in a logical manner under the headings, historical, nomenclature, formation, physical properties, reactions of the hydroxyl group, reactions of the acetylenic bonds, reactions involving the free ethynyl group and reactions involving the whole molecule. The main body of this book was written before 1940 and in order to bring it up to date an appendix has been added which covers the more recent developments in the field. Chapters on the chemistry of the rubenes, on the application of acetylenic carbinol reactions in the sex hormone field, and on physical constants of acetylenic alcohols are also included as appendices to the main body of the book.

This is a very valuable critical résumé of the chemistry of acetylenic alcohols and will be indispensable to research workers in the field. It will also serve as interesting reading for anyone who wants to become informed on these highly useful reactions and the properties of this group of organic compounds.

C. S. MARVEL

BOOKS RECEIVED

April 10, 1948–May 10, 1948

ERNEST DAVID BERGMANN. "Isomerism and Isomerization." Interscience Publishers, Inc., 215 Fourth Avenue, New York 3, N. Y., 1948. \$3.50. 138 pp.

WALTER BOAS. "An Introduction to the Physics of Metals and Alloys." John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 193 pp. \$3.50. First published, October, 1947.

WILLIAM CROCKER. "Growth of Plants." Reinhold Publishing Corporation, 330 West 42nd Street, New York 18, N. Y. 459 pp. \$10.00. Published April 5, 1948.

R. H. HARRINGTON. "Modern Metallurgy of Alloys." John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 209 pp. \$3.50. Copyright, 1948.

DAVID H. KILLEFFER. "The Genius of Industrial Research." Reinhold Publishing Corporation, 330 West 42nd Street, New York 18, N. Y. 263 pp. \$4.50. Published April 9, 1948.

JAMES W. PERRY. "Chemical Russian Self-Taught." Journal of Chemical Education, 20th and Northampton Streets, Easton, Pennsylvania. 221 pp. \$3.00. Copyright, 1948.

A. W. RALSTON. "Fatty Acids and Their Derivatives." John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 986 pp. \$10.00. Published January, 1948.

L. ROSENFELD. "Nuclear Forces. I." Interscience Publishers, Inc., 215 Fourth Avenue, New York 3, N. Y. 181 pp. \$5.00. Published 1948.

FRANK T. SISCO. "Modern Metallurgy for Engineers." Second Edition. Pitman Publishing Corporation, 2 West 45th Street, New York 19, N. Y. 499 pp. \$5.00. Copyright, January, 1941.

W. THEILHEIMER. "Synthetische Methoden der Organischen Chemie." S. Karger, Ltd., New York, N. Y., 309 pp. Sfr. 35.