peroxide. Subsequent rearrangement of the peroxide would yield oxalic acid. This second mechanism was suggested by Professor G. N. Lewis.

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NEW BOOKS

Liebig und die Bittersalz- und Salzsäurefabrik zu Salzhausen (1824-1831). (Liebig and the Magnesium Sulfate and Hydrochloric Acid Factory at Salzhausen.) Edited by Dr. ERNST BERL. Verlag Chemie, G. m. b. H., Corneliusstrasse 3, Berlin W 10, Germany, 1931. 65 pp. 17 × 24 cm. Price, M. 3.50.

Justus Liebig was only twenty-one years old when in May, 1824, he was called to a professorship at the University of Giessen. In December of the same year at the request of the Hessian Ministry of Finance he analyzed the waters of the Salzhaus Mineral Springs. On the basis of this analysis Liebig recommended that the mother liquors from these waters after the separation of the sodium chloride be worked up by the government as a source of magnesium sulfate and of hydrochloric acid. This recommendation was adopted and Liebig was commissioned to undertake the development of the process and the erection of the plant. He discharged this task with conspicuous success.

In the present small pamphlet there are reproduced verbatim some twenty reports which Liebig made to the Ministry of Finance during the progress of this work. There is also included a lecture in explanation of them delivered by Dr. Berl at the first annual meeting of the Liebighaus Society in Darmstadt.

It is of interest to point out that it was in the mother liquors from these springs that Liebig found the puzzling substance which he called "sodium hydroiodate" and from which he obtained a substance which he considered to be the chloride of iodine but which he instantly recognized to be bromine when Balard's discovery of that element was announced some months later.

Dr. Berl has already published a notable collection of the letters of Liebig. This present pamphlet makes a valuable supplement to that volume.

ARTHUR B. LAMB

General Chemistry. By H. I. SCHLESINGER, Professor of Chemistry, The University of Chicago. Revised edition. Longmans, Green and Company, 55 Fifth Avenue, New York, 1930. xi + 847 pp. Illustrated. 14.5 × 21 cm. Price, $4.00.

The second edition of this excellent text has been increased by about two hundred pages. The changes and additions consist "first, in an amplifica-

tion of the chapter on organic chemistry, particularly for those students who do not plan further work in chemistry; second, in the addition of descriptive material which would make the text more valuable as a reference work in advanced courses; and, third, in the simplification of treatment of certain portions which have given unnecessary difficulty. The first of these objectives has been accomplished by completely rewriting the chapter on organic chemistry and expanding it to three. . . . For the unifying principle which must guide the presentation of organic chemistry the idea of partial polarity has been used . . . more information about the inorganic compounds has been made available by the addition of an appendix which contains in tabular form the most important physical properties of the common compounds and elements, . . . the appendix has also been made an integral part of the text by inserting into the main body of the latter many illustrations of the usefulness of the appendix and many problems which must be solved by reference to it." Among other changes are the introduction of more historical material, a discussion of the theories of corrosion and a revision of the chapter on atomic structure. The first edition of this text impressed the reviewer as being a distinct contribution to the teaching of chemistry; in the revised edition the author maintains his high standard of excellence.

JAMES H. WALTON

Dielectric Constant and Molecular Structure. By CHARLES PHELPS SMYTH, Associate Professor of Chemistry in Princeton University. American Chemical Society Monograph. The Chemical Catalog Company, Inc., 419 Fourth Ave., New York, 1931. 214 pp. 15.5 × 23.5 cm. Price, $4.00.

Professor Smyth's contribution to the American Chemical Society Monographs continues the high standard set by the earlier members of the series, in that it presents a clear and well-rounded treatment of a subject of growing importance. The recent intensive study of the dielectric properties of matter has brought forward a large amount of valuable information and has given promise of becoming still more useful in approaching a number of fundamentally important problems. The present volume, written by a pioneer in this field of research, is therefore particularly welcome.

The subject matter of the book is concerned more with the interpretation of the experimental data than with an elaborate mathematical treatment of the subject. The Debye theory of dielectrics is outlined in the first chapter and is followed by a brief account of some related topics, among which may be mentioned anomalous dispersion for radio frequencies, Kerr effect and electrostriction. The principal methods for the experimental determination of dielectric constant are described in the third chapter, not in the manner of a laboratory manual but with the view of acquainting

the newcomer to the subject with the general principles involved in these measurements.

These three preliminary chapters occupy about one-third of the text. The remainder is devoted to summarizing and interpreting the data obtained during the past few years. The most emphasized topic is the correlation of the electric moment data with molecular structure. This field has been particularly fruitful in affording strong confirmation to the reality of structural formulas and, in many cases, in extending our knowledge of the spatial relationships of complex molecules. The connection between electric moments and the electronic theory of valency is considered briefly and is followed by a discussion of electronic polarization. The latter subject has received but little attention in current texts on physical chemistry and its inclusion in the present volume is a definite addition to the value of the book. The concluding chapter is devoted to a discussion of those types of molecular association which are best interpreted as being caused by dipole forces. A table of dipole moments determined prior to last May is included in an appendix.

On the whole the author is to be commended, not only for the breadth of his treatment, but also for the conservatism he has shown in his selection of material. His book presents a very readable and authoritative account of the advances in this field and will serve as a reliable guide to those wishing to acquire familiarity with this new method of attack.

HUGH M. SMALLWOOD

De Afscheiding van Wolfraam uit Gasvormige Verbindingen en hare Toepassing. (The Separation of Tungsten from Gaseous Compounds and Their Application.) By Dr. Ir. J. A. M. VAN LIEMPT. J. Muusses, Purmerend, Holland, 1931. vii + 119 pp. 21 figs. 15 × 23.5 cm. Price, f. 4.

Many of the early experiments on the preparation of tungsten filaments were based on the decomposition of the chlorides of tungsten upon an incandescent core. This book is a study of recent developments that have demonstrated possible applications of the process. When the core material consists of a single crystal of tungsten, the tungsten which is deposited upon it acquires the same crystalline structure as the core and builds out the filament to one having an octagonal cross-section. In the absence of hydrogen a single crystal rod several millimeters in diameter can be obtained. Similar results may be obtained with molybdenum.

The book is largely a discussion of the scientific background involved. The preparation, properties and constitution of the chlorides occupy half of the book. The equilibria involved and the conditions for deposition are briefly discussed. A good discussion is given of intermetallic diffusion.

Several applications are described. Single crystal tungsten rods have this advantage for sealing-in wires, that they are inherently free from

cracks. A compound filament of tungsten deposited upon molybdenum retains its pliability at higher temperatures than a filament of tungsten alone and has, therefore, found application in vacuum tubes. Seamless tubes have been made from a similar product by dissolving out the molybdenum.

The description of the process is not as full as in the original papers, but several novel and practical observations are given which are of assistance in carrying it out. The most helpful features of the book lie in its information on the properties of the chlorides and in the suggestive survey of this novel field. Anyone conversant with German and having a Dutch dictionary for occasional reference will find no difficulty in reading it.

GORTON R. FONDA

The Wave Mechanics of Free Electrons. By G. P. THOMSON, Professor of Natural Philosophy, University of Aberdeen. The George Fisher Baker Non-Resident Lectureship in Chemistry at Cornell University. McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York, 1930. vii + 172 pp. Illustrated. 15.5 × 23.5 cm. Price, $2.50.

This volume contains the substance of a series of lectures delivered by Professor Thomson at Cornell during the latter part of 1929. The subject matter is limited to the theoretical and experimental work on the diffraction of electrons by solids. Although the author has minimized the use of mathematics, he has not hesitated to incorporate such as is necessary to the exposition. In spite of the fact that a rather broad mathematical experience is required for the complete assimilation of the material, the physical chemist will find much of interest, both in the description of the experimental work and in the discussion of the physical background. Because of its emphasis upon the physical side of the problem, this book can be recommended to those who desire a more accurate knowledge of one of the most fundamental advances of the new mechanics.

HUGH M. SMALLWOOD

Gmelins Handbuch der anorganischen Chemie. (Gmelin's Handbook of Inorganic Chemistry.) Edited by R. J. MEYER. Eighth edition. **Iodine**, section 1. System-number 8. Issued by the Deutsche Chemische Gesellschaft. Verlag Chemie G. m. b. H., Corneliusstrasse 3, Berlin W 10, Germany, 1931. ix + 244 pp. 17 × 25 cm. Price, to subscribers, M. 28.50; singly, M. 37.

The reason given in the preface for issuing this volume dealing only with the physical and chemical properties of iodine itself without including any discussion of the compounds of iodine is as follows: "The element iodine, because of its ubiquity and mobility, belongs to those substances whose physical and chemical properties have been studied for a long time with particular zest and thoroughness. The same applies to its physiologi-

cal, pharmacological and therapeutic uses, whose scientific and practical exploitation are just now being followed up with great zeal. Connected with this is the fond care with which the occurrence and distribution of iodine have ever been the object of scientific investigation. This has led us to issue the present instalment, which may be characterized as not only an almost complete, but also as a critical monograph on the subject, immediately on its completion, and to allow the publication of the second instalment dealing with the compounds of iodine to follow at the beginning of next year. Before that time the element bromine will also have been finished so that the group of the halogens will then be complete."

It is indeed true that the appearance of this volume will be welcomed, and by an unusually wide variety of investigators ranging from the industrial and agricultural chemists on the one hand to the physiologist and physician on the other. The author of the present volume is Dr. W. Roman.

ARTHUR B. LAMB

Die Chemie der Cerebroside und Phosphatide. (The Chemistry of Cerebrosides and Phosphatides.) By H. THIERFELDER AND E. KLENK, Tübingen. Verlag von Julius Springer, Linkstrasse 23–24, Berlin W 9, Germany, 1930. viii + 224 pp. 14.5 × 22 cm. Price, unbound, RM. 19.60; bound, RM. 21.20.

This is a concise and compact monograph giving an up-to-date account of the chemistry of Cerebrosides and Phosphatides. The first section of the monograph is devoted to the Cerebrosides, containing chapters on Cerebron, Kerasin and Nervon, on their component parts and on their structure. It deals also with the distribution of the individual cerebrosides in the nervous system.

The second section deals with Lecithins, Cephalins and Sphingomyelin and their decomposition products. These substances are discussed from the viewpoint of composition, of structure and also from the viewpoint of their physicochemical properties. This chapter discusses also the distribution of the phosphatides in the organs. The phosphatides of the plants are described in a separate chapter.

The literature is brought up close to the date of publication. The general character of the monograph is that of a small reference book rather than of a readable treatise.

Klenk, though the junior author, was the more active contributor in recent years and the topics to which he contributed are written with greater emphasis than the rest of the text and with a definite partiality to himself, a fault which may be expected from a young and enthusiastic worker.

All in all, the monograph is a useful addition to biochemical literature.

P. A. LEVENE

The Colorimetric and Potentiometric Determination of P_H. Outline of Electrometric Titrations. By I. M. KOLTHOFF, Ph.D., Professor of Analytical Chemistry in the University of Minnesota. John Wiley and Sons, Inc., 440 Fourth Ave., New York 1931. xi + 167 pp. 35 figs. 15 × 23.5 cm. Price, $2.25.

This is primarily a textbook of hydrogen-ion concentration measurement and potentiometric titration for students who have completed an elementary course in physical chemistry. The book is divided into three sections dealing, respectively, with (1) the colorimetric determination of P_H, (2) the potentiometric measurement of P_H and potentiometric titration and (3) conductometric titration. Problems are given in each section and a practical course consisting of a list of experiments to be performed is appended.

The book tends to be descriptive of the literature of the subject rather than informing of performance and technique. Thus it would appear that the student must obtain much of his practical information from lectures and conferences. Our present-day conception of the electrochemistry of solutions is briefly noted in the text, but, in general, the student is coached on time-honored principles. Incidentally, one is surprised to note that liquid junction potential receives such scant attention.

The book is an excellent introduction to the subject and will doubtless be useful to a much wider circle of readers than those for whom it is primarily intended.

LAWRENCE T. FAIRHALL

BOOKS RECEIVED

August 15, 1931–September 15, 1931

E. v. ANGERER. "Wissenschaftliche Photographie, eine Einführung in Theorie und Praxis." Akademische Verlagsgesellschaft m. b. H., Leipzig C 1, Germany. 185 pp. M. 11, unbound; M. 12.80, bound.

JOSEPH A. BABOR, WILLIAM L. ESTABROOKE and ALEXANDER LEHRMAN. "Elemen of General Chemistry." Thomas Y. Crowell Company, 393 Fourth Ave., New York. 601 pp. $3.75.

JOSEPH A. BABOR, W. L. ESTABROOKE AND ALEXANDER LEHRMAN. "Laboratory Manual in Elements of General Chemistry." Thomas Y. Crowell Company, 393 Fourth Ave., New York. 420 pp. $2.00.

RAPH. ED. LIESEGANG. "Kolloidchemie des Glases." Sonderabdruck aus der *Kolloidchemischen Technologie*. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany. 50 pp. RM. 4.

HANS MEYER. "Analyse und Konstitutionsermittlung organischer Verbindungen." Fifth revised edition. Verlag von Julius Springer, Linkstrasse 23–24, Berlin W 9, Germany. 709 pp. RM. 48, unbound; RM. 51, bound.