

and the line spectrum of ionized C were observed, the C line at λ 2478 being particularly prominent. All these bands and lines were produced by the other substances; in addition there appeared on most of the plates the second positive group of nitrogen, arising no doubt from the trace of air remaining in the discharge tube. The spectrum of pentane, shown in Fig. 1, and that of acetylene contained some bands which are believed to belong to the CN band group at λ 3883. In the case of chlorobenzene, a well-defined benzene spectrum appeared accompanied by faint "raies ultimes" of Cl at λ 4810, etc. These facts indicate that the process of breakdown in the electrodeless discharge is the same for all these simple hydrocarbons. It should perhaps be mentioned here that in every case save one relatively large amounts of reddish-brown product similar to that described by Harkins and Gans were obtained; the significant exception was cyclohexane by which only a little was produced. A more detailed discussion of these observations will appear in a future publication.

RESEARCH LABORATORY
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J. B. AUSTIN

NEW BOOKS

Anorganisch-chemisches Praktikum. Qualitative Analyse und anorganische Präparate. (Laboratory Manual of Inorganic Chemistry. Qualitative Analysis and Inorganic Preparations.) BY DR. E. H. RIESENFELD, Professor at the University of Berlin. Ninth edition, revised with the assistance of Dr. R. KLEMENT. Verlag von S. Hirzel, Leipzig, Germany, 1930. xvi + 393 pp. 29 figs. 13.5 × 20.5 cm. Price, M. 9.

The author points out in the Preface to this ninth edition of the "Praktikum" that it had been usual in German Universities since the time of Liebig and up to the first of this century to begin the study of experimental chemistry with analytical reactions and separations—that is, with qualitative analysis. In 1903, Haber brought back from his travels in this country the American method of instruction, according to which the student first carries out a number of simple experiments which portray before his own eyes the broad relationships of chemical phenomena. This method the author strove zealously to introduce during his teaching activities at Freiburg twenty years ago when the first edition of the laboratory manual was published. The author states that only during the last decade have a number of the large German Universities altered their procedure to the extent that they preface the instruction in analysis with some exercises in the preparation of chemical substances.

This manual as it has now been developed has after the customary discussion of laboratory manipulations a long chapter devoted to prelimi-

nary experiments illustrative of the broad principles of chemistry. Next are two chapters on the descriptive chemistry of the most important non-metallic elements and one on the most important acids. Then follows a series of chapters based on the classification of systematic qualitative analysis. In each of these chapters there are experiments which develop both the general properties of the elements of the group and also those properties on which the analytical separation and detection are based. Meanwhile some sixty-four "preparations" are introduced at appropriate places. Discussions of the theoretical matters beyond what is given in the introductory chapter are also inserted at frequent intervals throughout the book.

It can be seen from the above that the manual combines the experimental work in general and inorganic chemistry with that in qualitative analysis and elementary inorganic preparations. The experiments and preparations appear to be wisely chosen. The descriptions and explanations are clear and concise. The manual is now more complete than even a combination of the usual American manuals of general chemistry and qualitative analysis. A student who works through it conscientiously will acquire a thorough knowledge of inorganic chemistry and qualitative analysis.

ARTHUR B. LAMB

Annual Survey of American Chemistry. Vol. IV. July 1, 1928, to December 31, 1929.

Edited by CLARENCE J. WEST, Director, Research Information Service, National Research Council. Published for the National Research Council by the Chemical Catalog Company, Inc., 419 Fourth Avenue, New York, 1930. 549 pp. 13.5 × 21.5 cm. Price, \$4.00.

Vol. IV of the Annual Survey of American Chemistry has been extended to cover a period of eighteen months in order that succeeding volumes of the survey may review the work published in a calendar year.

A study of the present volume brings out clearly the fundamental character and wide diversity of the contributions to chemical knowledge made in American laboratories. A recent compilation of statistics in regard to papers published on chemical subjects in the various countries of the world has shown that America and Germany head the list in the number of contributions. This volume is evidence of the high quality of the work done here.

The material presented is grouped in 43 chapters which have been prepared by active investigators in the several fields. In addition to the chapters dealing with the divisions of physical, inorganic, organic and industrial chemistry, this volume of the Survey contains reviews of work in certain limited fields in which rapid progress is being made. Among these are the following: determination of crystal structure by x-rays;

x-ray examination of industrial materials; carbohydrates; stereochemistry; pharmaceuticals; the vitamins; fermentation; rayon; synthetic resins. The extent of the work which is reviewed is evidenced by the fact that the index contains about 3500 names of authors. The activity in the several fields is shown by the number of references; for example, the chapter on insecticides and fungicides contains 249 references, fermentation 154, biochemistry 147, petroleum chemistry and technology 102, colloid chemistry 148, kinetics of homogeneous gas reactions 71.

It is evident that in this volume of the Survey the authors have succeeded in making their reviews more readable than in the past. When it was found advisable to refer to foreign work that had a direct bearing on the subject considered, such work has been included. Faced by the flood of contributions to chemistry that confronts one, the only way to keep in touch in a general way with current work outside one's own field is to read a book of the type of this Survey rather than to attempt to absorb knowledge from the usual form of highly condensed abstracts.

The Annual Survey of American Chemistry has made a place for itself and is steadily improving in its aim to present in a concise but readable form a record of the chemical research accomplished in this country.

JAMES F. NORRIS

Stuff. The Story of Materials in the Service of Man. By PAULINE G. BEERY. D. Appleton and Company, 35 West 32d Street, New York, 1930. xiii + 504 pp. Illustrated. 14.5 × 22.5 cm.

In this volume the author has written in a lively and enthusiastic vein about a great variety of materials or "stuffs," as she is at some pains to call them. She has been quite uncommonly successful in collecting a wealth of information of historical and "human" interest appertaining to these materials.

The presentation is descriptive and discursive. There is no progression and no attempt is made at any real explanation of chemical phenomena. There appear to be numerous inaccuracies: thus, we notice that "atomic numbers" are incorrectly defined; Prout is described as "a German chemist"; and Dalton's contributions are dismissed without mention of multiple proportions.

ARTHUR B. LAMB

Traité de Polarimétrie. (Treatise on Polarimetry.) By GEORGES BRUHAT, Professor in the Faculty of Sciences of Paris. Preface by A. COTTON. Éditions de la "Revue d'Optique théorique et instrumentale," 165 Rue de Sèvres; 3 and 5, Boulevard Pasteur, Paris, France, 1930. xvi + 447 pp. 250 figs. 16 × 24.5 cm. Price, 65 fr.

The subject of polarimetry is covered so thoroughly and so well in this treatise that the book will be invaluable to both the chemist and the

physicist. It supplies to the chemist an excellent description of the various forms of polarimetric instruments and accessory apparatus, a very able presentation of the physical laws which underlie the subject and chapters on the related topics of magnetic rotatory power, rotatory dispersion and the rotatory power of crystals. The work is carefully indexed for subjects and authors and carries nearly nine hundred literature references.

C. S. HUDSON

Grundzüge der theoretischen und angewandten Elektrochemie. (Outlines of Theoretical and Applied Electrochemistry.) By Dr. GEORG GRUBE, Professor and Director of the Physical Chemical and Electrochemical Laboratories of the Technical High School of Stuttgart. Second, enlarged edition. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1930. xii + 495 pp. 165 figs. 16 × 23.5 cm.

At the time of the appearance of the first edition of this textbook [THIS JOURNAL, 46, 260 (1924)], which dealt with the electrochemistry of solutions, the avowed intention of the author was to issue a second companion volume covering the electrochemistry of molten salts and of gases. This program for various reasons was not carried out, but instead in this second edition chapters covering these subjects as well as the electrothermal processes used in the chemical and metallurgical industries have been incorporated. In addition, the chapters from the first edition devoted to the electrochemistry of solutions have been revised and enlarged. In particular, a discussion of theory of the complete dissociation of strong electrolytes has been introduced. This book is designed primarily to serve as a textbook for instruction in electrochemistry at colleges and universities. Thanks to its clear and reasonably concise presentation it appears admirably suited for that purpose.

ARTHUR B. LAMB

A Report of the National Research Council Committee on the Construction and Equipment of Chemical Laboratories. The Chemical Foundation, Incorporated, 654 Madison Ave., New York, N. Y., 1930. xiii + 340 pp. 124 figs. 15.5 × 23.5 cm. Price, \$1.00.

The committee, consisting of G. L. Coyle, L. M. Dennis, C. R. Hoover, L. W. Mattern and J. N. Swan, has done a most valuable service in gathering under the covers of this excellent book the thought and experience of those who have produced some of the outstanding laboratory buildings erected before 1928. All phases of construction and of fixed equipment are considered. Advice is given on preliminary planning, location and exterior construction; this is followed by discussion of floor plans in general, ventilation, heating, lighting, plumbing, electrical installations and furniture. Various types of rooms such as must be provided in all larger chemical

laboratories are described in detail, and there are special sections dealing with the problems of the high school, the chemical industries, biochemistry and various special fields such as microscopy and spectroscopy. With the authors, ten specialists have collaborated, and it is obvious that every effort has been made to secure information from all available sources. Particularly interesting is the section on Industrial Chemical Laboratories, in which the plan of an actual building is described and then discussed in detail. The book cannot fail to be invaluable to anyone who faces the task of planning a new building or, for that matter, to those responsible for the upkeep of older ones, not only because of its general survey of the topics mentioned above, but especially because of the discussion and description of smaller details which so often are overlooked by architects unfamiliar with the needs of chemical laboratories.

There are one or two suggestions that might be made for the improvement of the book in the new editions which seem likely to be demanded. In a few instances the material is not treated as specifically as is desirable. For example, the statement is made that several laboratories have made exhaustive tests of paints and enamels, but the laboratories are not named, and there are other instances of similar kind. One of the most difficult problems in planning a building is to decide on the ratio of connected load to total supply and to fix on reasonable load and diversity factors for the various supplies. In the case of electrical current this matter assumes major significance, for selection of too large values for the factors may involve the waste of thousands of dollars while the opposite error may prove the undoing of the whole system. Experience of engineers and architects who have never built a chemical laboratory is of no value. While it is true that these factors will differ for various types of laboratories, some information as to what has been done would be of great value. Likewise description of jumper boards or other types of local switchboards for increasing flexibility in the distribution of current would give the designer of a new building a starting point for his own plans. Flexibility in other respects, also, is of the utmost importance in the modern laboratory, especially if it is to provide for advanced work. The use of portable laboratory benches, of adjustable shelving, of openings in walls and floors for intercommunication between rooms has been successful in several buildings, and might have received more detailed discussion.

But these are relatively minor matters. The book will stimulate the building of better laboratories. By improving the facilities for instruction and research it will be a vital factor in the progress of chemistry.

H. I. SCHLESINGER

Lehrbuch der organischen Chemie. (Textbook of Organic Chemistry.) By Dr. PAUL KARRER, Professor at the University of Zurich. Second edition. Georg Thieme Verlag, Leipzig, Germany, 1930. xxi + 889 pp. 8 figs. 17 × 25 cm.

An examination of Karrer's "Textbook on Organic Chemistry" is interesting for a variety of reasons: It comes from the pen of an active and eminent organic chemist; it represents—"but little expanded"—a course of lectures given at a great university; the arrangement of the material is "based entirely upon didactic considerations"; and it met with such immediate favor that a second edition was required within two years.

The reviewer confesses that the first effect of a brief examination was a feeling of wonder, or better perhaps, of bewilderment. Here are more than 850 large and well-filled pages in which—to judge from a rough calculation based on the size of the index—more than 4000 organic compounds find at least mention. How, one wonders, is it possible to present all of this material in a year and perhaps also—how is it possible for the student to survive it?

A closer examination revealed a partial explanation of the mystery. The author concentrates on substances, "their origin, the proof of their constitution, and whenever possible, also the proof of their configuration." A few general topics like enolization, esterification and coordination compounds receive a measure of attention, but relatively little space is devoted to matters of this kind and to the mechanism of reactions. By a liberal use of charts, therefore, and a printed text for reference it would doubtless be possible to cover this extensive ground in a year.

In the choice of material for presentation the author was influenced by the needs of students of medicine and the circumstance that during the last two decades the major developments in organic chemistry have been associated with the problems presented by natural products. The text therefore contains very excellent chapters on fermentation, the carbohydrates, purines, terpenes and alkaloids, as well as on the dyes and their intermediates. In addition to the regular text the book contains eighteen pages of useful tables and an excellent index.

It is easy to understand why Professor Karrer's textbook has been so favorably received. Its contents are extensive and selected with skill, its arrangement is orderly, its style is clear and interesting, and the presswork is admirable. The book can be heartily recommended to American students as a book of reference for those who are taking a second course in organic chemistry.

E. P. KOHLER

Colloids. A Textbook. By H. R. KRUYT, Professor of Physical Chemistry, University of Utrecht. Translated from the manuscript by H. S. van Klooster, Professor of Physical Chemistry, Rensselaer Polytechnic Institute. Second edition, revised and enlarged. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1930. xiii + 286 pp. 118 figs. 15 × 23.5 cm. Price, \$3.50.

The new edition is not greatly changed from the first edition,¹ either in quantity of material or method of presentation. Most of the topics have been brought up to date (September, 1929) by including reference to work published in the last few years. The author has successfully adapted the material treated to the understanding of students to whom it is addressed. The treatment of protein sols is admittedly "considerably at variance with the customary trend" and it is not obvious that this variance is justified by the experimental work quoted. One is surprised to read (p. 192) that the hydration of alcohol is governed by the law of mass action, which determines the equilibrium between the alcohol hydrate(s) and their decomposition products; and it is almost a shock to read (p. 263) that "we can compute the activity coefficient, i , according to the formula of van't Hoff," from the boiling point elevation of a soap solution. Instances of such loose statements are rare and perhaps they should not be mentioned at all.

As in the previous edition, the translator has successfully rendered a foreign language into smooth English from which literal translations of foreign idioms are happily lacking.

E. B. MILLARD

Kapillarchemie. Eine Darstellung der Chemie der Kolloide und verwandter Gebiete. (Capillary Chemistry. A Treatise on the Chemistry of Colloids and Related Fields.) By Prof. Dr. HERBERT FREUNDLICH, Kaiser Wilhelm Institute of Physical Chemistry and Electrochemistry. Fourth edition, revised with the assistance of J. Bikerman. Akademische Verlagsgesellschaft m. b. H., Schlossgasse 9, Leipzig C 1, Germany, 1930. viii + 566 pp. 97 figs. 17.5 × 25 cm. Price, unbound, M. 36; bound, M. 39.

The present new (fourth) edition is to appear in two volumes instead of one. The first volume is devoted to the fundamental principles of colloid chemistry; the second will presumably contain the remainder of the subject matter of earlier editions, namely, a discussion of individual colloid-disperse systems.

The first volume as compared with the corresponding part of the second edition, which appeared in 1922, shows only an enlargement of about 4% but it is clear that there have been a thorough revision and a careful consideration of recent work. This is particularly evident in the section dealing with interfacial films, where there has been so much active research.

As for the sub-division into two volumes, it is undeniable that two

¹ Reviewed in *THIS JOURNAL*, 49, 1852 (1927).

moderate-sized volumes in place of the single bulky volume of the earlier editions are a convenience. On the other hand, there is the resultant extra cost, a matter of real moment at the present time when the cost of scientific literature is mounting to such heights. Moreover, the indices present a difficulty: a separate index for the second volume would not only cause inconvenience but would detract from the value of the handbook as a whole; on the other hand, a combined index in the second volume would render the present index occupying 56 pages useless and hence an unnecessary expense.

However, irrespective of the cost, this revision of so unique, important and useful a handbook will be welcomed by the host of students and investigators interested in this rapidly developing field.

ARTHUR B. LAMB

Essential Chemical Elements that Constitute a Balanced Food. By CHARLES NOYES KINNEY, A. C., M. S., Professor of Chemistry in Drake University. Second edition. Success Composition and Printing Company, Des Moines, Iowa, 1930. xvi + 303 pp. 15.5 × 23.5 cm.

The first edition of this book was issued in 1929, and the second edition came from the press in the first half of 1930, which is a rather short time to elapse between the first and second editions. The second edition has been enlarged and contains 315 pages. The author states that it is the purpose of this book to review the newer ideas on foods and to clarify somewhat the discussion that is taking place on the subject at this time. It is the hope of the author that the data contained in the book will aid the reader to obtain a clearer conception of what constitutes a food for animals. There are twelve chapters and the title of each chapter is put in the form of one or more questions pertaining to the nature and function of the various metallic and non-metallic elements that ordinarily occur in a normal food. The author emphasizes the possible function of minute quantities of such elements as manganese, copper, zinc, nickel, cobalt, barium, strontium, fluorine, bromine and iodine in organic combination in the economy of plants and animals. Small quantities of compounds of these elements are normal constituents of the earth's crust and plants absorb minute quantities from the soil and synthesize them into metal and non-metal organic complexes, some of which undoubtedly have the properties of enzymes, oxidases, peroxidases, catalases, hormones and vitamins. The contents of the various chapters consist for the most part of abstracts of recent articles occurring in research journals dealing with the metabolism of plants and animals. The book should find its most interested readers among research investigators in these subjects. The book contains an appendix, a glossary of the less familiar words and terms pertaining to medicine, pharmacy and chemistry.

J. S. McHARGUE