

2419 (1931)] announced that their new conductivity measurements on acetic acid were in complete agreement with the Debye-Hückel value $a = 0.505$.

I think that these two independent investigations provide the best possible verification of the theoretical formula, and it is interesting to find that Hall's calculations on hydrochloric acid are also in agreement with them. Incidentally, further support, if that were needed, for the theoretical value is afforded by the most recent solubility measurements [La Mer and Goldman, *THIS JOURNAL*, **51**, 2632 (1929), on thallos iodate; unpublished measurements in this Laboratory on barium iodate]. I am glad, therefore, to express my agreement with Professor Hall's conclusions, and have already taken an opportunity of replacing the older, misleading figures in the book to which he refers.

BATTERSEA POLYTECHNIC
LONDON S. W. 11, ENGLAND
RECEIVED MARCH 22, 1932
PUBLISHED APRIL 6, 1932

C. W. DAVIES

NEW BOOKS

Svante Arrhenius. By ERNST H. RIESENFELD, Professor at the University of Berlin. Akademische Verlagsgesellschaft m. b. H., Schlossgasse 9, Leipzig C 1, Germany, 1931. 110 pp. Illustrated. 16 × 23.5 cm. Price, unbound, M. 7; bound, M. 8.50.

This is a biographical sketch giving a readable and clear delineation of Svante Arrhenius and his important place in contemporaneous science for a third of a century, accompanied by a bibliography. The author shows a thorough understanding of men and events as well as of the important part played by the dissociation theory in the decade and a half prior to 1900, when the infant science of physical chemistry was going through its growing pains. Students of the history or philosophy of science will gain an insight from this book into the obstacles that ideas in advance of the times frequently and probably quite generally have to overcome before being accepted.

"There are not many scientists who have shaken so deeply the foundations of their science and pointed the way for its future development so far in advance as Svante Arrhenius, the creator of the doctrine of electrolytic dissociation," the author very truly states in the opening paragraph.

The tardy recognition of Arrhenius by scientific men in his own country is regrettable but not unusual, and perhaps we may say even according to the Scriptures. The reader, at least the American reader, is somewhat puzzled by several references to the work of Arrhenius' enemies in retarding his scientific advancement because no reasons are apparent why he should have had enemies, or at least active ones, particularly as the picture painted of him by the author is that of a genial, modest personality without conceit.

That Arrhenius should have produced in 1906 a scientific best seller, "Das Werden der Welten," which was translated into seven languages, thus long antedating in a way Eddington and Jeans, will come as a surprise to many. He had an appreciation of the human side of knowledge, for in one letter he expresses his disapproval of piling data into big books that are seldom opened; and the present writer remembers that Arrhenius, when at the St. Louis World's Fair in 1904, expressed the comforting doctrine that as much knowledge may be gained from amicable discussions with one's friends over refreshments as from books. His ruddy complexion and somewhat rotund appearance fitted in with this remark which, however, should not be interpreted too literally, for what he had in mind was the stimulating effect of personal contacts. His students quickly felt how much he himself had to give in this way.

Besides the dissociation theory and its consequences—that great flash of the creative imagination of his youth which probably will remain his greatest monument—his other important contributions resulted from applying his comprehensive knowledge, coupled with exceptionally clear mathematical insight, to other fields of science such as cosmic physics and even the chemistry of immunity.

Gifted with fine perceptions in human affairs as well as in science, he held high ideals for human conduct and for civilization. The World War came as a profound shock to him; nevertheless, he kept his balance and his letters at that period show moderation, insight and as usual a point of view far in advance of the times. During the war his position in science and as a neutral enabled him to help many scientists of the warring nations, and in the years immediately following he was instrumental in reestablishing friendly relations among men of science of all nations.

As a biography some readers may feel that the book is all too brief.

EDWARD MALLINCKRODT, JR.

Mass, Zahl und Gewicht in der Chemie der Vergangenheit. Ein Kapitel aus der Vorgeschichte des sogenannten quantitativen Zeitalters der Chemie. (Measure, Number and Weight in the Chemistry of the Past. A Chapter from the Early History of the So-Called Quantitative Period of Chemistry.) By Prof., Dr., Dr.-Ing. e. h., PAUL WALDEN, Rostock. Verlag von Ferdinand Enke, Stuttgart, Germany, 1931. 106 pp. 16.5 × 25 cm. Price, RM. 10.

This is a most interesting essay in historical chemistry. The first chapters trace the development of the units of weight and of volume from 3000 B.C. to 1775 A.D. The reader will be astonished at the longevity of many of the units, for instance, the old Babylonian Mine (491.25 grams) and the old Egyptian Woten (454.79 grams) or water equivalent of the unit of volume, the Hin, in use as early as 3000 B.C., which persisted through Greek, Roman and Medieval equivalents to appear as our Troy and avoirdupois pounds of today (492.17 and 453 grams, respectively).

In the next chapters there is traced the history of the law of the conservation of matter (500 B.C. to 1789 A.D.). Here the author makes it clear that as a matter of fact Lavoisier in referring to this matter only gave expression to what he took to be a well-nigh universally accepted principle and that later biographers are responsible for crediting him incorrectly with its *discovery*.

Similarly in the following chapter the author shows that contrary to prevailing ideas the increase in weight experienced by metals during calcination had been demonstrated repeatedly between 1300 and 1775 A.D.—that is, previous to Lavoisier—and that the correct explanation of this phenomenon had more than once been given.

Two chapters are then devoted to the history of the discovery and preparation of mineral acids from the time of their discovery (1100 A.D.) until the introduction of modern methods (1800 A.D.), particularly as regards the relative weights of ingredients used.

A final chapter is devoted to the beginnings of quantitative chemical analysis—with special reference to the surprisingly accurate determinations of Wenzel (1777).

This book deals in an interesting and illuminating fashion with matters of the greatest importance in the history of chemistry.

ARTHUR B. LAMB

Potentiometric Titrations. A Theoretical and Practical Treatise. By Dr. I. M. KOLTHOFF, Professor of Analytical Chemistry, University of Minnesota, and N. HOWELL FURMAN, Ph.D., Associate Professor of Chemistry, Princeton University. Second edition, extensively revised. John Wiley and Sons, Inc., 440 Fourth Ave., New York, 1931. xiv + 482 pp. 74 figs. 15.5 × 23.5 cm. Price, \$6.00.

So much work has been done in this field since the appearance of this book in 1926 that the second edition, which is 40% larger, was greatly needed. Besides having been brought up to date, one improvement is particularly noticeable. The first three chapters of the old book dealing with the principles of volumetric reactions have been omitted because they are available elsewhere and in their place is a general chapter devoted to the theory of potentiometric titrations. In Part II, the length of which has been more than doubled, descriptions of new apparatus and technique have been added, among which may be mentioned the differential method, Cavanagh's method and thermionic devices. Part III, devoted to practical applications, has been increased by 25%, an indication of much progress in this field. Among the additions are many methods using ceric sulfate as an oxidizing agent and chromous salts as reducing agents. A complete description is given of existing methods of potentiometric analysis, together with a comprehensive bibliography.

There is no other book which thoroughly covers this field. It is in-

dispensable to the up-to-date analytical chemist as well as to one who is more interested in the theoretical aspect of this subject.

HOBART H. WILLARD

Practical Physical Chemistry. By Professor ALEXANDER FINDLAY. Fifth edition. Longmans, Green and Co., New York, 1931. xii + 312 pp., illustrated. 14 × 21.5 cm. Price, \$2.25.

A number of new experiments have been introduced into this fifth edition dealing, *inter alia*, with gaseous dissociation, vapor pressure of liquids, viscosity of highly viscous liquids, potentiometric measurements, the use of indicators for the determination of hydrogen-ion concentration, the vapor pressure of salt hydrates and the freezing point of binary systems. Some material has been omitted in order to make space for these new experiments. The concept of activity is used in the treatment of strong electrolytes and an experiment is included dealing with the effect of a salt on the activity of hydrogen ion. As in previous editions experiments are preceded by a brief theoretical discussion which together with many diagrams and graphs should make the student largely independent of reference books. The variety of experimental methods and large number of systems suggested for study in certain experiments give this manual a wide range of usefulness.

HENRY E. BENT

List of Periodicals Abstracted by Chemical Abstracts with Key to Library Files. Edited by E. J. CRANE. Revised edition. *Chemical Abstracts*, The Ohio State University, Columbus, Ohio. 142 pp. Price, 50 cents.

No chemist has direct access to all of the many periodicals of chemical interest and many have very poor library facilities. This circumstance is no longer the serious handicap in chemical work that it once presented because the List of Periodicals with its key to library files, coupled with the fact that many libraries now maintain a photoprint or a lending service, makes it possible for any chemist anywhere quickly to get almost any chemical paper at a reasonable cost. The list serves to bridge the gap between abstracts and full papers.

Key numbers are given for 250 libraries scattered throughout the United States, Canada and Hawaii.

In addition to the library information the List gives for each periodical the full title, the official abbreviation, the frequency of appearance, the 1931 volume number (the first if there is more than one per year), the first number of that volume if other than 1, the number of volumes per year, the price and the name and address of the publisher.

Besides entries for 1996 live periodicals, the new List contains 1104

entries which either tell of discontinued periodicals or take the form of cross references from former names, from transliterated names (mostly Japanese and Russian) or from the names of institutions sponsoring periodicals.

The List is published every five years. It has grown from a 60-page booklet in 1922 to one of 142 pages of 2-column fine print. Because of its completeness it has come to be used to a considerable extent as a check list in the building and maintenance of scientific libraries and also in chemical literature courses in the universities. Even though the latest List was published as a part of the regular November 20th number (1931) of *Chemical Abstracts*, the demand for extra copies in separate form, anticipated from experience with earlier lists, has been met by the provision of a supply of reprints. Copies of these can be obtained by writing to the office of *Chemical Abstracts*.

CHARLES L. PARSONS

Oxydations et Réductions. (Oxidation and Reduction.) By RENÉ WURMSER. Les Presses Universitaires de France, Paris, France, 1930. xix + 381 pp. Price, fr. 95.

This is one of a series of monographs dealing with problems in biology and this fact is perhaps a better indication of the nature of the book than its title. The author considers the application of thermodynamics to a variety of biochemical processes in which oxidation or reduction is involved. These include photosynthesis, chemosynthesis, the specific dynamic action, the chemical changes involved in muscular action and a great variety of enzymatic processes. The treatment of the energetics of oxidation and reduction employs the terminology of Lewis and Randall and gives a precise and clear account of the application of free energy equations to one phase of organic chemistry. The only criticism that the reviewer would make of this very excellent feature of the book is the failure to discuss the probable uncertainties in the values of the free energy of a reaction calculated by means of the third law. For example, the value of ΔF for the formation of carbon dioxide and hydrogen from glucose and water is given as -6277 cal., which is arrived at by taking the difference between $\Delta H = 145,220$ and $T\Delta S$ of $151,497$, and no hint is given of the fact that the uncertainties in the present values make ΔF uncertain by at least ± 1000 cal. The last half of the book deals with the measurement of oxidation-reduction potentials and their application to biological problems. All the important work in this field through 1929 seems to have been covered, and the results are given in considerable detail but without much attempt at a critical evaluation of their significance. Here, as elsewhere in the book, the handling of the physico-chemical aspects of the subject is superior to the treatment of the problems of interest to the

organic chemist. It is particularly unfortunate that a completely erroneous structural formula for hemin should be given.

The book will be of great interest and value to those who are concerned with the energetics of biochemical reactions and indispensable to the specialist in the subject of oxidation and reduction. The sections dealing with fields in which the author himself has been an investigator (for example, photosynthesis) are particularly interesting.

JAMES B. CONANT

Laboratoriumsbuch für die kolorimetrische Wasseruntersuchung. (**Laboratory Manual for Colorimetric Water Analysis.**) By PAUL MARTINY. Druck und Verlag von Wilhelm Knapp, Halle (Saale), Germany, 1931. vii + 73 pp. 26 figs. 16 × 23 cm. Price, unbound, RM. 5.40; bound, RM. 6.80.

This little book is Volume 28 of "Laboratory Manuals for Chemical and Allied Industries." It is divided into two parts of about equal length. Part I deals with general directions for colorimetric analysis and gives brief descriptions (with illustrations) of the following colorimeters: Wolf, Donnan, Duboscq, Bürker, Bjerrum-Arrhenius (double-wedge), Martiny (compensation), Krüss (polarization), Hillige (comparator), Folin-Wulff, Pulfrich (photometer) and Olzewski-Rosenmüller (photometer).

In Part II procedures are given for the following determinations in the order listed: aluminum, ammonium, lead, copper, bromide, chlorine, chromate, iron, iodide, potassium, calcium, silica, magnesium, manganese, sodium, phenol, phosphate, protein nitrogen, thiocyanate, nitrate, nitrite, sulfate, hydrogen sulfide, zinc, caramel, turbidity and hydrogen ion.

JOHN H. YOE

Über die Fehlerquellen bei der mikroanalytischen Bestimmung des Kohlen- und Wasserstoffes nach der Methode von Fritz Pregl. (**Sources of Error in the Micro-analytical Determination of Carbon and Hydrogen by the Methods of Fritz Pregl.**) By Dr.-Ing. MAX BOËTIUS, Lecturer at the Technical High School of Dresden. Verlag Chemie, G. m. b. H., Corneliusstrasse 3, Berlin W 10, Germany, 1931. 113 pp. 15.5 × 22.5 cm. Price, RM. 7.

The well-known micro combustion method of Pregl is admirably simple in principle and possesses a high degree of reliability in the hands of the experienced worker. But for special reasons it is more susceptible to errors than other microanalytical methods, and occasionally failures are encountered even when Pregl's directions are strictly followed.

Basing his experiments on Pregl's work, Dr. Boëtius by a careful and systematic study of these disturbing influences has endeavored to disclose and eliminate certain errors which in his opinion were not fully recognized or sufficiently emphasized by Pregl. This program has naturally involved a laborious reëxamination of the experimental details of the method.

The number of new facts contributed by the investigation is comparatively small. Nevertheless, there are many points which merit the interest of the microanalyst. Special mention may be made of the paragraphs dealing with the errors due to the employment of lead peroxide (retention of water), and with the factors which influence the constancy of weight of the absorption tubes (temperature, humidity, nature of the absorbing material, condition of the rubber connections). Certain suggestions regarding apparatus and technique may prove to be of practical value.

Apart from the experimental contributions to the problem, the book serves a didactic purpose, being supplementary to the monograph of Pregl. It is particularly valuable to the novice since he will find there accurate quantitative statements, in the form of experimental records, indicating to what extent each individual source of error may influence the result. In addition, the detailed description of the experiments may convey to him some conception of the means whereby the various errors may be detected and eliminated. Also, papers previously published on the subject are discussed in connection with the author's own findings. The broad yet detailed treatment may well be due both to the nature of the topic and to the example set by Pregl's excellent monograph.

O. WINTERSTEINER

Jahrbuch der organischen Chemie. (*Yearbook of Organic Chemistry.*) By Professor Dr. JULIUS SCHMIDT, Stuttgart. Vol. XVII, 1930. Verlagsbuchhandlung von Franz Deuticke, Wien, Austria, 1931. xvi + 300 pp. 17 × 25.5 cm. Price, M. 30; bound, M. 33.

By the publication of two volumes in both 1930 and 1931 the "Yearbook of Organic Chemistry" has been brought completely up to date, an achievement on which both the editor and the publisher are to be congratulated. In the present edition, as in its predecessors, the reviews are entirely objective, the reviewer accepting, almost invariably without discussion or criticism, the interpretations given in the papers under review. The organization of the material likewise remains the same as heretofore but the prevailing interest in natural products is clearly reflected in the steadily increasing space devoted to this subject.

E. P. KOHLER