

fractions (3.6 g. total) of iodine number 330-340. The 8.6 g. was again passed over adsorbent and was collected practically entirely (8.3 g.) as a single fraction of iodine number 319.1; sap. equiv. 319.2 (theory 318.5); n_D^{25} 1.4828; yield of octabromides upon brominating 0.382 g. in ether, 92% which is 10% higher than we have described for methyl arachidonate prepared by debromination.⁵ From these data, we believe this to be the purest specimen of methyl arachidonate so far isolated.

The combined fractions of iodine number 330-340, noted previously, were further separated to give 1.0 g. of iodine number 375; sap. equiv. 318.1; polybromide yield, 110%; 70.1% bromine; n_D^{25}

1.4853. On the basis of these data this fraction is believed to be mainly methyl eicosapentenoate. This is the first evidence we have obtained in this Laboratory for the presence of eicosapentenoic acid in adrenal lipids.

We are now applying the method to a specimen of the ester prepared by debromination which is likely to contain isomeric eicosatetrenoates of the geometric type as well as more unsaturated esters of this series.

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RECEIVED NOVEMBER 8, 1948

NEW BOOKS

Supplement to the United States Naval Medical Bulletin on Preparation and Measurement of Isotopes and Some of their Medical Aspects. Published by Bureau of Medicine and Surgery, U. S. Navy, 1948. 215 pages. Copies can be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for \$0.65.

Most of the papers in the Supplement were part of a symposium of the Division of Biological Chemistry of the American Chemical Society in cooperation with the Office of Naval Research at the 1947 New York meeting of the Society. They have been printed through the interest and cooperation of the Editor of the Naval Medical Bulletin, Dr. Louis H. Roddis, as the March-April 1948 Supplement to the Naval Medical Bulletin.

The introduction of the supplement, which contains a short review of the historical development of the applications of isotopic indicators and some remarks of general interest, is written by Harold C. Urey. It is, as usual, both instructive and refreshing to read statements of that great pioneer of nuclear sciences. The fundamentals of isotope separation are discussed by Karl Cohen, thermal diffusion and other methods of isotope separation by William W. Watson, while Harold W. Washburn describes a new mass spectrometer for isotope-ratio measurements. Most useful statements are those of David B. Sprinson and David Rittenberg. These authors have unique experience in the preparation of gas samples for mass spectrometric analysis of isotope abundance some of which they communicate in 12 pages. The mass spectrometric analyst can be expected to save a lot of trouble and disappointment by taking due regard of the suggestions of these authors.

In his article on the chemical methods of isotope separation, A. F. Reid presents among other things a description of a commercial plant used for the production of heavy carbon and discusses also the natural separation of C^{12} and C^{13} . As to the natural variation in the C^{13} content of carbon of diverse origin, it is shown to amount to almost 3%. More and more regard will have to be taken of these variations in the investigation of biological specimens in the future when the precision of analysis can be expected to increase.

The fascinating subject of pile production of radioactive isotopes is presented by Waldo E. Cohn. In a very lucid contribution, beside the considerations in the choice of pile targets and such in the isolation of a carrier-free radioisotope, specific processes for the production of the more important radioisotopes as C^{14} , P^{32} , S^{35} , Ca^{45} , Fe^{59} and

fission products are described. Improvements of his original method of the pile production of P^{32} are described. These include the substitution of the cation-exchange column for the ether extraction to convert the metal phosphate solution to phosphoric acid. This substitution rendered iron less unique as a carrier and made its replacement by lanthanum possible. The serious disadvantages that attended the use of iron: peptization, causing incomplete precipitation and cation exchange adsorption, and the retention of considerable quantities of P^{32} on the cation exchange itself, can thereby be eliminated. Statements as to the separation of fission products by an ion-exchange adaption-elution process are presented. All fission products but ruthenium, iron, iodine and technetium can be and are being separated by such a process. Production of radioactive isotopes by the cyclotron and other methods is the subject of the contribution of John W. Irvine, Jr., the application of radioisotopes to problems of naval medicine of that of Robert Emrie Smith. While Richard D. Present gives a synopsis of basic ideas in the theory of radioactivity and the detection of radiation, the determination of hard and soft radiation, respectively, including preparation of samples is described by William F. Bale and Arthur K. Solomon, respectively.

Martin D. Kamen, discussing the detection of intermediates and criteria of purity, demonstrates difficulties encountered when faced with the task of isolating in sufficient purity products of low specific activity, if high specific activity products labeled by the same indicator are present as well. His final conclusion that there is no substitute for good chemistry can be expected to find universal approval. Dorothy J. Axelrod and Joseph G. Hamilton are the authors of a paper on the radioautographic technique. This important method found extended application and a remarkable development in recent years. The paper gives a full description of the four general types of radioautographs: thick slices of tissue in contact with the photographic film; histological sections in contact with the film; histological sections covered with a photographic emulsion; histological sections mounted on a photographic film. The paper is illustrated by numerous instructive figures including the radio-autographies of pigskin exposed to labeled lewisite taken by the authors. This contribution can be expected to be a very profitable reading to anyone interested in radioautography.

An illustration of the power of isotopes in a biochemical problem is the title of the contribution of Vincent du Vigneaud, and it is a beautiful illustration indeed. The author traces the problem of the mechanism of the con-

version of methionine to cystine through the stages of possibility based on speculation and analogy to the stage of probability based on indirect experimental evidence, and to the final stage of certainty based on this crucial experiment made possible by making use of synthesized methionine with sulfur containing an excess of heavy sulfur, and with the β - and γ -carbons labeled with C^{13} .

The subjects of the four last papers of the monograph move on a very different plane. They discuss the hazards presented by radioactive materials and how to cope with them (Karl Z. Morgan); the dosage levels in administration of isotopes to animals and man (Hermann Lisco); the laboratory handling of radioactive material, protection of personnel and equipment (Poul C. Tompkins), and the medical aspects of atomic disaster plan (E. Richard King) bringing much interesting information and suggestion.

Those responsible that the papers read at the symposium on isotopes before the Division of Biological Chemistry at the 1947 New York Meeting of the American Chemical Society and some other contributions were made accessible to the reader in connected form are to be congratulated. Several papers of this monograph contain information of great value.

G. HEVESY

The Chemistry of Organic Compounds. A Year's Course in Organic Chemistry. By JAMES BRYANT CONANT, President of Harvard University, Formerly Sheldon Emery Professor of Organic Chemistry, and ALBERT HAROLD BLATT, Associate Professor of Chemistry, Queens College. Third Edition. The Macmillan Company, 60 Fifth Avenue, New York, N. Y. 1947. viii + 665 pp. 16 × 24 cm. Price, \$5.00.

This is an extensive revision and modernization of the admirable 1939 edition. It is an extraordinarily readable text, with its facts and theories clearly and interestingly presented. And it is pertinent also to comment on the pleasing clarity of the type which is used.

Considerable discrimination must be exercised in the selection of the subject matter for a modern elementary organic chemistry text. To effect a reasonable balance of fundamental reactions, physicochemical concepts, together with some industrial and biochemical information presents a real pedagogical challenge.

The authors should be highly commended for their judicious selection of topics, and for their application of physical chemistry to a better understanding of the course of organic chemical reactions.

There is interestingly developed in a broad sense, during the course of the text, how energy relations control equilibria. The electronic theory of valence and resonance is utilized in a manner which is in keeping with a first year organic text. Industrial topics are well chosen and include, among others, some of the significant and recent advances in the petroleum and plastic industries. There is also a good selection of biochemical topics.

It is quite clear that this text will be pleasant for students of organic chemistry as well as for their instructors.

ARTHUR J. HILL

Physical Chemistry. First Edition. By E. D. EASTMAN, Ph.D., Late Professor of Chemistry, University of California, and G. K. ROLLEFSON, Ph.D., Professor of Chemistry, University of California. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 18, N. Y., 1947. viii + 504 pp. 15.5 × 23.5 cm. Price, \$4.50.

The first paragraph of the Preface of this new textbook of physical chemistry is as follows: "The material in this book is designed to meet the requirements of the year course in physical chemistry usually presented to third- or fourth-year college students and to serve as a reference book in later work. The arrangement and choice of topics is based

on our experiences in teaching the introductory course in this subject at the University of California. A considerable portion of the subject matter was put in syllabus form in the summer of 1942, and in that form it has been used as a text for our classes. The revision of the syllabus and the completion of the book were delayed by the untimely death of Professor Eastman in May, 1945. Fortunately he left extensive notes concerning his ideas for revision so that the text as presented here is truly representative of the ideas of both authors."

The chapter headings are: I. Objectives, Methods, and Scope; II. Interactions of Material Systems; III. States of Material Systems; IV. The First Law of Thermodynamics; V. Thermochemistry; VI. Properties of Gases; VII. The Kinetic Theory of Gases; VIII. The Crystalline State; IX. Energy and Heat Capacity of Gases and Crystals; X. The Liquid State; XI. Atomic Structure; XII. Molecular Structure; XIII. Radioactivity and Nuclear Reactions; XIV. Solutions; XV. The Second Law of Thermodynamics; XVI. Phase Equilibria in One-component Systems; XVII. Escaping Tendency; XVIII. Vapor Pressure and Related Properties of Ideal Solutions and Dilute Solutions; XIX. Phase Equilibria in Two-component Systems; XX. Phase Equilibria in Three-component Systems; XXI. Equilibria in Chemical Reactions; XXII. Chemical Kinetics; XXIII. Electrical Conductance and Transference; XXIV. Electromotive Force in Galvanic and Electrolytic Cells; XXV. Interactions of Light with Matter; XXVI. Surface Phenomena; Index.

Compactness is one of the most striking features of this book. The authors' treatment is contained within the compass of only about 500 pages, in contrast with the usual 700-800 pages of the commonly favored physical chemistry texts. Professor Eastman and Professor Rollefson have not omitted any important topic of the various departments of the science. They have, however, felt it advisable—in finding the compromise which all authors must strike between desirable compactness and desirable elaboration of exposition—(1) to treat the subject matters very largely "as they are today, without the illumination afforded by their historical background and growth"; (2) to suppress, largely, detailed description of instruments, apparatus and experimental techniques (suppressed partly also "because the genuine values to be obtained from their understanding come best from experience rather than from description").

The compactness of treatment achieved is actually mainly the result of the authors' very great ability to make general, summary, convincing and satisfying statements of main outlines, and yet "to carry each subject to a point from which departure may be successfully made into its more specialized regions, and to offer some attraction to those who desire more than the minimum fare." The reviewer cannot recall any text in the field of physical chemistry in which the pithy succinctness and covering power of the language can match those of Eastman-Rollefson. (Perhaps the time-worn but still admirable "Principles of Physical Chemistry" of Washburn offers the nearest approach to it). Witness the skill with which the authors employ the brief early chapters—Objectives, Methods, and Scope—Interactions of Material Systems—States of Material Systems—The First Law of Thermodynamics—and, in fact, many sections in all of the chapters, to lay in for the student a foundation of definitions, points of view and objectives, as well as techniques of approach. The intensiveness and extensiveness of the considerations which the authors present are very well balanced. Witness, too, the skill and good judgment with which the mathematical treatment is carried along and certain derivations, beyond the scope of an introductory text, withheld. A simplified system of symbols is used.

This is an extremely competent book. The serious student who studies it and masters its clearly written pages will secure for himself the invaluable possession of a first-class working knowledge of the principles of physical chemistry.

The reviewer feels that compactness has been secured at some considerable sacrifice of warmth and vividness, and

probably with the loss of some reading appeal. But many teachers of physical chemistry who "teach the textbook" like to introduce into their lectures—based primarily on the textbook of their choice—a good deal of their own illustrative and supplementary material and their own elaborations. Into such a plan of presentation the Eastman-Rollefson text should fit most usefully, serving as the core background upon which any further desired interior decoration could be easily and naturally applied. Be it noted, though, that it serves in itself as a most satisfying basis for a sane, sound and elegant course. It deserves, and no doubt will receive, a wide adoption in courses for both chemists and chemical engineers.

The authors have obviously given much careful attention to the always difficult problem of planning a satisfactory arrangement of the subject matter. The chapter order is somewhat different; and the intention has been to find an order that would permit discussion of the various aspects of a subject together, just as far as possible. The review exercises in the early part of the book and the many problems at chapter ends are excellent.

EDWARD MACK, JR.

Mechanical Behavior of High Polymers. By TURNER ALFREY, JR., Assistant Professor of Polymer Chemistry, Polytechnic Institute of Brooklyn. (High Polymers Series, Vol. VI.) Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y., 1948. xiv + 581 pp. 246 Figs. 15.5 × 23.5 cm. Price, \$9.50.

The tremendous increase in the use and manufacture of high polymeric materials during recent years has been accompanied by the development of an area of investigation known as "polymer science." This has been reflected in our scientific literature by the appearance of numerous books dealing with various aspects of polymer preparation or behavior. The book presently under consideration, "Mechanical Behavior of High Polymers" by Turner Alfrey, Jr., is one in an ever growing list designed to make polymer literature more complete and self-sufficient. It appears to be the author's intent to make his treatment comprehensive enough so that little outside reference need be made to fundamental work dealing with subjects not exclusively concerned with polymers. Thus the book starts out with a brief introduction on stresses, strains, elasticity, flow of liquids, and so on.

The main body of the book is concerned with the actual mechanical behavior of polymeric materials. Frequent use is made of mechanical models involving springs and dashpots to aid in deriving mathematical expressions which might be applied to various time dependent deformation phenomena. It is a moot question whether or not such extensive use of macroscopic models will greatly enhance our knowledge of systems depending upon molecular structure. Since they are quite generally used, however, the author cannot be severely criticized for employing these devices. Nevertheless, the reviewer hopes that definite steps will be taken in the future to get away from the highly artificial models.

The book deals with a great variety of subjects although some are naturally treated only briefly. A considerable amount of discussion is concerned with items not usually considered "mechanical behavior." Included among such additional items are certain aspects of polymer formation and the process of cross linking. These related topics are well treated and are generally worthwhile, for they contribute to a better understanding of the relationships between structure and properties.

Numerous lengthy quotations from the original scientific literature appear in portions of the book. Some of the quotations deal with controversial matters but others were apparently included to save rewriting. To a certain extent, the book gives the impression of being a comprehensive collection of items from recent literature, although the reviewer has no objections to raise concerning the choice of topics.

Although the volume is quite complete, one noticeable omission is apparent. Notwithstanding the copyright date of 1948, no reference is made to Debye's treatment of intrinsic viscosity which first appeared in 1946. Likewise no mention is made of Debye's light scattering studies, which are even older, although this omission could be attributed to the lack of direct connection to mechanical behavior.

On the whole the book will prove quite useful to chemists and physicists interested in polymers. In particular it will help those with limited background for it contains much of the necessary basic material. The reviewer found some inevitable typographical errors but was generally pleased with the over-all readability and usefulness.

F. T. WALL

BOOKS RECEIVED

October 10, 1948–November 10, 1948

- ROGER ADAMS, Editor-in-Chief. "Organic Reactions." Volume IV. John Wiley and Sons, Inc., 601 West 26th Street, New York 16, N. Y. 1948. 428 pp. \$6.00.
- ED. F. DEGERING and collaborators. "Fundamental Organic Chemistry." University Lithoprinters, Ypsilanti, Michigan. 1948. 516 pp. \$4.50.
- J. G. F. DRUCE. "Rhenium–DVI–Manganese, The Element of Atomic Number 75." Cambridge University Press, The Macmillan Company, 60 Fifth Avenue, New York 11, N. Y. 1948. 92 pp. \$2.50.
- FRITZ EPHRAIM. "Inorganic Chemistry." Interscience Publishers, Inc., 215 Fourth Avenue, New York 3, N. Y. 1948. 939 pp. \$8.75.
- P. KARRER AND E. JUCKER. "Carotinoide." Druck von E. Birkhäuser and Cie. AG., Basel, Switzerland. 1948. 388 pp. 43 Swiss francs.
- ROBERT LIVINGSTON. "Physico Chemical Experiments." Revised Edition. The Macmillan Company, 60 Fifth Avenue, New York, N. Y. 1948. 267 pp. \$3.50.
- WOLFGANG PAULI. "Meson Theory of Nuclear Forces." Second Edition. Interscience Publishers, Inc., 215 Fourth Avenue, New York 3, N. Y. 1948. 69 pp. \$2.00.
- VAN R. POTTER, Editor-in-Chief, HENRY WELCH, HAROLD D. GREEN, A. C. IVY, Editors. "Methods in Medical Research. Volume 1." The Year Book Publishers, Inc., 304 South Dearborn Street, Chicago, Ill. 1948. 372 pp. \$8.00.
- ALOIS X. SCHMIDT AND CHARLES A. MARLIES. "Principles of High-Polymer Theory and Practice." McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 18, N. Y. 1948. 743 pp. \$7.50.
- RALPH W. G. WYCKOFF. "Crystal Structures." Section I. Interscience Publishers, Inc., 215 Fourth Avenue, New York 3, N. Y. 1948. \$8.00.