NEW BOOKS

Grundriss der physikalischen Chemie. (Fundamentals of Physical Chemistry.) By ARNOLD EUCKEN, University of Göttingen. Fourth edition. Akademische Verlagsgesellschaft m. b. H., Markgrafenstrasse 6, Leipzig C 1, Germany, 1934. xxiii + 699 pp. 179 figs. 16 × 23.5 cm. Price, RM. 27; bound, RM. 29.

This fourth edition of Professor Eucken's shorter book undoubtedly sets an entirely new standard of excellence in the treatment of the fundamentals of physical chemistry. The older editions have been radically revised and many new sections added. The discussions of the principles of thermodynamics, of heat capacity, optics and quantum theory are admirable. The well thought out classification of the subject matter, the authoritative treatment, the clarity of the argument, and the care with which the Author has maintained a proportioned balance of space devoted to the various topics of different degrees of importance, are all very appealing. One must admire, also, the skilful manner in which the diagrams and simple mathematical developments have been used.

The translation of the second German edition by Jette and La Mer (1925) was eminently justified, and it is to be hoped that this latest edition may also be made available in English. The German, however, is straight-forward and relatively easy, and the German text could be used in our American more advanced courses with great profit. It is the opinion of the reviewer that there is no other text that can compare with this powerful book of Eucken in giving the student a general comprehensive view of the fundamentals of physical chemistry, particularly with respect to a strong and adequate physical approach.

There are some features of the text to be regretted. The set of symbols employed seems unnecessarily unwieldy. The techniques in thermodynamics of the G. N. Lewis school of chemistry have been largely ignored. The student will hardly obtain an entirely correct idea of the origins and general contributions to the development of physical chemistry from the manner in which references and acknowledgments are confined pretty largely to German authorship.

The appearance of the book is exceptionally good. The paper is of fine quality, the type clear and the figures are neatly drawn.

EDWARD MACK, JR.

Introduction to Physical Chemistry. By ALEXANDER FINDLAY, Professor of Chemistry, University of Aberdeen. Longmans, Green and Co., 55 Fifth Ave., New York, 1933. vii + 492 pp. 14 × 22 cm. Price, $3.00.

This text-book of physical chemistry from the lucid pen of a distinguished and experienced teacher and writer of text-books should prove attractive to many American teachers. It is written logically and coherently in simple, expressive English. It is in reality an *introduction* to physical chemistry. In the various chapters the author seems to start off a little further back with a more elementary beginning than usual, and then gradually to plunge the student into the midst of the argument. The whole book is pitched at a perceptibly easier level than several of the texts commonly used in the better class American universities.

In the Preface, the Author says: "In general, the historical method of treatment, a method which seems to be the soundest one educationally, and one which is particularly needed at the present time, has been adopted. An acquaintance with the historical development of a subject is necessary for a true understanding and appreciation of its present state, and has a cultural value which should constantly be emphasized."

The subject matter and the arrangement of the subject matter in most of the text-books of physical chemistry have been so largely standardized, even to the numbering of the chapters, that there is no particular point in listing the chapter headings of Professor Findlay's book here. Its Table of Contents is essentially the customary one. It does seem to the reviewer, however, that Professor Findlay has treated a broader compass of topics than is commonly done, although necessarily briefly, and that he succeeds in introducing the beginning student to a "feel" for a surprisingly large variety of well selected laws, techniques, definitions, effects, theories and working ideas of physical chemistry. "The work is designed more especially to meet the needs of the student of chemistry who desires to build his later specialized study on a broad foundation."

The two chapters on "Liquids and their Properties," and the chapters on dilute solutions, osmotic pressure and lowering of vapor pressure, law of mass action and the phase rule are particularly well done. Many of the chapters are constructed of selected portions, of high pedagogic value, taken from the Author's previously published texts and monographs. One misses a treatment of the very significant oil film experiments; and the sections on crystal structure, in view of the subject's immense present importance, seem quite inadequate. Indeed, the student is likely to obtain a false impression of the structure of the benzene ring, as deduced from x-ray analysis, from the few brief words devoted to this matter.

An appendix containing about 160 good problems, with answers, accompanies the text.

EDWARD MACK, JR.

Introduction à l'Étude de l'Effet Raman, ses Applications Chimiques. (Introduction to the Study of the Raman Effect and its Chemical Applications.) By PIERRE DAURE, Professor in the Faculty of Sciences of Bordeaux. Preface by M. Jean Cabannes. Éditions de la Revue d'Optique théorique et instrumentale, 165 Rue de Sèvres, Paris 15e, France, 1933. viii + 90 pp. 38 figs. 14 × 22.5 cm. Price, fr. 18.

As implied by the word "Introduction" in the title one does not find in this brief book anything approaching a

comprehensive treatment of the Raman Effect. The presentation is very elementary and fragmentary as regards the general nature and significance of the Raman spectra and a reader to whom French is any more difficult than English might do better to consult some of the reviews of the subject already published in the current periodicals. The chapter on technique is more complete and should be useful to any one contemplating measurements of this sort. The principles involved in the interpretation of Raman spectra are presented by means of a discussion of a few kinds of internal vibration in molecules of the diatomic and methane types. While conveying an idea of the nature of the problem, this discussion is hardly very informative for one who may wish to apply Raman spectra to the study of any but the simplest molecules. The discussion is supplemented, however, by some interesting examples of the empirical use of Raman spectra in the qualitative identification of the structure of compounds and radicals. The plates used as illustrations have reproduced extremely well and provide as good examples as one will find anywhere to show clearly the nature of the phenomenon.

D. H. ANDREWS

Veröffentlichungen des Wissenschaftlichen Zentral-Laboratoriums der photographischen Abteilung-AGFA. (Contributions from the Research Laboratories of the Photographic Division-AGFA.) Vol. III. I. G. Farbenindustrie Aktiengesellschaft. Verlag von S. Hirzel, Königstrasse 2, Leipzig, Germany, 1933. vii + 313 pp. 193 figs. 17.5 × 24.5 cm. Price, RM. 15.

Appearing after an interval of two years, Volume III deals with practical and theoretical photographic problems of major importance at the present time. Among these are sensitometry, spectral sensitivity, the latent image, physical development, solarization, grain, sensitizers, materials and procedure for infra-red, Roentgen, α and γ rays, still and motion pictures in color, ultra short exposures and the reproduction of sound photographically recorded. Each problem is approached from the standpoint of fundamental principles and is analyzed with the help of a profusion of exact measurements. The volume is ably organized, and the cuts are extremely good. The firm's products appear solely as material for scientific investigation and technical improvement—no hint anywhere of advertising or of national policies.

The conclusions, naturally, are of most intimate concern to specialists in photography, but they cannot fail to interest physicists and photochemists as well.

G. S. FORBES

Manipulations de Chimie. (Chemical Procedures.) By CLÉMENT DUVAL. Masson et Cie., Éditeurs, 120 Boulevard Saint-Germain, Paris, France, 1933. vi + 375 pp. Illustrated. 17 × 25.5 cm. Price, fr. 65.

This manual, which is designed for the use of advanced students, presents a diverse array of experiments in inorganic, organic and physical chemistry. In a few cases a fairly complete description of the procedure is given, but for the most part the book is a compilation of abstracts from the literature. Over seven hundred experiments are included in the space of about half this number of pages, and it is obvious that there is thus little room for much elaboration of detail.

The preparations are grouped according to method, and the list of experiments is both impressive and suggestive. The book is likely to be of more use as a source of unusual subjects for experimentation than as an actual laboratory guide. The value of the volume as a work of reference would have been considerably enhanced if the author had given fuller consideration to the foreign literature and if he had been more scrupulous in bringing the references up to date.

LOUIS F. FIESER

Inorganic Colloid Chemistry. Volume I. **The Colloidal Elements.** By HARRY BOYER WEISER, Professor of Chemistry at the Rice Institute. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1933. xi + 389 pp. 54 figs. 15.5 × 23.5 cm. Price, $4.50.

Professor Weiser has produced a book which should be in every chemical library. Taken as a reference work it is of great service in bringing together for the first time the chief facts with regard to the preparation and properties of the chemical elements in their colloidal forms together with many references to the sources from which a knowledge of their properties and behavior and even many of their applications may be obtained. However, the book is more than this. It is a readable text which gives a fair conception of much of modern colloid theory as well as important industrial and biological applications and the principles which underlie them. The treatment is interesting because theory and significant conclusions are always kept in mind. Throughout the discussions Professor Weiser has indicated his own critical interpretation of the points under consideration.

It is refreshing to note that the time is now passing when a colloid may be regarded as consisting of particles of the chief element or compound present, mysteriously charged, without mention of the nature and properties of the equally important constituent, the stabilizing agent or solution link and its ions.

In addition to chapters devoted to various elements or groups of elements there is an introductory chapter of seventeen pages on the general methods for the formation of colloidal elements, a chapter on the adsorption of gases by metals, and one on colloidal metals as contact catalysts to which sixty-seven pages are devoted. This is therefore valuable reading in inorganic or colloid chemistry for upper division or graduate students.

JAMES W. MCBAIN

Organic Syntheses. An Annual Publication of Satisfactory Methods for the Preparation of Organic Chemicals. Vol. XIV. By W. W. Hartman, Editor-in-Chief, W. H. Carothers, L. F. Fieser, John R. Johnson, C. R. Noller, R. C. Fuson and C. F. H. Allen, Secretary. John Wiley and Sons, Inc., 440 Fourth Ave., New York, 1934. vii + 100 pp. 15.5 × 24 cm. Price, $1.75.

The list of preparations in the present volume of Organic Syntheses is as follows: Aceto-*p*-cymene, Benzanthrone, Benzopinacol, β-Benzopinacolone, *o*-Bromophenol, β-

Chloroethyl Methyl Sulfide, Decamethylene Glycol, Diazoaminobenzene, β-Diethylaminoethyl Alcohol, 2,6-Dimethylpyridine, Diphenylmethane, Diphenyl Sulfide, Ethyl Acetosuccinate, Gallacetophenone, Glycerol α,γ-Dibromohydrin, Glycine Ethyl Ester Hydrochloride, *p*-Hydroxybenzoic Acid, 2-Hydroxy-3,5-diiodobenzoic Acid, β-Hydroxyethyl Methyl Sulfide, *dl*-Methionine, 5-Methylfurfural, *p*-Nitrodiphenyl Ether, Nitromesitylene, *p*-Nitrophenyl Isocyanate, Nitrothiophene, *dl*-β-Phenylalanine.

The reviewer notes with satisfaction that this list includes a larger number of substances which are of biochemical interest. In his opinion, the utility of these valuable annual publications would be enhanced also by the inclusion of more preparations involving the resolution of *dl*-mixtures.

E. P. KOHLER

Handbuch der biologischen Arbeitsmethoden. Abt. IV. **Angewandte chemische und physikalische Methoden.** Teil I, Hefte 7 and 8. (**Handbook of Biological Methods.** Section IV. **Applied Chemical and Physical Methods.** Part I, Volumes 7 and 8.) Urban und Schwarzenberg, Friedrichstrasse 105B, Berlin N 24, Germany, 1933. Heft 7, 80 pp. Heft 8, 70 pp. 17.5 × 25.5 cm. Price, Heft 7, RM. 4; Heft 8, RM. 3.50.

The first subdivision of this Handbook contains a discussion of co-zymase, the co-enzyme of alcoholic fermentation, by Karl Myrbäck and Hans v. Euler. The nomenclature of the zymase system, the properties and preparation of apozymase, the roles of phosphate and hexosephosphate in fermentation and the isolation, purification, determination and present knowledge of co-zymase are here discussed in a manner that should be very useful to those desiring a brief review of the subject.

The second subdivision contains an article by Torsten Thunberg on an enzymatic-chemical method for the determination of citric acid. The method is an extremely sensitive and rapid one and can be applied to such complex materials as milk, urine, blood serum, etc. It depends upon the use of a specific oxidizing enzyme of the dehydrogenase type, "citrico dehydrogenase," which activates the hydrogen of the citric acid. The color changes produced on methylene blue by such activated hydrogen are determined quantitatively by the well-known Thunberg technique, the conditions for the reaction being such that the amount of activated hydrogen depends exclusively upon the quantity of citrate ions in the reaction mixture.

Finally, there is a chapter on carbohydrate-hydrolyzing enzymes, by Rudolf Weidenhagen, which discusses in particular the specificity, preparation and separation of these enzymes.

CHARLES N. FREY

Kolloidchemie der Eiweisskörper. (Colloid Chemistry of Proteins.) By Professor DR. WO. PAULI AND DR. EMMERICH VALKÓ. Second, revised edition. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1933. xiv + 353 pp. 152 figs. 15.5 × 23.5 cm. Price, RM. 28; bound, RM. 30.

The advances that have been made in protein chemistry during the last decade could scarcely be more effectively demonstrated than by comparison of the first and second editions of Pauli and Valkó's "Kolloidchemie der Eiweisskörper."[1] In 1922 I reviewed for THIS JOURNAL the first edition of Pauli's book and at the same time Loeb's study on "Proteins and the Theory of Colloidal Behavior." At that time the amphoteric properties of the proteins had been recognized and the chemical nature of their reactions with acids and bases. The investigations of Hardy, of Pauli, of Michaelis and of Sörensen had led to our understanding of the isoelectric condition, and Sörensen's osmotic pressure measurements had yielded an estimate of the molecular weight of egg albumin, the only protein whose size was accurately known in 1922.

When the first edition of Pauli's book appeared, the isoelectric molecules not only of proteins but of amino acids were considered to be largely undissociated, and therefore uncharged. True, Küster, Bredig and E. Q. Adams had suggested that amino acids were to be regarded as inner salts, but it was not until 1923 that Bjerrum clearly marshaled the evidence in favor of the view that amino acids, though not electrolytes, bear electric charges even in the isoelectric condition, and adopted Küster's term zwitterion—which has thus far received no very satisfactory English translation—for molecules that bear at once a positive and a negative charge. The second edition begins with a consideration of the amino acids as zwitterions.

The investigations of the last decade have demonstrated the correctness of the zwitterionic hypothesis and proved that the reactive acid groups of both the amino acids and the proteins, have dissociation constants comparable to those of aliphatic acids, whereas the basic groups have dissociation constants comparable to those of aliphatic amines. Knowledge has increased during the decade, in terms of which the amphoteric properties of the proteins may be correlated with those of the amino acids, and the number of reactive groups associated with the number of dibasic and dicarboxylic amino acids held in the long peptide chains which constitute the protein molecule. Not only the number of charged groups but their spatial relation to each other begins to be considered. Studies upon peptides, as well as upon proteins, have indicated the magnitude of the effect to be expected both from the polarity of chemical groups, and from the electrostatic forces in a multivalent molecule.

Perhaps the most convincing evidence regarding the zwitterionic nature of amino acids and peptides is derived from measurements upon the dielectric constants of their aqueous solutions. The dielectric constants reported for peptide solutions from several laboratories are many times that of water, and suggest the importance of substances of high capacity in the physiological environment. The results upon proteins are more complicated and related to their anomalous dispersion. These newer fields of protein chemistry are carefully considered in the second edition of the "Kolloidchemie der Eiweisskörper."

When the first edition of Pauli's book appeared, Svedberg had not yet employed the ultracentrifuge in estimating the molecular weights of proteins. By the time the second edition was written, this ingenious method had

(1) The first edition, by Pauli, was published in 1920. The English translation by P. C. L. Thorne was published in 1922.

been fully developed and the molecular weights of many well-known proteins determined. Moreover, the method established a new criterion for demonstrating the homogeneity of certain proteins; non-homogeneity of others. The application of the laws of diffusion had led to distinctions being made between proteins which behave in solution as though they were spherical and those which behave as though asymmetrical in shape. Elongated rod-shaped molecules appear to be responsible for double refraction of flow and studies on this interesting phenomenon are considered in Pauli and Valkó's book.

If advances of this kind have given us new information regarding the shape of molecules as a whole, x-ray diffraction diagrams of the proteins have yielded information regarding the relations of amino acids to each other within the molecules. The distances between amino acids within the same chain, and separating the paralleled chains, have been estimated within the last few years, and begin to supplement our previous knowledge of the composition of proteins with a knowledge of their structure.

The point of view that the behavior of the proteins must depend upon their structure is emphasized, not only in the authors' introduction, but throughout the volume. The newer theories of the stability, of the swelling, of the solubility and of the denaturation of proteins are for the most part couched in terms of the size and the charged condition of these large polyvalent molecules. These theories, as well as the experiments upon which they are based, are very fully presented in this treatment of the colloid chemistry of the proteins, which is far more comprehensive and contemporary than any previously published regarding the proteins.

EDWIN J. COHN

BOOKS RECEIVED

March 15, 1934–April 15, 1934

H. CARON AND D. RAQUET. "Analyse Chimique Quantitative a l'Aide de Liquers Titrées." Librairie Vuibert, 63 Boulevard Saint-Germain, Paris 5^{e}, France. 304 pp. Fr. 40.

WILLIAM H. CHAPIN. "Exercises in Second Year Chemistry. A Manual of Theoretical and Analytical Procedures." John Wiley and Sons, Inc., 440 Fourth Ave., New York. 255 pp. $2.50.

MALCOLM DIXON. "Manometric Methods as Applied to the Measurement of Cell Respiration and Other Processes," The Macmillan Company, 60 Fifth Ave., New York. 122 pp. $1.75.

FRANZ FISCHER, Editor. "Gesammelte Abhandlungen zur Kenntnis der Kohle." Vol. XI. Verlag von Gebrüder Borntraeger, Schöneberger Ufer 12a, Berlin W 35, Germany. 708 pp. RM. 72; bound, RM. 74.50.

W. W. HARTMAN, Editor-in-Chief. "Organic Syntheses." Vol. XIV. John Wiley and Sons, Inc., 440 Fourth Ave., New York. 100 pp. $1.75.

FERDINAND HERČÍK. "Oberflächenspannung in der Biologie und Medicin." Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany. 220 pp. RM. 14; bound, RM. 15.

HARRY N. HOLMES. "Introductory Colloid Chemistry." John Wiley and Sons, Inc., 440 Fourth Ave., New York. 198 pp. $2.50.

HARRY N. HOLMES. "Laboratory Manual of Colloid Chemistry." Third edition, rewritten and reset. John Wiley and Sons, Inc., 440 Fourth Ave., New York. 220 pp. $3.25.

M. M. KATZNELSON. "Handbook of Chemico-Pharmaceutical Preparations." (In Russian.) Third edition, revised and enlarged. State Chemical Publishing Office, Leningrad Division, Leningrad, U. S. S. R. 276 pp.

FRITZ MAYER. "Chemie der organischen Farbstoffe." Vol. I. Künstliche organische Farbstoffe. Verlag von Julius Springer, Linkstrasse 23–24, Berlin W 9, Germany. 255 pp. RM. 23.60; bound, RM. 24.80.

ALLAN C. G. MITCHELL AND MARK W. ZEMANSKY. "Resonance Radiation and Excited Atoms." The Macmillan Company, 60 Fifth Ave., New York. 338 pp. $5.00.

KURT POHLISCH AND FRIEDRICH PAUSE. "Schlafmittelmissbrauch." Verlag Georg Thieme, Antonstrasse 15/19, Leipzig C 1, Germany. 170 pp. M. 9.60.

WILLIAM MAYO VENABLE. "The Sub-Atoms. An Interpretation of Spectra in Conformity with the Principles of Mechanics." The Williams and Wilkins Company, Mount Royal and Guilford Aves., Baltimore, Md. 148 pp. $2.00.

T. N. WHITEHEAD. "The Design and Use of Instruments and Accurate Mechanism. Underlying Principles." The Macmillan Company, 60 Fifth Ave., New York. 283 pp. $3.50.

"Communications of the Institute for the Study of Platinum and Other Rare Metals." (In Russian.) Section 11. Edited by N. C. Kurnakov and O. E. Swiagintzeff. Academy of Sciences of U. S. S. R., Leningrad, U. S. S. R. 236 pp.

"Proceedings of the World Petroleum Congress, Organized by the Institution of Petroleum Technologists, Held at the Imperial College of Science and Technology, South Kensington, London, July 19th–25th, 1933." Vol. II. Refining, Chemical and Testing Section. Published at the Offices of the Congress, Aldine House, Bedford St., London W. C. 2, England. 956 pp. £2/5s./-.

"Publications of the Department of Chemistry," The Ohio State University. Research Studies and Chemical Education. July 1, 1932–June 30, 1933. Vols. A, B and C.