

silver chloride cells in deuterium oxide, we have tested the reliability of silver-silver chloride electrodes made by a thermal method analogous to that recommended by Owen¹ and by Keston,² respectively, for the corresponding iodide and bromide electrodes. An electrode formed from a coil of platinum wire sealed into a tube of Jena normal glass was covered with a paste composed of seven parts of silver oxide and one part of silver chlorate and heated to decomposition in an electric furnace. No appreciable differences were observed when the percentage of silver chlorate was varied between 8 and 15.

Twelve electrodes immersed in 0.01 *M* hydrochloric acid solution exhibited ± 0.02 mv. as the average deviation from the mean. After standing for six weeks this value increased to not more than ± 0.04 mv. Freshly made electrodes agreed with the old within this limit.

A comparison of the "thermal" type electrodes with those made by decomposing a paste of silver oxide by heat and then electrolyzing for five hours in 0.2 *M* hydrochloric acid solution at 1.8 milliamperes per electrode showed that the electrolytic type tended to drift and were on the average about 0.04 mv. more positive.

CHANDLER LABORATORY RECEIVED OCTOBER 6, 1936
COLUMBIA UNIVERSITY
NEW YORK, N. Y.

(1) Owen, *This Journal*, **57**, 1526 (1935).

(2) Keston, *ibid.*, **57**, 1671 (1935).

The Heat of Fusion of Stannic Iodide

BY SAMUEL S. TODD AND GEORGE S. PARKS

The changes in heat content of stannic iodide were measured by us in 1928 for the temperature intervals between 27 and 80, 120, 155 and 171°, respectively. A method of mixtures was used with a water calorimeter, the details of the apparatus and experimental procedure being given in a previous paper by Parks and Todd.¹ The sample of stannic iodide studied had been kindly prepared for us by Professor J. H. Hildebrand.

Although the error in the calorimetric measurements themselves was within 1%, considerable uncertainty as to the premelting effect in the crystalline material precluded at that time a reliable calculation of the heat of fusion of stannic iodide from our heat content data. Recently, however, Negishi² has obtained accurate information concerning the heat capacities of solid and liquid stannic iodide over a range of temperatures. Using his data and taking the melting point as 144°, we have now calculated the following fusion values from our four determinations pertaining to the 27–155° range: 7.23, 7.19, 7.24 and 7.25 cal. per gram. The mean heat of fusion is 7.23 (± 0.14) cal. per gram or 4530 cal. per mole.

DEPARTMENT OF CHEMISTRY
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RECEIVED SEPTEMBER 2, 1936

(1) G. S. Parks and S. S. Todd, *Ind. Eng. Chem.*, **21**, 1235 (1929).

(2) G. R. Negishi, *This Journal*, **58**, 2293 (1936). Prof. J. H. Hildebrand kindly sent us these essential data prior to publication.

NEW BOOKS

Physical Aspects of Organic Chemistry. By WILLIAM A. WATERS, M.A., Ph.D. (Cantab.), University of Durham. Introduction by Professor T. Martin Lowry, George Routledge and Sons, Ltd., Broadway House, 68–74 Carter Lane, London E.C., England, 1935. xv + 501 pp. 14 × 22 cm. Price, 25s.

The title of this book does not indicate very clearly the nature of its contents. Actually it is largely concerned with current electronic ideas of valence and their application to organic chemistry, especially to details of reaction mechanism. The chapter headings are: Chemical Affinity, Physical Theories of Molecular Structure, Valency, Electrical Dipoles, Chemical Reactivity, Unsaturation, Free Radicals and Their Non-ionic Reactions, Ionization

and Ionic Reactions, Acidity, The Reactivity of Halogen Compounds, General Polarity, Hydrolysis and Esterification, Ionotropic Change, Molecular Rearrangement, Conjugation, Aromatic Compounds—I, Aromatic Compounds—II.

But this list does not furnish an adequate indication of the range of topics dealt with. Many of these subjects are exceedingly broad, have a lengthy and complicated history and even today have not reached any state of agreed opinion. One is therefore especially impressed with the skill of presentation. The author states in his preface: "The historical aspect of a rapidly developing subject has been kept continually in view, with the intention of giving a general outline of theoretical organic chemistry rather than

one *ad hoc* point of view." In general, he succeeds admirably in this aim. Any final interpretations are usually those of the English schools, whose recent writings on electronic mechanisms have been so extensive and ingenious, though sometimes obscure and not always in mutual agreement. Here the obscurity is resolved or avoided, conflicting viewpoints are judiciously weighed, and the attempt to interpret is seldom pushed to such a degree of detail that it ceases to be profitable or becomes devoid of plausibility.

No book is perfect, and this one errs perhaps in a tendency toward excessive conciseness. Thus the discussion of atomic structure is probably too brief to inform anyone not already informed.

In so extensive an effort it is natural also to find some errors in apportioning or assigning credit. For example, the Diels-Alder reaction, which is neatly, if rather sketchily, summarized in about two pages was not first discovered by Diels and Alder in 1928, but by v. Euler and Josephson in 1920. Incidentally also, this reaction is not diagnostic of conjugated systems, since even apart from side reactions consisting of complex polymerization it sometimes fails.

Again it seems scarcely correct to state that what are here called stable mixed double bonds were first suggested by Lowry in 1922. It is no doubt true that he first called attention to some special implications of this type of structure. But the arithmetical existence of a charge on atoms having unconventional valences could hardly escape the attention of anyone making the count of electrons necessary to write the structure. Besides, Langmuir¹ had already in 1921 presented a generalized formula for the calculation of such residual charges.

No one will, however, deny that Professor Lowry has made important innovations in the application of electronic ideas to chemical structures and reactions. Moreover, he laid the foundation for this book, completed by Dr. Waters, which is the first clear and comprehensive summary in its field.

(1) Langmuir, *Science*, **54**, 62 (1921). In his original paper [*Trans. Faraday Soc.*, **18**, 285 (1923)] Lowry says "It is difficult to believe that Langmuir can have overlooked the fact . . . that the nitrogen atom is positively charged . . . but I cannot find in any of Langmuir's papers a clear recognition of the phenomenon of intramolecular ionization." Apparently then he had not noted the paper cited above.

W. H. CAROTHERS

Die Bierhefe als Heil-, Nähr- und Futtermittel. (Beer Yeast as a Medicinal Agent, Food and Feeding Stuff.) By Dr. JULIUS SCHÜLEIN, Munich. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1935. viii + 194 pp. 29 figs. 15 × 22.5 cm. Price, RM. 9; bound, RM. 10.

The author has brought together a large amount of widely scattered material dealing with the use of yeast as a food and as a medicinal agent. Much of this information has heretofore not been assembled. He has attempted to give a general view of the subject, and discusses the state of research in connection with this field. The subjects discussed are vitamins, the use of yeast as a therapeutic agent, the use of yeast and yeast extracts in human nutrition and as a food for animals. The work on vitamins is fairly com-

prehensive, but some of the conclusions are based on vitamin researches carried on a number of years ago, and consequently certain statements should be interpreted with this fact in mind. This also applies to some of the statements concerning yeast. The term yeast is used indiscriminately. It is not always clear whether he refers to baker's yeast or beer yeast.

The data given on page nine require correction. In paragraph three it is stated that McCollum designated the antirachitic vitamin as vitamin D in 1922, whereas in the tabulation following paragraph four the date is given as 1925. In a number of instances it is believed the author has been too brief, consequently the reader does not obtain a clear conception of the papers cited and of the subject under discussion.

The author discusses the value of vitamin B for the pregnant mother and for the child. He also discusses the vitamin B/2 complex. Whether or not vitamins A, C and D are present in yeast is taken up in considerable detail. Mineral salts, glutathione, amino acids, enzymes, hormones and choline are discussed. The therapeutic use of yeast is given considerable attention.

In describing the production of vitamin D milk by the yeast feeding method the type of yeast employed for irradiation is not given. Statements in regard to the quality of the mineral yeast and top yeast grown on molasses to which mineral salts are added, should be modified as they do not apply to modern conditions.

The author reviews some of the most valuable work pertaining to the use of yeast in animal nutrition, and the preparation of yeast extracts rich in vitamin B. Fortification of diets deficient in certain vitamins by means of yeast is also discussed.

It is believed that this work will stimulate research in the fields which the author has reviewed. 436 references are given. A complete author and subject index is included.

C. N. FREY
G. W. KIRBY

Le Métabolisme de L'Azote, Physiologie des Substances Protéiques. I. Aliments, Digestion, Absorption, Enzymes Digestif. No. XX, Les Problèmes Biologiques. (Nitrogen Metabolism. Physiology of Protein Materials.) By ÉMILE F. TERROINE. Published by Les Presses Universitaires de France, 49 Boulevard Saint-Michel, Paris. Price, 80 francs.

This is the second book by the author on nitrogen metabolism. The first dealt with the excretion of nitrogen and the protein requirements of animals. The object of the book under review is to consider the physiological phases of the utilization of nitrogen and the changes that take place in nitrogenous substances from the time of ingestion through their utilization. The subject is discussed under four headings: (a) Protein foods and their digestibility; (b) The nature of nitrogenous substances absorbed by the body; (c) The processes of digestion and absorption; (d) The factors in digestion (enzymes), their respective roles, and conditions necessary for their activity.

The first part of the work discusses protein foods in general, followed by the consideration of digestibility, the effects of various factors, physical, chemical and physio-

logical, on the digestion of proteins, and a table of digestion coefficients.

The second part takes up the question of absorption of unmodified protein, a short discussion of food sensitization, and the absorption of the intermediate and final products of protein degradation, including evidence for the presence of these products in the blood.

The third part of the book is devoted to the processes of digestion and absorption in the various parts of the alimentary tract with particular attention to the extent of digestion and absorption and the interrelationship of the processes in one portion of the digestive tract to those in another.

The last section of the book is concerned with enzymatic processes, the role of the gastric, pancreatic and intestinal juices, and the enzymes responsible for digestion, and their mode of action.

The style of the book is monographic. The author has gathered a wealth of material and presented it critically from a functional and dynamic point of view. The subjects are discussed by topics and often through the use of the question and answer method to focus the attention of the reader on a specific point.

PAUL E. HOWE

Röntgens Briefe an Zehnder. (Röntgen's Letters to Zehnder.) Edited by LUDWIG ZEHNDER. Rascher et Cie., Verlag, Limmatquai 50, Zürich 1, Switzerland, 1935. 198 pp. Illustrated. 16 × 23 cm. Price, Swiss fr. 5; bound, 7.50.

This is a collection of the more important and interesting letters written by W. C. Röntgen to Ludwig Zehnder. The first letter was written in 1887 shortly after the two men had become acquainted during a summer vacation at Pontresina. In this letter Professor Röntgen offered Dr. Zehnder a position as Assistant and Demonstrator in his Laboratory at the Realgymnasium in Mainz. Zehnder was only slightly Röntgen's junior and they became close friends, this friendship being terminated only by Röntgen's death in 1922.

The letters referring to Röntgen's epoch-making discovery of x-rays are of course of particular interest, but all of the letters are valuable in disclosing the vigorous, earnest and high-minded personality of Röntgen. Some of the important letters are reproduced in facsimile and Zehnder has interspersed a sufficient account of the circumstances, together with a few of his own letters, so that the subject matter of Röntgen's letters can be adequately appreciated.

This indirect biography of Röntgen is eminently satisfactory and the only item that leaves one dissatisfied is the inexplicable action of his executors, as reported by Dr. Zehnder, in destroying, apparently on their own initiative, all documents bearing on Röntgen's discovery of x-rays, including the letters of Zehnder to Röntgen during the period of 1889-1902.

Incidentally, this collection of letters depicts an almost ideal friendship between these two men and reflects the admirable though quite different personalities of each of them.

ARTHUR B. LAMB

Atomsppektren und Atomstruktur. Eine Einführung für Chemiker, Physiker und Physikochemiker. (Atomic Spectra and Atomic Structure. An Introduction for Chemists, Physicists and Physical Chemists.) By Dr. GERHARD HERZBERG, Lecturer in Physics at the Technical Institute, Darmstadt. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1936. xvi + 188 pp. 79 figs. 15.5 × 22.5 cm. Price, RM. 13; bound, RM. 14.

This is the first of two monographs by the author on atomic and molecular spectra. The second, on molecular spectra, is in preparation.

As the title suggests, the book is intended primarily to serve as an introduction to atomic spectroscopy for those who wish to obtain a working knowledge of the subject which has, more than any other, thrown light on the extra-nuclear structure of atoms. No attempt is made to give a rigorous presentation of the theory of atomic spectra. Only an elementary physical description of the fundamental principles of the quantum mechanics is set forth, but brief descriptions of this method of treating certain problems, including the hydrogen spectrum, the Zeeman effect and the Pauli exclusion principle are given. The vector model is used in treating the main body of spectroscopic phenomena and the building of the periodic system of the elements. The last chapter gives an application of atomic theory in its discussion of valency and collision processes.

The author takes pains to explain clearly the fundamental spectroscopic terms and concepts. A feature of the book is the large number of term diagrams which are a great aid in visualizing spectroscopic phenomena.

ROBERT B. KING

Annual Tables of Constants and Numerical Data, Chemical Physical, Biological and Technological. Published under the patronage of the International Union of Chemistry. N. THON, Editor-in-Chief. The McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York, N. Y., 1936. 23 × 28.5 cm. Advance Reprints from Vol. XI. "Numerical Data on Rotatory Power," 1931-1934, by E. Darmais. 68 pp. \$2.00. "Numerical Data on Radioactivity, etc.," 1931-1936, by I. Joliot-Curie, B. Grinberg and R.-J. Walen. 57 pp. \$2.00. "Numerical Data on the Raman Effect, etc.," 1931-1934, by M. Magat. 112 pp. \$3.00.

The Committee of Annual Tables, recently appointed by the International Union of Chemistry, announces that owing to the fact that Annual Tables has lagged behind its schedule of publication since Volume X (1930), the data for 1931 to 1936 are to be published in a more condensed form and more critically edited, in a series of fascicules by subjects, partly separately for 1931-1934 and 1935-1936, and partly for the wholly period 1931-1936. The full set of these fascicules will constitute Volumes XI and XII of Annual Tables. It is planned to complete this program in 1937, whereby the numerical material published by Annual Tables will then be brought strictly up to date.

In addition, an Index Volume by Substances for the Volumes VI-X (1923-1930), like the one published for the Volumes I-V (1910-1922), is to appear toward the end of

1936. A similar Index Volume will be prepared for the Volumes XI and XII, to be published in 1937.

The present three fascicules represent preprints from Volume XI. The section on Transmutations, in the fascicule by Joliot-Curie, giving a systematic, complete and critical account of the numerical data relative to nuclear reactions and artificial radioactive disintegrations, is particularly timely and noteworthy. The compilation of data on Rotatory Power, by Darmois, will be of great value to students of stereochemistry; while the compilation of data on the Raman Effect, by Magat, cannot fail to interest keenly those workers seeking a deeper knowledge of the structure of chemical compounds.

ARTHUR B. LAMB

Catalytic Reactions at High Pressures and Temperatures.

By VLADIMIR N. IPATIEFF, Professor, Northwestern University, and Director of Chemical Research, Universal Oil Products Company. The Macmillan Company, 60 Fifth Avenue, New York, N. Y., 1936. xxii + 786 pp. 56 figs. 14.5 × 22.5 cm. Price, \$7.50.

This book makes no pretense, except possibly in its title, of being a comprehensive survey of catalytic reactions at high pressures and temperatures. It is primarily a collection and review of the author's own researches in the field of catalysis. The author prepared this book because, as he expresses it: "Much of my published work is inaccessible"; a circumstance which probably explains why he has sometimes failed to receive the recognition which he so frequently in this book feels to be his due.

In the 700 odd pages of this book are disclosed the author's methods of work, his habits of thought, his concepts of catalytic reactions. These should be of interest to all workers in this field. The book is in every sense what the author intended it to be, namely, his "chemical autobiography." Accordingly, the presentation is more or less chronological, beginning with his early work on dehydration and dehydrogenation of alcohols and closing with his more recent work on destructive hydrogenation, polymerization and alkylation. In between, appear sections devoted to isomerization, condensation and pressure hydrogenation. A chapter is devoted to the author's theories of catalysis, particularly as applied to liquid phase hydrogenation. The book reports a very large number of experiments, the results of which are in many cases given in considerable detail. For the specialist, these should be of considerable interest. The arrangement is such, however, that the general reader will be able to maintain reasonable continuity.

One cannot read this book without a feeling of regret that the author's early researches were not more generally known by the other pioneer workers in the field of catalysis. The author was one of the first to appreciate that the material out of which the apparatus is constructed might have catalytic properties which must not be disregarded. His early experiences illustrate how equipment problems may determine the whole course of subsequent research. In studying the decomposition of alcohols he observed that considerable carbon was deposited when the reaction occurred in an iron tube. In order to determine whether the catalytic effect was due to the iron tube or to the car-

bon deposited, he lined the tube with graphite. The graphite contained kaolin as a binder, to which (so he states) he attached no catalytic significance. Why, is difficult to understand in view of his earlier observations that the material of the apparatus might have pronounced catalytic effects. Be that as it may, experiments with the new apparatus disclosed that iron and not carbon was the catalyst with which he had been dealing in his previous experiments. The carbon tube, however, gave an entirely different result than the iron, in that it produced almost exclusively ethylene and water. The author ascribed this reaction to the kaolin binder rather than the carbon. In his search for the active constituent of the kaolin, he discovered the catalytic properties of alumina. Then followed an extended study of alumina during which he disclosed that its catalytic properties were related in an important manner to its state of hydration which in turn could be controlled by its method of preparation. Likewise in his hydrogenation studies the author found that the method of preparation of metal and oxide catalysts was very important. For example, in the case of nickel, the state of oxidation, its previous heat treatment, rate of reduction—each of these had an influence on its catalytic properties. The author was one of the earliest, maybe the first, to recognize the so-called promoter action of certain substances which, by themselves, have no obvious catalytic effect and yet in contact with a catalyst do modify its properties favorably. There is frequent reference throughout the book to substances which have an adverse effect upon the catalyst, such as accidental impurities originally present in the catalyst or in the reactants involved. Since he recognized that certain substances could slow up a reaction, even stop it completely, it seems strange that he did not consistently avoid such materials in his own investigations. For example, on page 171, in referring to certain work of Sabatier and Senderens (whose investigations, by the way, receive considerable critical attention in this book), the author states: "Sabatier and Senderens were careful about the purity of the reduced nickel; I paid no attention to its purity." Again on page 182, referring to the work of Schröter, he states: "In my first experiments on the hydrogenation of naphthalene, I used the naphthalene as obtained from Kahlbaum, whereas Schröter paid serious attention to the purity of his naphthalene and was therefore able to hydrogenate it at a lower pressure."

In considering the mechanism of catalytic reactions the author feels that many investigators have been too much concerned with physical concepts. Catalysts, says he, must have very special chemical as well as physical properties. To understand a catalytic process one must consider the "mutual chemical action of the components participating in the reaction." In advancing theories explaining some of his own reactions he has adhered to the proposition that it is as impossible to formulate a single theory covering all catalytic reactions as it is to formulate a general explanation for all known types of chemical reactions. In the case of hydrogenation the author assumes a role for water which some investigators in this field may question.

Some readers may feel that the author has been a little too controversial at times. Some, that he has insisted too frequently upon the priority of his own investigations. On

the whole, however, the book affords interesting and instructive reading. This reviewer believes it to be an important and timely contribution. Its reading and careful study are strongly recommended.

ALFRED T. LARSON

Die Fermente und ihre Wirkungen. (Enzymes and their Action), Supplement. Lieferung 2 (Bd. 1. Spezieller Teil: Hauptteil VIII). By Prof. CARL OPPENHEIMER, Dr. Phil. et Med. W. Junk Verlag, Scheveningsche Weg 74, The Hague, Holland, 1935. 160 pp. 13 figs. 20.5 × 28 cm. Price, \$6.80. Lieferung 3 Supplement (Bd. 1. Spezieller Teil: Hauptteil VIII, IX). 1936. 160 pp. 25 figs. Price, \$6.80. Lieferung 4 Supplement (Bd. 1. Spezieller Teil: Hauptteil IX-XII). 1936. 160 pp. 10 figs. Price, \$6.80.

Since the publication of Lieferung, or Part 1 dealing with the recent chemistry of the esterases [reviewed in THIS JOURNAL, 58, 538 (1936)], three additional parts: 2, 3 and 4 have appeared. The same plan has been followed as in the first part. Parts 2, 3 and the first part of 4 are devoted to the chemistry of the carbohydrases and their substrates. The subject matter covered in Part 2 is chiefly the recent literature on the oligases, *i. e.*, enzymes specific to the hydrolysis of glycosidic linkages in the simpler sugars and glycosides. Part 3 takes up the chemistry of the amylases as well as some of the recent views concerning the constitutions of different starches as revealed by their enzymatic behaviors. The first part of Lieferung 4 also deals with the chemistry of poylases, although more particularly the glucanases, like cellulase, the fructanases, the polyuronidases and pectinases. The remainder of Part 4 takes up first nucleosidases, nucleic acids, aminases, acylic amidases, etc., followed by a discussion of some of the more recent views concerning the constitutions of proteins. The latter is intended to serve presumably as a background for a review of the more recent work in the field of proteolytic enzymes to be taken up in the next Lieferung.

As mentioned in the previous review of Part I, the author has succeeded in mentioning practically all of the large mass of literature which has appeared, in this part of enzyme chemistry, during the ten years elapsing since the publication of the original Hauptwerk. Although he has, by means of discussion in the text, tried to correlate and integrate as much as possible the more significant data contained in the literature, the supplement will be welcomed by chemists as an excellent and complete source of references, rather than as a critical review.

J. M. NELSON

Semi-Micro Qualitative Analysis. By CARL J. ENGELDER, Ph.D., Professor of Analytical Chemistry, University of Pittsburgh, TOBIAS H. DUNKELBERGER, B.S., University of Pittsburgh, and WILLIAM J. SCHILLER, Ph.D., Mount Mercy College, Pittsburgh, Pennsylvania. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y., 1936. x + 265 pp. 15.5 × 24 cm. Price, \$2.75 net.

In the words of the authors, it has been their aim in this textbook "to apply the methods and technique of micro-

analysis to the ordinary (macro) schemes of qualitative analysis with the objects: first, of confining the operations to drops or, at most, to one or two cubic centimeters of solution; second, of developing a micro scheme which could be placed in the hands of undergraduate students taking their first course in qualitative analysis; and, third, by dispensing with the use of microscopes, of bringing the micro technique within practical pedagogic and economic reach of large laboratory classes of sophomore or even freshman students."

The book is divided into four parts: fundamental principles of qualitative analysis, reactions of the cations, reactions of the anions and systematic microanalysis. Approximately ninety pages are devoted to the fundamental theory of qualitative analysis, embracing the customary topics; there is a brief discussion of the Werner theory of valence, and of chelate compounds. The group separations of the cations follow the conventional macro scheme. The separations employed within the groups are again the usual ones in most instances. For the identification tests extensive use is made of the new spot reactions developed by F. Feigl and others, which are carried out on drop-reaction paper or a spot plate. In most cases two or three such tests are described for each cation, and in addition many other drop reactions are mentioned together with literature references. Inclusion of the sensitivities of the tests described would have added greatly to the practical value of the book.

Doubtless there will be a difference of opinion among teachers concerning the advisability of introducing the student to practical qualitative analysis via the semi-micro technique. The reviewer believes many will feel that the operations of qualitative analysis as ordinarily carried out are effected on an unnecessarily large scale, and that semi-micro and micro procedures have great advantages over the older technique in point of certainty and economy of time. To those favoring the new departure in analysis the present work is recommended.

E. B. SANDELL

Inorganic Chemistry for Colleges. A Textbook for Students who have had a Preparatory Course in Chemistry. Second edition. By WILLIAM FOSTER, Ph.D., Russell Wellman Moore, Professor of Chemistry in Princeton University. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y., 1936. xi + 925 pp. Illustrated. 14 × 22.5 cm. Price, \$3.90.

In this revised edition, the general plan of the former edition has been followed (confer the review on p. 1617 of THIS JOURNAL, 1931). Many of the sections of the book have been rewritten so as to incorporate any theories that have been enunciated.

An entire chapter is devoted to atomic structure, and the subject matter has been considerably extended along with many other things. This chapter contains a modified Bohr-Thomsen and Periodic Tables; the Electron Theory of Valence; the Main Facts Concerning Heavy Hydrogen and Heavy Water; A Discussion of the Transmutation of the Elements as well as a brief statement of the Quantum Theory. The chapters on Ionization have been thoroughly modified, and the new definitions of acid and base are given.

New problems and questions have been introduced; the reading references have been thoroughly revised, and extended; and the appendix enlarged. The Textbook has been modernized by an attempt not to include too large an amount of physical chemistry and physics, while at the same time, retaining an adequate amount of descriptive and industrial chemistry.

HERMAN SCHLUNDT

An Introduction to Organic Chemistry. By ALEXANDER LOWY, Ph.D., University of Pittsburgh, and BENJAMIN HARROW, Ph.D., College of the City of New York. Fourth edition. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y., 1936. xiv + 429 pp. 15.5 × 24 cm. Price, \$3.00.

The fourth edition of this well known text follows closely early editions which have been reviewed in *THIS JOURNAL*, 47, 900 (1925); 54, 4468 (1932). Considerable additional material has been added including formulas proposed for certain of the vitamins and hormones.

R. R. RENSHAW

Allgemeine Untersuchungsmethoden. Erster Teil. Physikalische Methoden. (General Research Procedures. Part I. Physical Methods.) Edited by A. BÖMER. Vol. II, Bömer-Juckenack-Tillmans, "Handbuch der Lebensmittelchemie." Verlag von Julius Springer, Linkstrasse 23-24, Berlin W 9, Germany, 1933. x + 536 pp. 401 figs. 17.5 × 26 cm. Price, R.M. 66; bound, R.M. 69.

This volume, comprising approximately half of the second one of a series of eight which when completed will constitute an encyclopedic treatise on food chemistry, is devoted exclusively to comprehensive discussions of the underlying principles and descriptions of those methods and tools of the physical chemist which find application in this field as the Germans define it. Some eleven authors have contributed to the compilation of this volume of 21 chapters, each of which is practically a small monograph on the subject in hand.

The chapter headings and the author responsible for the contents are: specific gravity (16 p.), viscosity (12 p.), ultra-filtration (12 p.), dialysis and electro-dialysis (16 p.) and surface tension, adsorption phenomena and capillary analysis (20 p.), by K. Täufel; solubility (11 p.), melting point and boiling point (23 p.), and heat of combustion (14 p.) by A. Bömer and R. Grau; cryoscopy (11 p.) by R. Strohecker; bathometry or measurement of pH (36 p.), indicators (22 p.) and electrolytic conductivity (28 p.) by A. Thiel; acidimetry and alkalimetry (20 p.) and oxidation-reduction potentials (17 p.) by P. Hirsch; refractometry (31 p.) by F. Löwe; spectroscopy and spectrophotometry (58 p.) by H. Ley; polarimetry (47 p.) and color measurement (20 p.) by F. Volbert; colorimetry and nephelometry (16 p.) by H. Freund; luminescence analysis (24 p.) by P. W. Danckwortt; and microscopy (74 p.) by C. Griebel.

The general treatment of the several subject matters is uniformly excellent. Illustrations have been generously used throughout this work. A few chapters follow some-

what the literature review pattern, yet this does not seem to detract from their interest or value. Some authors, as for example Täufel, Griebel, Freund and Volbert, have added to their literature citations brief references to the book literature for amplification, if the reader is so disposed. Danckwortt accomplishes this end by referring him to his larger work on luminescence analysis (1929). The field of micro-analysis has not been overlooked for included herein are its applications to cryoscopy, spectroscopy and the determinations of melting points and heats of combustion.

It is the opinion of the reviewer that this volume, perhaps under another less specialized caption and certainly enlarged as to make it more serviceable, by the addition of an index, would arrest the attention of others and serve them equally as well as the food chemist to whom it is obviously addressed.

H. A. SCHUETTE

Ebulliometry. By WOJCIECH ŚWIETOSŁAWSKI, Professor of Physical Chemistry at the Polytechnic Institute of Warsaw. The Jagellonian University Press, Krakow, Poland, 1936. x + 196 pp., 52 figs. 18 × 25.5 cm.

In recent years ebulliometric technique has been improved in convenience and precision, as well as extended in its applications, by Professor Świetosławski and his co-workers. Modern methods and applications of ebulliometry are described comprehensively in this book, which is a revised and enlarged English edition of the monograph "Ebuljometrja" published in Polish in 1935. It is written in a straightforward and logical style. The description of experimental technique and the illustrations of apparatus are of such clarity and detail that the book serves as a laboratory manual as well as a text of principles and an interesting source of information, data, and references.

Perhaps the most important uses of Świetosławski's ebulliometers are the determination of exact boiling points ($\pm 0.002^\circ$), of dp/dt ratios, and the degree of purity of liquid substances. The last determination usually depends on the measurement of the difference between the boiling point and condensation temperature. For an absolutely pure liquid, these temperatures are, of course, identical, but in the presence of impurities their difference, and in many cases particularly the condensation temperature, changes markedly and uniformly with the quantity of the impurity. For example, by this method 0.002 per cent. of benzene is readily detected in toluene, and by similar measurements the moisture content of solids as well as of liquids can often be determined with high accuracy, even when of the order of only 0.001 per cent. In addition to measurements customarily classified as ebulliometric, many others, of which the following are noteworthy, can be made by these methods: the degree of thermal decomposition of substances, the solubilities of solids, the amounts of substances adsorbed on the surface of solids or occluded in crystals, the calibration of thermometers, esterification constants, deviations from Raoult's law, osmotic coefficients, the detection and analysis of azeotropic mixtures and the displacement of azeotropic points with change in pressure.

An excellent discussion is given of the phenomenon of

azeotropy and its application to the purification of liquids, particularly with respect to the dehydration of liquids like toluene and ethanol by azeotropic distillation. Important data on accurate boiling points and dp/dt ratios of pure liquids are tabulated. A bibliography of the 64 references cited in the text is given at the end.

The increasing recognition in physical chemistry of the convenience and precision of comparative methods of measurement with the use of water as a primary standard may well lead to the universal adoption of Świetosławski's ebulliometric technique for the determination of many physical constants of liquid substances and mixtures as well as for the examination of their purity.

EDGAR R. SMITH

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September 15, 1936–October 15, 1936

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- A. H. B. BISHOP and G. H. LOCKET. "An Elementary Chemistry." Oxford University Press, 114 Fifth Ave., New York, N. Y. 400 pp. \$1.75.
- ROBERT D. COGHILL and JULIAN M. STURTEVANT. "An Introduction to the Preparation and Identification of Organic Compounds." McGraw-Hill Book Company, Inc., 330 West 42d St., New York, N. Y. 226 pp. \$1.75.
- ROBERT DURRER. "Erzeugung von Eisen und Stahl." Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany. 159 pp. RM. 10; bound, RM. 11.
- SAMUEL GLASSTONE. "Recent Advances in General Chemistry." P. Blakiston's Son and Co., 1012 Walnut St., Philadelphia, Pa. 430 pp. \$5.00.
- SAMUEL GLASSTONE. "Recent Advances in Physical Chemistry." P. Blakiston's Son and Co., 1012 Walnut St., Philadelphia, Pa. 477 pp. \$5.00.
- L. A. GOLDBLATT. "Collateral Readings in Organic Chemistry." (Reprintings.) Lithoprinted by Edwards Brothers, Inc., Ann Arbor, Mich. 128 pp. \$1.00.
- OTTO HAHN. "Applied Radiochemistry." The George Fisher Baker Non-Resident Lectureship in Chemistry at Cornell University, No. 14. The Cornell University Press, 124 Roberts Place, Ithaca, N. Y. 278 pp. \$2.50.
- ALBERT P. MATHEWS. "Principles of Biochemistry." William Wood and Company, Mt. Royal and Guilford Aves., Baltimore Md. 512 pp. \$4.50.
- WILLIAM BUELL MELDRUM and FRANK THOMSON GUCKER. "Introduction to Theoretical Chemistry." American Book Company, 88 Lexington Ave., New York, N. Y. 614 pp. \$3.50.
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- KEITA SHIBATA and YUJI SHIBATA. "Katalytische Wirkungen der Metallkomplexverbindungen." Publication No. 2, Iwata Institute of Plant Biochemistry, Tokyo, Japan. 219 pp. \$2.50.
- "Annual Tables of Constants and Numerical Data, Chemical, Physical, Biological and Technological." Advance Reprints from Vol. XI. "Raman Effect," by M. MAGAT. "Rotatory Power," by E. DARMOIS. "Radioactivity," by I. JOLIOT-CURIE, B. GRINBERG and R.-J. WALLEN. Institut de Chimie, 11 Rue Pierre Curie, Paris 5^e, France. 112 + 68 + 57 pp. \$3.00 + \$2.00 + \$2.00.
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