
 NEW BOOKS

A German-English Dictionary for Chemists. By AUSTIN M. PATTERSON, Ph.D., Vice-President and Professor of Chemistry, Antioch College. Second edition. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1935. xx + 411 pp. 12.5 × 18.5 cm. Price, \$3.00.

Dr. Patterson's German-English Dictionary for Chemists has proved its value in the eighteen years that have passed since the appearance of the first edition, but owing to the great development of the field of chemistry and the large number of new terms that have been introduced in recent years, the book, even with its Addenda, has become somewhat out-of-date, and a new edition is welcome.

The book has grown very materially in size, containing 410 pages as against 316 pages in the first edition, or 343 pages including the Addenda. This, however, by no means indicates the real increase, as (to quote from the preface) "in order to save space it has been necessary to adopt the paragraph style for entries beginning with the same word element." This change has not only given more space, but has also very materially enhanced the convenience in consulting the book.

A comparison of the two editions indicates an average of about 30 new words to the page, probably more than 10,000 additions in all. These new words appear to have been very wisely selected. Comparatively few words were found to have been dropped from the first edition, and here again good judgment has been shown.

As in reviewing the first edition, the reviewer tested the book by looking up quite a number of less common words which have only lately come into chemical literature, but failed to find one missing.

The convenient size and flexible binding of the earlier edition have been retained. The book is almost indispensable to the library of a chemist.

JAS. LEWIS HOWE

Remsens Einleitung in das Studium der Chemie. (Remsen's Introduction to General Chemistry.) Ninth edition, newly edited and revised by Dr. HANS REIHLEN, Professor at the University of Tübingen. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1935. xii + 311 pp. 56 figs. 16 × 24 cm. Price, RM. 10.

It may prove instructive and interesting to compare this book with the last American edition of Remsen's book upon which it is based. There will appear, of course, some new material which has been learned in recent years. But more important are the differences in order of presentation and in the philosophical viewpoint.

Remsen's ideas concerning the teaching of elementary chemistry were given in the Preface to the First Edition of the Briefer Course, 1885. The selection of subjects was to be governed by the rule that only such substances and such phenomena should be included as would give an insight into chemical action. Every effort was made to show the relationships among the phenomena presented,

thus securing a more scientific result. Theories were to be introduced only after the student was thoroughly prepared for them. Even then they were to be subordinated to the other material. The development of a scientific habit of mind, Remsen held, is the first purpose of any science course. The laboratory was to be the core around which the course was to be built. To this end, experiments were very carefully designed to teach a lesson which could not be learned otherwise. Such was the spirit of Remsen's book.

Reihlen's edition and revision has retained most of this spirit. The selection of substances and phenomena is that of Remsen with the addition of some new materials. The selection of theories has been governed by the rule that only those theories should be included which are indispensable in explaining "pure chemistry." These theories are: The Atomic Theory, The Ionic Theory, and the Concept of Chemical Equilibrium. More physical chemistry has been included than is to be found in Remsen's work. Directions for laboratory and physical parts have generally been introduced earlier in the course.

Thus, Reihlen places the Gas Laws in the third chapter; Remsen placed them in the appendix. Reihlen introduces a full discussion of the Concept of Chemical Equilibrium into Chapter 4 in which water is studied; Remsen postponed this concept to the very end of the course. The discussion of molecular weight occurs five chapters earlier in Reihlen's work than it does in Remsen's; Osmotic Pressure and The Mass Action Law likewise appear at an early date in Reihlen's revision.

The changes are made by Reihlen to meet the demands of the German educational system which, he points out, gives the beginning student in chemistry a better scientific background than does our system. In spite of them, the book retains Remsen's fundamental idea that chemistry should make a scientific habit of mind its first object. The American chemistry teacher will find the book an inspiration from that point of view.

THEO. BROWNYARD

Quantitative Chemical Analysis. By ALFRED STOCK and ARTHUR STÄHLER. Translated from the Fourth German Edition by WINTON PATNODE, Research Chemist, General Electric Company, and L. M. DENNIS, Emeritus Professor of Chemistry at Cornell University. McGraw-Hill Book Company, Inc., 330 West 42d St., New York City, 1935. x + 176 pp. 30 figs. 14.5 × 21 cm. Price, \$1.75.

This is a laboratory manual, not a text-book. However, in the introductory chapters (pp. 1-36) there is a fairly adequate discussion of the essential principles of quantitative technique such as drying, weighing, filtration, evaporation, etc. Chapter 3 (53 pp.) is devoted to volumetric analysis and includes directions for 30 typical experiments covering the usual types of volumetric procedures. Chapter 4 (41 pp.) deals with 14 experiments in

gravimetric analysis. Chapter 5 (21 pages) outlines seven experiments in electroanalysis, and Chapter 6 deals with two experiments in electrometric titrations. The volume closes with an appendix listing necessary reagents and solutions.

To the reviewer, who in his own work has largely followed the explicit directions of Washington, Hillebrand, or Mellor, it appears that the directions of the present volume are likely to give the student a false impression of the absolute accuracy of the final results. Thus, for example, double precipitation is not employed where one would expect it to be stressed, *e. g.*, limestone analysis. In fact, the reviewer failed to find any mention that double precipitation is often essential for high accuracy. In the analysis of feldspar for potassium the method is essentially that of J. Lawrence Smith, but the alkali metal portion is weighed as the sulfate and is stated to be "potassium sulfate" with no mention of a possible contamination with sodium sulfate. Carbon dioxide in carbonates is determined by the loss in weight of acidulated samples rather than by absorption and direct weighing of the carbon dioxide.

By and large, however, the manual should be satisfactory for introductory courses. In these days of decreased student income the low price should decidedly favor the adoption of this manual.

ROSS AIKEN GORTNER

Chemical Kinetics and Chain Reactions. By N. SEMENOFF, Member of the Academy of Sciences, U. S. S. R. Oxford University Press, 114 Fifth Avenue, New York, 1935. xii + 480 pp. 148 figs. 16.5 × 24.5 cm. Price, \$10.50.

This book has been written by a person who is eminently qualified to undertake the work. Indeed, not since the time that Bodenstein developed the concept of chain reactions has anyone contributed more to their theory than Semenov. The volume is a monumental contribution in which the entire problem of chain reactions has been dealt with from a comprehensive and logical point of view. The first part (some 80 pages) is devoted to the mathematical theory of chain reactions, in particular to the theory of branching chains, the effect of the walls of the container in starting and breaking the chains, the development of chains in time ("induction period") and the theory of gaseous explosions, the latter being an integral part of the whole as presented here. In the succeeding sections reactions of halogens and gaseous oxidations are treated in detail; then follow briefer discussions of autooxidations in solution, decomposition reactions in gaseous phase and polymerizations. One of the last chapters is devoted to the decomposition of solid explosives. Altogether some 50 reactions have been considered more or less exhaustively.

Semenov stresses that the old kinetic theory, with its simple uni- and bi-molecular reactions and with its temperature dependence of the rate according to the Arrhenius equation, fails to account for the kinetic behavior of too many known reactions, among them the ones technically most important. He thus reaches the conclusion that the chain theory, which in the past has been usually

attached as a kind of superstructure to the classical treatment of chemical kinetics, must be made one of the corner stones of the whole edifice. Of course, he admits there are cases where the primary reactions are not followed by the formation of chains, but these cases are the exception rather than the rule and should be treated accordingly. Experimental findings of the last few years are, on the whole, in support of this contention and partially justify the somewhat extreme attitude taken in the book.

The treatment of the experimental material is refreshingly original and unusually interesting. Even an old subject like the hydrogen-chlorine reaction, which has been rehashed in so many books and reviews, receives a novel presentation in the hands of Semenov and makes very enjoyable reading. Most of the material, however, has been presented here for the first time in a comprehensive manner, much of it having been published in not too readily accessible journals of the U. S. S. R. Semenov succeeds well in showing that much of it can be interpreted by means of the relatively simple ideas underlying the theory of straight and branched chains. He devotes, throughout the book, more attention to the general physical characteristics of the various reaction chains, than to the proof of the specific chemical compounds involved in them. This he justifies—and quite correctly—by indicating that the time is not yet ripe in many instances for such a discussion and that it may too easily degenerate into mere speculation unsupported by experimental facts. The reviewer has seldom read another book which holds the attention so well and presents so much food for thought and so many possibilities for further experimental work.

The first part is the most difficult one to follow and here a reference list of all symbols used by Semenov, together with their physical meaning, would be very helpful to the reader. Misprints are infrequent and not very objectionable. In a few instances the author makes assertions which are hardly supported by the experimental data presented in their defense as for instance on page 398 where the rate dependence is much better described by P^2_{ClO} , than by P_{ClO} , as stated in the book. These minor imperfections do not detract seriously from the value of the book, and it is heartily recommended to all who are already familiar with the classical theory of chemical kinetics and who wish to acquaint themselves with some of the most important work now going on in this field.

G. B. KISTIAKOWSKY

Die Mikrogasanalyse und ihre Anwendung. (Micro Gas Analysis and its Applications.) By Dr. HEINRICH SCHWARZ, University of Vienna. Verlag Emil Haim and Company, Maria-Theresien-Strasse 10, Wien, Austria, 1935. xi + 286 pp. 52 figs. 17.5 × 24.5 cm. Price, RM. 21; bound, RM. 22.80.

In this monograph the author gives the best of current practice in what is rather elastically termed "micro" gas analysis. It includes half-micro, micro and microscopic methods, though a few pages only are devoted to the latter. Although methods of biochemical or clinical importance bulk largely, a fair amount of space is devoted to other applications of micro gas methods. The monograph is divided into four sections comprising the introduc-

tion and general principles of gas investigation, special methods of gas analysis and special applications to a variety of problems. The types of apparatus and methods of analysis evolved by Haldane, Van Slyke, Krogh, Barcroft and Warburg are discussed *in extenso* and should prove particularly useful to those who do not have ready access to the original literature. The manometric methods of Barcroft and Warburg receive especial attention. The section allotted to qualitative tests for a variety of gases of industrial or hygienic importance together with their quantitative determination is satisfyingly informative. In addition to the absorption and manometric methods, optical, thermoelectric and mechanical methods of analysis, as well as methods for the determination of gas density, are described. The numerous tables and extensive bibliography add much to the usefulness of this book.

LAWRENCE T. FAIRHALL

Orthohydrogen, Parahydrogen and Heavy Hydrogen. By ADALBERT FARKAS, Dr. phil. nat. (Frankfurt), Dr.-Ing. (Vienna). The Macmillan Company, 60 Fifth Avenue, New York, 1935. xiv + 215 pp. 14.5 × 22 cm. Price, \$3.50.

The subject matter of this book is divided into two main divisions: Part I, ortho and para hydrogen; Part II, heavy hydrogen. The book really represents a review of the theoretical work on molecular hydrogen which has been done since the discovery of the ortho and para hydrogen in 1929. In each division the theories involved are well summarized, and a careful review of the experimental work is given. The properties reviewed include the thermodynamic, kinetic and physical properties. The author also gives a discussion of the application of the results to other chemical and physical properties. The text is well illustrated with very convenient tables and illuminating figures. The transmutation reactions involving both hydrogen and deuterium are only mentioned in the book. This, of course, must almost necessarily be true, since a review of this field would require something like another volume of this size.

It is difficult to find any criticism of this book. The faults of the book are more the fault of the present state of the subject matter than in the review which is presented here. What appears to the writer to be the most inadequate feature is the discussion of the kinetics of reactions involving hydrogen and deuterium. The problem of explaining these differences in the velocities of chemical reactions is really much greater than one would gather from the discussion given in this book and the literature cited. The difference in zero point energies of the hydrogen and deuterium and their compounds alone cannot explain the differences in velocities of reactions, and other factors must be taken into account. The inadequacies, as already stated, are more the fault of research papers in the field than of the review of them given in this book. Workers in the field of kinetics, it seems, have a way of giving the impression that a partial discussion of the subject is really a beautiful explanation of all the phenomena.

The review of the work on ortho and para hydrogen is far more satisfactory than the review on heavy hydrogen. This of course is due to the much more satisfactory state

of the research work on the ortho and para hydrogen than on the heavy hydrogen. The first subject is rather well developed, while the work on the latter subject has only really begun. Hence, the review of this field will undoubtedly need extensive revision in the future.

The writer is glad to recommend this book to people who are interested in an excellent review of the subject by a man who has contributed extensively in the field. In addition to an excellent discussion of the subject, it contains much factual material available for reference.

HAROLD C. UREY

Röntgenoskopie und Elektronoskopie von dispersen Systemen, Fäden, Filmen und Grenzschichten. (Röntgenoscopy and Electronoscopy of Disperse Systems, Fibers, Films and Surface Layers.) Edited by Prof. Dr. Wo. OSTWALD. Proceedings of the Tenth Meeting of the Colloid Society, Hannover, September 17-20, 1934. Reprinted from the *Kolloid Zeitschrift*, Vol. 69, No. 3. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1935. 138 pp. 139 figs. 19.5 × 27 cm. Price, RM. 9.

This special issue of the *Kolloid Zeitschrift* comprises a series of general articles reviewing different aspects of the study of fibers, films and surfaces by means of the diffraction phenomena obtained with x-rays and with electrons. A general article on deformed and dispersed systems has been contributed by Schiebold; one on particle size by Brill; one on inorganic gels by Fricke; one on organic gels by Halle; one on protein fibers by Astbury; one on lamellar systems by Hofmann; one on biological materials by Saupe; one on orientation in metals by Wever; one on surfaces by Rupp; one on electron diffraction by organic compounds by Trillat; and one on the electron microscope by Brüche. The value of these excellent reviews is increased by the extensive bibliographies which are included. The number constitutes an excellent survey of the present state of the science of the subjects discussed.

A. W. KENNEY

Kristallchemie. (The Chemistry of Crystals.) By Dr. Q. HASSEL, Lecturer in Physical Chemistry at the University of Oslo. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1934. viii + 114 pp. 8 figs. 15 × 22.5 cm. Price, RM. 9; bound, RM. 10.

In a broad sense, crystal chemistry is the physical chemistry of the solid state. The rapid development of the subject during the last ten years, and the important role which crystal structures have taken on as a proving ground for the new developments in the theory of the chemical bond, make the appearance of this survey book most welcome.

The first part of the book gives an excellent short summary of the early work of V. M. Goldschmidt on atomic and ionic radii in crystals, effects of polarization, and correlations between different structure types. This is followed by later derivations of ionic radii, a survey of simple crystal structure types, and a discussion of the Pauling electrostatic valence rules. An excellent chapter on the crystal chemistry of the silicates is presented in consider-

able detail. The remaining chapters include a discussion of the symmetry and structure of radicals and groups, application of the Werner theory to crystals, the structure of metals and intermetallic compounds, molecular structures (including organic crystals), the geometrical determination of molecular weight, and the rotation of atomic groups in crystals.

As a concise well-written summary of crystal chemistry up to about 1931, the book is excellent. It is somewhat deficient, however, in its presentation of the recent important advances in the application of the theory of the homopolar bond to the structure of crystals. Although the new work is mentioned, it is hardly given the emphasis which it deserves, and the reader is not left with a strictly up-to-date perspective of the present state of crystal chemistry. As an example, the simple present day explanation of the structures of the B sub-group elements of groups IV, V, VI and VII on the basis of the homopolar bond is not even mentioned. Except for the omission of recent work, the subject matter is well chosen. The book is very well written and can be recommended as a general survey of the field. The publishers could have avoided a negative valence sign which is hard to distinguish from a plus sign.

B. E. WARREN

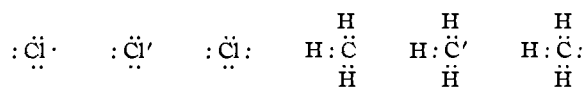
Die Homöopolare Bindung. Eine allgemein anwendbare Elektronentheorie der Valenz. (The Homopolar (Covalent) Bond. A Generally Applicable Electronic Theory of Valence.) By Dr. GEORG HAHN, Lecturer at the Johann Wolfgang Goethe University, Frankfurt-on-Main, Germany, 1934. viii + 96 pp. 15 × 22 cm. Price, M. 2.50.

The author of this brochure begins by saying that while Lewis' electronic theory has been extensively used in America and England, it has found little acceptance in Germany because "the physical hypothesis on which it rests is too little established and the deductions from it vary." We may well remark that the same was often said of the theories about the structure of carbon compounds seventy years ago.

The writer hoped from the title that Dr. Hahn would give an exposition of the theory which might contribute to its acceptance in Germany. Unfortunately, he has no clear understanding of the theory of covalency as it has been developed in America and in England. This theory now includes the following items.

(1) That an atom may assume a noble gas structure by sharing one or more pairs of electrons. (2) That the pair of electrons, having "spins" in opposite directions, hold the atoms together by rotating in an orbit which includes the kernels of the two atoms—so far as the wave mechanicians permit themselves to indulge in pictures. (3) That they balance a unit positive charge in each of the atoms held together—though they may not be equally shared by the atoms. (4) That the four pairs of electrons characteristic of a large number of the atoms in chemical compounds, whether shared or unshared, have an approximately tetrahedral arrangement (see C. A. Knorr, *Z. anorg. Chem.*, **129**, 109 (1923); Pauling, *THIS JOURNAL*, **53**, 1367, 3225 (1931); Slater, *Phys. Rev.* **37**, 481 (1931); Lewis, *J. Chem. Physics*, **1**, 21 (1933); and similar ideas

by Heitler and London). (5) Enough of this tetrahedral structure remains in double and triple covalences to give compounds containing these an increased molecular volume (parachor). (6) When the two atoms held by a covalence separate, the electron pair may remain with one of the atoms, giving the reaction an ionic character. (7) When the sum of the covalences and unshared electrons of an atom is greater or less than the number of unit positive charges in its kernel, the atom is the significant part of a complex ion or ionic group. (8) In chemical reactions atoms or radicals may often assume three different forms, positive, neutral and negative: *e. g.*,



On the basis of these principles it is possible to write electronic formulas for many compounds and many reactions. If chemists are willing to use them, we shall soon know whether or not they are useful.

Dr. Hahn has used only the first two of these principles in a rather confused manner and has very unfortunately introduced the terms "Elektronen-Acceptoren" and "Elektronen-Donatoren," which are liable to be confused with Sidgwick's "acceptor" and "donor" but which have an entirely different meaning.

W. A. NOYES

Aide-Mémoire de Chimie Organique et Essai de Synopsis de la Chimie Organique (Classification, Nomenclature, Stoechiometrie, Bibliographie). Memory Aid of Organic Chemistry and Synopsis of Organic Chemistry (Classification, Nomenclature, Stoichiometry, Bibliography). By J. KOETSCHET. Section 1. Acyclic Hydrocarbons and their Halogen and Nitro Derivatives. Impr. Emilie Birkhaeuser and Cie., Bâle, Switzerland, 1934. vi + 70 pp. 16 × 24.5 cm. Price, 5 frs. Swiss.

The section in hand is the first of about twenty parts to be published over a period of a few years and sold separately. The entire work will form an index of organic chemistry. The first part contains concise chapters on the classification, nomenclature and literature of organic compounds. The principal part of the book consists of two tables. The chief of these is a table in which the organic compounds are arranged according to the system numbers as given in the 4th edition of Beilstein's Handbook. Subclasses are indicated by ordinal numbers arranged in a decimal system. The table contains sixteen columns of which the first indicates the system and ordinal number of the compound and the others in turn the common name, "non-formulae" (an abbreviated Geneva name), molecular formula, molecular weight, state at 20°, melting point, boiling point (760), d^{20}_4 , n^{20}_D , solubility (both hot and cold) in water, alcohol, ether and other solvents, the name of the discoverer and year, reference (by volume and page) to Beilstein 4th edition, Meyer and Jacobson 2d edition, Wurtz Dictionary and its supplements and finally a brief bibliography of the literature for the period 1919 to 1933. The references in the brief bibliography are chiefly citations to *Chemisches Zentralblatt*. It is unfortunate that these are not to the original literature as many American chemists will not have the *Zentralblatt* immediately available.

The space available is also unfortunately too limited to make the bibliography comprehensive. The second table is an alphabetical index indicating the system and ordinal number for each sub-class.

Some interesting innovations have been introduced under the "non-formulae:" chloroform becomes methane-1,1,1-chloro; isoprene, but-1,3-ene-2-methyl; undecane, 11-ane and decylacetylene, 12-1-ine. It seems obvious such a system will meet difficulties when those compounds are reached in which it is necessary to indicate the position of both ends of a double bond.

The present section covers only the simple aliphatic hydrocarbons and their halogen and nitro derivatives, corresponding to the first 15 system numbers of Beilstein (Volume I to page 267). The program laid down by the author is an ambitious one and when completed the work will form a useful tool in the systematic search of the organic literature. It will be still more useful if issued in English, a possibility which seems dependent upon the demand.

WILLIAM RUSSEL STEMEN
CECIL E. BOORD

The Science of Rubber. Edited by R. F. DUNBROOK, Ph.D., and V. N. MORRIS, Ph.D., Firestone Tire and Rubber Company. Authorized English Translation of "Handbuch der Kautschukwissenschaft," edited by Prof. Dipl.-Ing. K. Memmler. Reinhold Publishing Corporation, 330 West 42d Street, New York, 1934. xvi + 770 pp. Illustrated. 16 × 24 cm. Price, \$15.00.

This book will be eagerly welcomed by all scientists and technologists whose work has to do with rubber. As the title suggests, it does not deal with the technology of the preparation of rubber goods or with factory practice, but it attempts to cover exhaustively all of the more scientific aspects of rubber. More definitely its scope is indicated by the topics: Botany; Cultivation; Collection and Preparation of Rubber; Chemistry; Vulcanization; Analytical Methods; Physics; Physical Testing Methods; Microscopy of Technical Vulcanization. (This last section includes a number of fine colored plates.) The authors are L. Hock, E. Kindscher, A. Koch, K. Memmler, H. Pohle, R. Pummerer, A. Schob and A. Zimmermann.

The American editors were prompted to undertake the translation by the fact that no single treatise of a similar scope was to be found in English. The work was carried out with the aid of ten of their colleagues, and it was thus possible to assign a qualified expert to each section.

The original edition was completed in 1930 and it is naturally strongly colored by the German viewpoint. This has led to occasional scientific irrelevancies and to an emphasis on German interests in the presentation of economic statistics and the description of testing methods. The translators have attempted to remedy this defect and to make the work more timely and generally useful by the addition of many supplementary notes dealing especially with recent developments in synthetic rubber, the compounding and direct utilization of latex, gutta-percha, recent x-ray work, the latest physical testing equipment (with emphasis on that of American origin), and recently developed theories of vulcanization. They have added besides a comprehensive bibliography covering all im-

portant books and pamphlets on rubber. The book under review is therefore considerably more than a mere translation of the original.

The method of supplementary notes serves fairly well in bringing the text up to date in factual matters, but it is less satisfactory in dealing with some points of interpretation. At the time the original text was written, the unfortunate and rather senseless association hypothesis was still being defended. One finds, for example (p. 240), that "very high molecular weights of rubber and hydorrubber are rendered improbable by the solubility of these substances in ether, as well as by the low melting point of frozen and homogeneous crystallized rubber." Again (p. 165) Harries' views that rubber is made up of rings containing four to six isoprene groups "have by no means been disproved but now seem even more plausible." Many similar statements occur, and although osmotic data indicating very high molecular weights are cited, the reader is left with the impression that the molecules of rubber are probably small and only the micelles are very large. The supplementary notes offer very little to modify this impression. Today, surely no one doubts that rubber is made up of very large molecules. Studies of synthetic polymers especially have gradually resulted in the general adoption of views in accordance with chemical common sense. The thoroughly tested premises of structural organic chemistry are profitably receiving consideration from specialists in colloids and x-rays. In the reviewer's opinion, the possibilities of progress in the clarification of ideas will be still further enhanced when the word *micelle* is abandoned.

The spiral rubber molecule first proposed by Kirchhoff is on page 455 attributed to J. R. Katz. In the discussion of sol and gel rubber, pp. 182-184, it is unfortunate that no reference to Staudinger and Bondy, *Ann.*, **488**, 153 (1931), is made.

The science of rubber is a very complicated field and intensive efforts to develop it have naturally resulted in the production of some rubbish and considerable temporary confusion. Nevertheless, very definite progress is being made in the selection and organization of fact and in the formulation of cogent interpretation. One may expect that effective theory will develop rapidly in the future. Meanwhile, the translators have performed a real service in making conveniently available this extensive summary of existing knowledge.

WALLACE H. CAROTHERS

Principles of Physical Biochemistry. By HSIEN WU, Ph.D., Professor of Biochemistry, Peiping Union Medical College. Yu-Lien Press, Peiping, China, 1934. xiii + 264 pp. 17 figs. 14.5 × 21.5 cm.

Physical Chemistry for Students of Biology and Medicine. By DAVID INGERSOLL HITCHCOCK, Associate Professor of Physiology in the Yale University School of Medicine. Second edition (with laboratory directions). Charles C. Thomas, 220 East Monroe Street, Springfield, Illinois, 1934. xi + 214 pp. 28 figs. 14.5 × 24 cm. Price, \$2.75.

Both these books are written with the same object, to impart to students of biology or medicine an understanding of those laws of physical chemistry which are most sig-

nificant in the study of the living organism. They are addressed, of course, primarily to students with little or no previous training in physical chemistry, and the task undertaken by the authors is a difficult one.

The first edition of Professor Hitchcock's book has previously been reviewed in *THIS JOURNAL*, Vol. 55, page 1746 (1933), and the main text of the second edition has been little altered, save for the addition of brief sections on surface films, and on Brönsted's theory of acids and bases. A group of twelve laboratory experiments, described carefully in detail, has been added, and should prove of great value to many instructors. The bibliography has been revised and enlarged. The second edition as a whole maintains the high standard of clarity, simplicity and accuracy set by the first edition.

Professor Wu "has endeavored to present not physical chemistry as such but rather the general principles of biochemistry from the physical standpoint." This point of view has been maintained throughout the book and the author's aim has been in general very successfully achieved. The opening chapters deal with the organization of matter and forces of organization, give a brief discussion of the electronic theory of valence, of polar and non-polar linkages, size and shapes of molecules and forces of intermolecular and intra-molecular attraction. There follows a discussion of the laws of gases in solutions, the properties of colloids, reaction velocities, equilibrium in homogeneous and heterogeneous systems and electro-chemical potentials. Then follow two chapters on the physico-chemical properties of the living system and the equilibrium between the living system and its environment. And the book concludes with a chapter on energetics. The discussion and the admirable sets of questions placed at the end of each chapter constantly bring out the nature of the problems involved, and the relation of the physico-chemical laws involved to biological problems.

The book, as a whole, is excellent, but a number of detailed criticisms might be made. Thus the statements at the beginning that "The atom consists of a nucleus and a ring of electrons" and that "The maximum number of electrons in the ring is 8" are far from an adequate statement of the structure of the atom. Even for the purposes of such a book as this, it would seem desirable, without any attempt to approach the rigorous treatment of the physicist, to give a somewhat fuller treatment of the concepts of atomic structure and of valence. Likewise, the discussion of polarity might well include some treatment of the existence of permanent dipoles in organic molecules and their relation to molecular shape and structure (as illustrated, for example, by water and carbon dioxide and by the extremely polar amino acids). The treatment of colloids seems to the reviewer to overstress somewhat the contrast between colloidal and other systems rather than the underlying identity of the forces directing behavior in both colloidal and crystalloidal systems. Some chapters, notably those on electrochemical potentials and on energetics contain a great number of equations and a relatively very short discussion of the fundamental concepts underlying the equations. This may be dangerous as the effect may be either to bewilder the student or sometimes merely to give him facility in manipulating symbols whose full meaning escapes him.

Allowing for all these criticisms, however, this book by Wu remains a stimulating and valuable achievement. It should give the ordinary student a clearer understanding of the need for physical chemistry in biological studies and it should spur the more exceptional student on to a deeper study of the underlying foundations of the subject. It bears the evidence of having been written by one with a real love of his subject and enthusiasm for it, and it should impart much of that same feeling to its readers.

JOHN T. EDSALL

Créatine et Créatinine. (Creatine and Creatinine.) (1) **Métabolisme des Corps Créatiniques. (Creatinine Metabolism.)** (2) By Dr. FERNAND KAYSER. Hermann et Cie., Éditeurs, 6 Rue de la Sorbonne, Paris, France, 1934. 16 × 25 cm. (1) 88 pp. (2) 84 pp. Price, each, fr. 15.

These two small volumes are designed to supplement the well-known monograph by Hunter, which appeared in 1928, and are consequently limited to a consideration of work of the last eight years, with only such references to earlier material as are needed to provide the necessary background.

The first volume deals with creatinine and creatine (including phosphocreatine) from the standpoint of physical, chemical and biological properties, distribution and methods of analysis. The main emphasis is on aspects of the subject which have not been exhaustively reviewed elsewhere within the past two or three years. In the discussion of the biological significance of phosphocreatine, special attention is hence paid to mammalian experiments, and the reader is expected to consult other sources for detailed information on the voluminous literature concerned with the function of this substance as revealed by experiments with frog muscle. The treatment is for the most part uncritical.

The main concern in the second volume is with the factors that influence the excretion of creatine and creatinine, and their concentration in the blood (under both normal and pathological conditions). Here, presumably because differences of opinion center very largely about questions of interpretation, and to only a minor degree involve technical points, the author has presented his material with a serious attempt to evaluate the work cited in a reasonably impartial manner.

CYRUS H. FISKE

Mikrochemie des Blutes. (Blood Micro-Chemistry.) By Dr. FRIEDRICH RAPPAPORT, University of Vienna. Preface by Prof. Dr. Fritz Silberstein. Verlag Emil Haim and Company, Maria-Theresien-Strasse 10, Wien, Austria, 1935. xi + 206 pp. 51 figs. 17.5 × 24.5 cm. Price, R.M. 15; bound, R.M. 16.80.

In this monograph on blood micro-chemistry, the author gives the investigator micro-methods which he has found to be quick, simple and accurate in estimating the more important constituents of the blood. The contents include instructions for the determination of specific gravity, water content, blood gases, anions and cations, the non-protein nitrogenous constituents, the proteins, carbohydrates and their derivatives, ketone bodies, fat

and lipoids, bile pigments and enzymes. A useful appendix discusses general principles involved in micro-chemical quantitative analysis together with directions for constructing and calibrating the necessary apparatus. Instructions in colorimetry are also given.

On the whole, the author appears to have made a wise choice in his selection of methods. But the Folin procedures given here for the determination of amino and uric acids have recently been improved and it is quite generally conceded that the Fiske method of calcium estimation represents an advance over the older techniques. Furthermore, the author's apparent predilection for iodimetric titrations will not be shared by all.

The descriptions of the methods which are presented in a brief and lucid manner are still sufficiently detailed to be of use to the less experienced worker. The outline consists of a short discussion of the principle together with the chemical equations involved, details of the analysis and calculations and concludes with examples of normal and pathological variations in the concentration of the constituents in the blood. In addition, details for carrying out tolerance tests with examples of results to be expected under various pathological conditions are given and numerous charts and tables which greatly aid in carrying out the calculations are also included.

The handbook is clearly written and thoroughly understandable and should be well received by the clinical investigator.

J. W. HEIM

The Biochemistry of the Eye. By ARLINGTON C. KRAUSE, M.A., Ph.D., M.D., F.A.I.C., Instructor in Ophthalmology, The Johns Hopkins Medical School and Assistant Dispensary Ophthalmologist, The Johns Hopkins Hospital. The Johns Hopkins Press, Baltimore, Maryland, 1934. xv + 264 pp. 17 figs. 15.5 × 23.5 cm. Price, \$3.25.

It may occasion surprise to chemists not familiar with recent developments in the study of the eye that the accumulated knowledge of its chemistry is so extensive. The bibliography of 983 titles in the volume under consideration is evidence of the progress of chemical investigations of this sense organ, whose ready availability has made possible more detailed studies than are possible with other smaller and less accessible sense organs. Among the pioneer workers in this field may be mentioned Berzelius, whose contributions to the study of the lens in 1830 paved the way for the more extensive studies of his fellow countryman Mörner in 1894. The author of the present volume, who has himself made many investigations in this field, ably reviews in detail the literature concerned with the chemistry of the external secretions and conjunctiva, the sclera, the cornea, the uveal tract, the retina, the vitreous and aqueous humors and the lens. Of special interest are the studies of the metabolism of the eye, particularly in relation to the roles of the sulfhydryl compounds (glutathione and cysteine) and the ubiquitous ascorbic acid.

The theme of the review is thus expressed in the introductory chapter: "Some empiricists have frequently voiced the opinion that the biochemistry of the eye is a

highly academic subject without practicality. The basis of normal and abnormal physiology of the eye is chemistry and physics and, furthermore, the physiology of the eye is the foundation for the theoretical conceptions of medical and surgical ophthalmology. The biochemist develops his subject while the ophthalmologist applies the resulting biochemical theories to conquer diseases of the eye."

This book will undoubtedly contribute materially to hasten the day when ophthalmologists become chemically minded, when "chemical ophthalmology will . . . rapidly become more quantitative and less qualitative in nature." It is to be hoped that it may also serve to make chemists more ophthalmologically minded.

HOWARD B. LEWIS

BOOKS RECEIVED

March 15, 1935–April 15, 1935

HERMAN T. BRISCOE. "The Structure and Properties of Matter." McGraw-Hill Book Co., Inc., 330 West 42d St., New York City. 420 pp. \$3.75.

P. A. M. DIRAC. "The Principles of Quantum Mechanics." Second edition. Oxford University Press, 114 Fifth Ave., New York. 300 pp. \$6.00.

MICHELE GIUA and CLARA GIUA-LOLLINI. "Dizionario di Chimica Generale e Industriale." Vol. II, F to Z. Unione Tipografico-Editrice Torinese, Corso Raffaello 28, Torino 116, Italy. 1208 pp. Lira 175.

WERNER HILTNER. "Ausführung potentiometrischer Analysen nebst Vollständigen Analysenvorschriften für technische Produkte." Verlag von Julius Springer, Linkstrasse 23–24, Berlin W 9, Germany. 141 pp. RM. 6.60.

WALTER HÜCKEL. "Theoretische Grundlagen der organischen Chemie." Vol. II, Second edition. Akademische Verlagsgesellschaft m. b. H., Markgrafenstrasse 6, Leipzig C 1, Germany. 338 pp. RM. 14; bound. RM. 15.60.

FRITZ LIEBEN. "Geschichte der physiologischen Chemie." Verlagsbuchhandlung von Franz Deuticke, Helferstorferstrasse 4, Wien I, Austria. 743 pp. M. 20; bound. M. 23.

J. S. MARSH. "Principles of Phase Diagrams." Published for the Engineering Foundation by the McGraw-Hill Book Co., Inc., 330 West 42d St., New York City. 193 pp. \$3.00.

CLARENCE AUSTIN MORROW. "Biochemical Laboratory Methods for Students of the Biological Sciences." Revised and Rewritten by William Martin Sandstrom. John Wiley and Sons, Inc., 440 Fourth Ave., New York. 319 pp. \$3.75.

SATYA PRAKASH. "An Introduction to Inorganic Chemistry for B.Sc. Students of the Indian Universities." The Kala Press, Allahabad, India. 478 pp. Rupees 6 or 10 s.