

the medium of chains which require a surface for their initiation.^{1,3,4} A glass surface was found to be much less efficient for starting chains than a solid bromine-ice surface.

At -104° the slow reaction goes to completion in a time ranging from twenty seconds to four minutes in accordance with the following equation



If ozone is added in excess the reaction stops when all the hydrogen bromide has disappeared. Under the conditions of an explosion, however, any amount of excess ozone is completely decomposed. In a detonation some of the hydrogen bromide remains undecomposed due to the equilibrium established at the high instantaneous temperature developed.

The kinetics of the reaction is being studied in detail.

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NEW BOOKS

Annual Survey of American Chemistry. Vol. V, 1930. Edited by CLARENCE J. WEST, Director Research Information Service, National Research Council. Published for National Research Council by The Chemical Catalog Company, Inc., 419 Fourth Ave., New York, N. Y., 1931. 629 pp. 14×21.5 cm. Price, \$5.00.

Volume V (1930), "Annual Survey of American Chemistry," edited by Clarence J. West, with a brief foreword by Harry A. Curtis, presents in 630 pages a comprehensive survey of the work done in all branches of Chemistry in this country during 1930.

The subject matter covered is divided into forty chapters, each contributed by a specialist in the particular field covered. The individual contributors are to be congratulated on the success which they have had in so arranging the material comprised within the separate chapters that the work as a whole has continuity.

An admirable author and subject index adds greatly to the usefulness of the book. The list of authors in fine print, three columns to a page, requires nineteen pages and shows better than words can describe the great strides which chemical research has made in this country. The usefulness of the volume is greatly increased also by the careful attention which the Chemical Catalog Company gave to the printing and binding.

Although the reviewer did not examine the text critically for errors, there appear to be surprisingly few, considering the nature of the task

³ H. Alyea and F. Haber, *ibid.*, 10B, 193, 1930; H. Alyea, *THIS JOURNAL*, 53, 1324 (1931).

⁴ H. W. Thompson, *Z. physik. Chem.*, 10B, 273 (1930).

involved. On page 192 in the review of the work of Kohler and Richtmyer there is an obvious misplacement of the linkage which should join the carbon to the oxygen atom in the third formula. Also on page 193 there is a misprint in the formula illustrating the reduction product, which evidently should be formulated as an open-chain oxime.

A possible improvement in the text might be made if each contributor, following the practice formerly so successfully used in Meyer's "Jahrbuch der Chemie," were to give, whenever the subject matter permitted, a brief biographical and bibliographical summary at the beginning of the chapter. For the present volume such a bibliographical outline was introduced by Oliver W. Storey at the beginning of his review of the applications of Electrochemistry in Chapter XI.

Considering the great amount of time and thought which has been expended to make this volume a success, it seems to the reviewer unfortunate that it has been found impracticable to make this annual survey international. The demand for such a complete survey has become increasingly insistent since the discontinuance of Meyer's "Jahrbuch der Chemie."

W. L. JENNINGS

Gmelin's Handbuch der anorganischen Chemie. (Gmelin's Handbook of Inorganic Chemistry.) Edited by R. J. MEYER. Eighth edition. Germanium. System-Number 45. Issued by the Deutsche Chemische Gesellschaft. Verlag Chemie, Corneliusstrasse 3, Berlin W 10, Germany, 1931. xxi + 62 pp. 17 × 25 cm. Price, to subscribers, M. 10; singly, M. 13.

Due to the increased availability of germanium, knowledge of it and of its compounds has increased with great rapidity during the past few years. The appearance of this volume is timely. It is particularly pleasing to find that so important a part of these recent advances have been made in this country.

The literature has been covered up to May, 1931. The authors of this volume are R. J. Meyer with Dorothy Hymann and Gertrud Pietsch-Wilcke.

ARTHUR B. LAMB

An Introductory Course of Quantitative Analysis with Explanatory Notes. By HENRY P. TALBOT, Late Professor of Chemistry, Massachusetts Institute of Technology. Seventh Edition, Revised and Rewritten by L. F. HAMILTON and S. G. SIMPSON. The Macmillan Company, 60 Fifth Ave., New York, 1931. xii + 253 pp. 14.5 × 21.5 cm. Price, \$2.50.

The general characteristics of the original, well-known textbook are preserved in this revised edition. Though a few new experiments have been introduced, most of the procedures are the same except for occasional minor alterations in the directions or discussions. There is, however, one important innovation. The stoichiometrical principles, instead of being discussed in a very brief fashion at the end of the book, are now treated in

considerable detail in connection with each analytical method. This new material with the numerous illustrative problems and an abundance of problems for assignment is well presented and adds greatly to the usefulness of the book.

With respect to the selection of analytical experiments and the careful, detailed directions, this book can be recommended without qualification. Some teachers will find fault, however, with the very meager treatment of the theoretical aspect of the subject. Thus, the solubility product principle is mentioned only once, in a note on the sulfate determination. In this connection it may also be noted that the summary of the electrolytic dissociation theory, which constituted the first section of the Appendix in the previous edition, is replaced by a brief discussion of potentiometric titrations. In the reviewer's opinion too little attention is paid to technique, particularly from the standpoint of precision. There is, however, a new section dealing with the proper retention of significant figures.

The book is excellently made up. Only a few errors were observed. The period of drainage of a transfer pipet given on page 23 is not consistent with that given on page 22 and the statement on page 24. The temperature correction data referred to on page 20 is not given in the Appendix.

ARTHUR F. SCOTT

A Textbook of Practical Physical Chemistry. By K. FAJANS and J. WÜST. Translated by BRYAN TOPLEY. Published by E. Dutton and Company, Inc., New York, 1930. xv + 233 pp. 74 figs. 15 × 23 cm. Price, \$4.95.

This book will undoubtedly be found to be a very interesting and very helpful volume for those who have responsibility for laboratory instruction in physical chemistry. To a large extent the importance of the volume is due to the fact that the authors have done much more than sit down and write another laboratory manual for students of physical chemistry. The book in its present form represents the results of many years of improvement in actual use in different laboratories. It originated from a course of instruction in the Institute of Professor G. Bredig in the Technische Hochschule of Karlsruhe, and has been modified from time to time while in use at Munich, Erlangen and Würzburg. It has been further perfected by suggestions and assistance in one way or another from a number of outstanding German chemists. In addition to the present English translation it is also appearing in Russian and Spanish editions.

One of the principal objects of the authors was to produce a text requiring of the student a maximum of self-reliance and a minimum of assistance from the instructor, a method which has been remarkably well achieved by the authors by prefacing each experiment with an excellent theoretical discussion. While this is the most outstanding feature of the book, an important feature is also the choice of experiments, the discussion of

their significance and the variety of experimental material covered as indicated by the titles of the nineteen principal divisions which are as follows: molecular weights (in solution); vapor pressures and distillation of liquid mixtures; surface tension and internal friction of liquids; adsorption from solution; coagulation of sols; P_H determinations; calorimetry; metallography; radioactive transformations; rates of reaction (in solution); refractometry; spectrophotometry; electrical conductivity; transference; electromotive force; and practical electrolysis.

There is also an introduction covering general instructions for laboratory work which is most excellent. Finally, it appears to the reviewer that the original has lost nothing in the translation and is quite free from errors such as frequently appear in translations and which in a book of this kind would be particularly troublesome where the student is designedly being placed largely upon his own responsibility. At the end of the theoretical discussions of most of the chapters the authors have given references to many of the large textbooks on physical chemistry for the student's further instruction in the theoretical aspects of the problem.

In the opinion of the reviewer this text is distinctly different from others available and will find an important place in laboratory instruction. It is certainly worthy of serious consideration by every teacher of physical chemistry.

J. C. W. FRAZER

The Chemical Analysis of Rocks. By HENRY S. WASHINGTON, Ph.D. Fourth edition, rewritten and enlarged. John Wiley and Sons, Inc., 440 Fourth Ave., New York, 1930. xvi + 296 pp. Illustrated. 15.5 × 23.5 cm. Price, \$4.00.

In this latest revision of a well-known work "the various procedures have been treated with even greater detail than in previous editions." Minor changes of technique have been made and some of the newer methods described, *e. g.*, the precipitation of magnesium with 8-hydroxyquinoline. Unfortunately the author has not stated that a solution of an ammonium salt used to wash the hydroxide precipitate should be tested for neutrality (p. 172). He might also have mentioned that the precipitation of calcium oxalate from a hot, acid solution by the slow addition of dilute ammonia water is more satisfactory than by the method described (p. 202). The precipitate is less likely to run through the filter and the separation from magnesium is better as shown by Richards, *et al.* (reference in footnote, p. 202). There are a few typographical errors such as "silira" for silica (p. 45); two of the less apparent are "Stäbler" for Stähler (p. 48) and "Erback" for Eberbach (p. 63). Although not strictly in accord with the best current practice, the index is very good. The book admirably fulfils its objective: "being a practical guide for the beginner."

B. A. SOULE

Alkalien und Erdalkalien in ausgewählten Kapiteln. (The Alkalies and Alkaline Earths in Selected Chapters.) By DR.-ING. BRUNO WAESER, Berlin. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1931. viii + 196 pp. 15 × 22 cm. Price, unbound, RM. 13.50; bound, RM. 15.

This little book is volume 26 of the "Technische Fortschritteberichte." It deals with the industrially important inorganic compounds of sodium, potassium, lithium, calcium, strontium, barium and beryllium, except fertilizer materials, nitrates and nitrites, sulfates, cements, glass and products obtained by electrolysis, since these exceptions have been covered in earlier volumes of the series.

No attempt is made to give a complete systematic discussion of the chemical technology of the materials discussed, as the reader is assumed to be familiar with the common industrial practice and the older standard books. The book is devoted to a discussion of economic and technical trends and recent developments as disclosed in recent statistics of production and of foreign trade, and in new patents and published information as to introduction of new methods of manufacture and developments of new uses. It is not a "Jahresbericht," as the literature cited and discussed covers much more than a single year. A great majority of the references cited are dated within the last decade and there are a considerable number dated 1930 and even a few dated 1931. The statistics quoted are mostly for the years 1928 and 1929. The author disclaims any purpose to cite all patents and articles in the chemical literature but has attempted to select those which he judges to be most important. The names of individual companies are used freely. The treatment is distinctly international rather than primarily German. References to American companies and American patentees are numerous. Anyone who desires to keep well informed as to the development of industrial chemistry will find this book helpful.

GRINNELL JONES

Theoretische Grundlagen der organischen Chemie. (Theoretical Principles of Organic Chemistry.) Vol. I. By WALTER HÜCKEL, Professor at the University of Greifswald. Akademische Verlagsgesellschaft m. b. H., Schlossgasse 9, Leipzig C 1, Germany, 1931. xi + 410 pp. 22 figs. 16 × 23.5 cm. Price, unbound, M. 22; bound, M. 24.

If for no reason other than that it is the first book of its kind since Henrich's "Theorien der organischen Chemie," the first edition of which appeared in 1908, Hückel's "Grundlagen" will be welcomed by all those who are interested in the chemistry of the carbon compounds either as investigators, as teachers or as advanced students. The new treatise, however, has much more to recommend it than the scarcity of works de-

voted entirely to questions of theory. In the field of research, Dr. Hückel is recognized as an investigator with a distinguished record of accomplishment; he now appears as an able and well-informed writer with particularly keen critical faculties, and he has presented in this treatise a valuable contribution to the science.

The author assumes a familiarity on the part of the reader with the factual side of organic chemistry and no attempt is made to duplicate the field covered in the ordinary textbook. The work is distinguished from the monographs available on special subjects in that the author takes for his province the whole theoretical structure upon which the science rests. The title is thus highly descriptive, for Hückel devotes himself throughout to a careful analysis of the experimental foundations for the present views concerning the nature of the organic compounds. In so doing he has broken away from the usual practice of presenting a collection of separate essays and adopted the more difficult, but more valuable, method of cross-section study. The whole of organic chemistry, or at least a very considerable part of it, is examined from a single point of view: What are the facts? How sure are the inferences? Do the theoretical conceptions introduced have a real physical significance?

Asking these questions, Hückel first turns to the development of the valence theory from the earliest beginnings to the electronic conception of valence. As logical extensions of the fundamental principles of structure and of valence, successive chapters deal with stereochemistry, secondary-valence, or molecular compounds, and compounds displaying abnormal valence. These four chapters make up the contents of Book 1: "The systematic basis of organic chemistry." Book 2: "The limitations in the methods of expression employed in the organic-chemical system," follows in natural succession. One limitation of structural theory is presented by those substances to which it appears necessary to assign two formulas: the tautomeric compounds. Closely akin to tautomerism is the subject of intramolecular rearrangements, and this is followed by a consideration of steric rearrangements. Through an account of the Walden inversion and of *cis* and *trans* addition, the author artfully bridges the way to a study of the unsaturated compounds and, finally, to aromatic chemistry, pointing out in each case the boundaries beyond which the simple structural theory cannot safely go in accounting for the new phenomena.

One conclusion which stands out sharply as a result of this survey, which concludes the contents of the first volume of the treatise, is that the problems of organic chemistry are so complicated that a complete solution by purely chemical methods of experimentation cannot be hoped for. The author thus turns in the second volume to the methods for a further penetration of the problems made available by the newer developments

of physics and of physical chemistry. This volume will be reviewed by another writer.

It will be evident that the book follows a thoroughly logical development, and that the author is to be congratulated on his skill in correlating different phenomena. His presentation of a subject seldom follows the orthodox method, and in ploughing over the old ground he has without doubt given impetus to the growth of sounder theory. There can be little cause for objecting that he goes back too far or that he reverts too frequently to the crude ideas of Kekulé or of Berzelius. The process of sorting out the good from the bad, in this reëvaluation of the theoretical scaffolding of the subject, necessarily demands a consideration of the older theories as well as those which have in part supplanted them. By following the development of an idea, Hüchel frequently has been able to show wherein the principles of logic have been violated, and he thus paves the way for more adequate conceptions. Thus although the Thiele theory, as anything but a worn-out working hypothesis, is finally discarded, Hüchel's analysis of the shortcomings of the ideas of Thiele may be of value in constructing more sound views of the nature of the unsaturated compounds.

It may be said that Hüchel is a sharp critic, and that few theories completely withstand his careful scrutiny. His criticism, however, is not unsympathetic, but merely rigorous, and, if he has torn down some of the theoretical scaffolding as unsound, he has made it appear an exceedingly attractive problem to replace the structure and to build higher.

In the expectation that new editions will be demanded, and that these will undergo revision, it is worth while noting that the reviewer considers the chapters on the unsaturated compounds and on the aromatic compounds to be the weakest in the book. In the first instance there is too much tabulation and too little attention to the recent work on the mechanism of the addition of the Grignard reagent. Aromatic chemistry is treated quite briefly and not very well. Indeed, one might almost accuse the author of prejudice in his treatment of the mechanism of aromatic substitution reactions. In a previous chapter he has rejected the Michael hypothesis that the alkylation of acetoacetic ester proceeds through an addition to the double bond of the enolate, and he attributes the hesitancy of some authors to place the sodium atom on carbon to timidity. Turning to aromatic substitution, Hüchel is very reluctant to assume intermediate addition compounds. Can it be through the influence of his judgment against the *other* intermediates that Hüchel forgets that such compounds *have* been isolated in the case of substitutions in anthracene and phenanthrene, and that Zincke's work on the chlorination of β -naphthol furnishes excellent evidence for the addition theory?

Vortrage aus dem Gebiete der Eiweisschemie. By ERNST WALDSCHMIDT-LEITZ, Professor at the German Technical High School of Prague. Akademische Verlagsgesellschaft m. b. H., Leipzig C 1, Germany, 1931. vii + 74 pp. 15.5 × 23 cm. Price, M. 6.80.

This short but interesting book brings together nine addresses given by the author between the years 1923 and 1930, which bear more or less on the question of structure of the proteins, as elucidated by the action of enzymes. The work discussed should be of interest to biologists and chemists, particularly in showing what progress has been made recently by attacking the problem through enzymic action.

D. C. CARPENTER

Quantitative Pharmaceutical Chemistry, Containing Theory and Practice of Quantitative Analysis Applied to Pharmacy. By GLENN L. JENKINS, Ph.D., Professor of Pharmaceutical Chemistry, AND ANDREW G. DUMEZ, Ph.D., Professor of Pharmacy and Dean of the School of Pharmacy, University of Maryland. The McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York, 1931. xxiii + 408 pp. Illustrated. 14.5 × 21 cm. Price, \$3.50.

The authors define quantitative pharmaceutical analysis as the application of the general theories of analytical chemistry to the procedures used in the analysis of drugs, chemicals and medicinal preparations employed in pharmacy. Chapters are devoted to gravimetric, volumetric, gasometric, electrometric and photometric procedures, alkaloidal and volatile oil assay, refractometric measurements, determination of rotatory power and of hydrogen-ion concentration, ultimate analysis and the measurement of various physical constants. When the size of the book and the nature of the subjects are considered, it is obvious that many of the topics can receive only superficial treatment. It cannot be emphasized too strongly that some training in the fundamentals of electrochemistry should precede or accompany instruction in electrometric measurements and the determination of hydrogen-ion concentration by the potentiometric method.

A better example might have been chosen to illustrate the application of the distribution coefficient. In the chapter on ultimate analysis it is unfortunate that the electric combustion furnace was not described instead of the obsolete gas furnace. The Thompson-Oakdale method for the determination of halogens in organic compounds has practically made the use of the dangerous and inconvenient Curious method unnecessary.

The extensive bibliography of reference books dealing with all types of analytical procedures is a very commendable feature.

The book possesses outstanding merit in that, unlike most others which deal with the same subject, a very serious attempt has been made to avoid an empirical treatment of the material. A considerable number of equa-

tions are given and the basic principles underlying various procedures are developed quite fully. Especially from the standpoint of the student the book undoubtedly represents a distinct advance over many of the texts published hitherto on pharmaceutical analysis.

F. F. BLICKE

Fighting Disease with Drugs. The Story of Pharmacy. A Symposium, edited by JOHN C. KRANTZ, JR. Introduction by Dr. James H. Beal. A Publication of the National Conference of Pharmaceutical Research. The Williams and Wilkins Company, Mt. Royal and Guilford Aves., Baltimore, Maryland, 1931. xix + 230 pp. Illustrated. 15.5 × 23.5 cm. Price, \$2.00.

This addition to the increasing number of books written for the purpose of interpreting various technical subjects to the non-technical reader will be probably equally interesting to those who are technically well informed upon the subject in general.

Twelve chapters each written by a man who may properly be looked upon as an authority in the particular field covered by him enables presentation in a relatively small book of 230 pages of an unusual amount of information. The coördination of the different chapters has been well worked out so that the scope covered is wide without any more overlapping than is inevitable.

In a work of this kind one familiar with the subjects treated will always think of changes that might have been made either by addition of other information, or elimination of some that is given. On the other hand, any who have ever attempted such condensed surveys will really appreciate the difficulties to be encountered and the quality of work that has been done.

The book will give to the layman information about various phases of the origin, production, control and use of drugs that is not given by any other single book with which the reviewer is acquainted and it is also an interesting source of information to the technical reader.

A carefully prepared and thorough index would materially increase the usefulness of the book.

F. O. TAYLOR