
NEW BOOKS

Dictionary of Science and Technology in English-French-German-Spanish. By MAXIM NEWMARK. Philosophical Library, Inc., 15 E. 40th St., New York, N. Y. 1943. viii + 386 pp. Price, \$6.00.

Like a four-color mechanical pencil, a four-language dictionary creates at first sight an impression of ingenuity, compactness, and efficiency, but after a little use one begins to wonder whether a set of old-fashioned single-purpose pencils or dictionaries is not generally more convenient. The present dictionary is constructed in four parts, of which the first is a *numbered* alphabetical list of English words, each followed by its approximate equivalent in French, German, and Spanish. Then come three alphabetical lists of French, German, and Spanish words, respectively, each followed by the *number* of the English word to which it corresponds. Thus compactness is obtained at the expense of convenience, for in order to find the meaning of a foreign word (the most frequent purpose for which such a dictionary is wanted) it is necessary to look in two places. It appears that additional compactness is obtained at the expense of reasonable completeness. As a test, a single sentence of four lines was selected at random from a standard German text on a physico-chemical subject, and found to contain three words not in the Dictionary—*verlaufen*, *darstellen*, *bestätigen*, by no means rare words. In fairness it should be said that the author is particularly interested in achieving up-to-date coverage of technological terms.

It would seem that this book might be useful where for some reason compactness is at a premium, or where there may be occasional need to translate from one foreign language to another.

A. S. COOLIDGE

The Chemistry of Large Molecules (Frontiers in Chemistry, Volume 1). By R. E. BURK, Director of Research, The Standard Oil Co., Cleveland, Ohio, and OLIVER GRUMMERT, Morley Chemistry Laboratory, Western Reserve University, Cleveland, Ohio. Published under the Auspices of Western Reserve University. Interscience Publishers, Inc., New York, 1943. 313 pp. 26 figs. 15.5 × 23.5 cm. Price, \$3.50.

The chapters of this book represent lectures presented during 1942 as one of the Frontiers in Chemistry series sponsored by Western Reserve University. This is the first of these series to be published. Other volumes will follow. It is the purpose of these lectures to bring together reports summarizing progress in related fields of research.

This volume consists of eight chapters. In the first chapter, "The Mechanism of Polyreactions" by Professor H. Mark, mechanisms of various types of polymerization are discussed. The second chapter, "The Investigation of High Polymers with X-Rays," also by Professor H. Mark, reviews broadly the occurrence, origins and effects of crystallinity in chain polymers. Diffusion, dialysis and viscosity of dilute polymer solutions and the dependence of these on molecular size and shape are discussed by the late Dr. E. O. Kraemer under the title "The Colloidal Behavior of Organic Macromolecular Materials." The fourth chapter on "The Ultracentrifuge and its Application to the Study of Organic Macromolecules," also by Dr. Kraemer, presents an excellent summary of the essentials of ultracentrifuge methods and the results which have been obtained on proteins and on filamentous molecules. "Elastic-Viscous Properties of Matter" by Drs. A. Tobolsky, R. F. Powell and H. Eyring is rather more diversified than other chapters. The statistical mechanics of chain configuration and of mixing of long chains with small molecules are included as well as applications of the transi-

tion state theory of viscous flow to the flow of polymer molecules by segments, theory of rubber elasticity, creep in metals, viscosity of suspensions and polymer solutions and thixotropic phenomena. In 27 pages Dr. R. M. Fuoss presents the most significant results of recent investigations carried out chiefly by Fuoss and collaborators on "The Electrical Properties of High Polymers" and their relationship to chemical structure and mechanical properties. Similarly, Professor C. S. Marvel summarizes recent work for which he and his associates are largely responsible on "Organic Chemistry of Vinyl Polymers." The final chapter (65 pp.) by Dr. Emil Ott on "Chemistry of Cellulose and Cellulose Derivatives" represents an exceptionally well organized, concise summary of a very broad field.

In view of the scope and purpose of these lectures, it is clear that the book is to be regarded neither as a text nor as a reference work. From the point of view of the casual reader who desires to be informed on recent accomplishments and current problems, but who cannot (or at least does not) find the time to become an expert on all phases of the subject, this may be looked upon as a point of merit. Too often scientific books strive to be either comprehensive of the entire field or to be complete in all details. This book can be recommended to readers desiring to be brought up to date on the broader aspects of recent developments in the phases of the subject covered by these eight chapters. The book should find a welcome place among the current flood of books which continue to appear on high polymers.

The bibliographies at the end of each chapter should be useful to readers who will want to delve farther into the subject. Numerous diagrams and figures are included. The editing and printing are well done and errors are few. A subject index is given at the end of the volume.

P. J. FLORY

Physical Biochemistry. By HENRY B. BULL, Ph.D., Associate Professor of Physiological Chemistry, Medical School of Northwestern University. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y., 1943. iv + 347 pp. Illustrated. 14.5 × 22 cm. Price, \$3.75.

This book represents "an attempt to reorient to some extent" the character of "instruction in physical chemistry for premedical and for graduate students in the biological sciences." The general pattern of the presentation is indicated by the chapter headings: Atoms and Molecules, Energetics, Reaction Kinetics, Electrostatics and Dielectrics, Ions in Solution, Electromotive Force Cells, Acids and Bases, Oxidation-Reduction, Electrical Conductance, Electrokinetics, Surface Activity, Colloidal Solutions, Viscosity and the Flow of Liquids, Diffusion, The Ultracentrifuge, Osmotic Pressure, Membranes and Cell Penetration, Colloidal Structures. Under these headings are found discussions of a number of topics which I have not seen previously treated in comparable detail in any book addressed to a similar audience. These include: the transition state theory of reaction kinetics; some aspects of electrostatics, including dielectric constants, dipole moments, and dielectric increments; semiquinones; a very full discussion of electrokinetics, including the Tiselius electrophoresis apparatus; the relation between viscosity and molecular asymmetry in solutions of large molecules; streaming birefringence; sedimentation and diffusion in their relation to molecular size and shape; and the evaluation of pore size in membranes. The chapter on surface activity goes into much detail, and covers nearly forty pages. Numerous references to the original literature, often to very recent papers, are given as footnotes to the

text; and the student is urged to read at least a few of them.

All of these topics are interesting and important, and are in the forefront of interest to many investigators today. For the teacher who is presenting important topics in physical chemistry to biological and premedical students, however, the question of relative emphasis remains a difficult problem. In the opinion of this reviewer, it is essential that the student should obtain a firm grasp of the fundamentals of chemical thermodynamics, the significance of the mass law, acid-base equilibria and oxidation-reduction potentials, and the elements of reaction kinetics especially in relation to enzyme action. All these topics are treated by Bull, but in some cases with a brevity which might leave most students without a firm grasp of the subject. It would seem essential to supplement the use of the text, and the recommended outside reading, by the working of numerous quantitative problems requiring the application of the fundamental principles. A set of such problems might be a valuable addition to the book in future editions. For instance, the extensive table of free energies of formation in Chapter II is excellent in itself, but the student is not likely to appreciate it unless he uses it in solving problems. The discussion of thermodynamics in this chapter would benefit from considerable amplification, with fuller explanation of the fundamental concepts, if the student is really to acquire the ability to use thermodynamics effectively in his thinking. The exposition of the activity concept (p. 26), which occupies less than a page, is one example of this; and the short paragraph on entropy and probability (p. 19) may mystify the student more than it enlightens him.

Raoult's law is not introduced until p. 293; in view of its importance, it might be well to place it near the beginning, in Chapter II (Energetics); and also to place Chapter XVI (on osmotic pressure and colligative properties) immediately after Chapter II.

Some equations, such as those involving electrokinetic potentials (p. 157 ff.), and the Langmuir adsorption equation (p. 206), are derived step by step, while others, sometimes simpler and more fundamental, are given without derivation. This is true for instance of the equation for the osmotic work involved in concentrating a component of a system (p. 20), or the Michaelis-Menten equation for enzyme kinetics (pp. 54-55). The student ought certainly to understand the derivation of such equations, if he is to obtain full educational value from a course of this sort.

Occasionally the discussion leaps suddenly from quite simple to much more complicated topics. For instance, on p. 60, a very simple discussion on the elements of electrostatics is followed abruptly by Poisson's equation. I fear that most students will fail to see the significance of the latter when so presented.

It is easy to find points for criticism in a book of this type, for the choice of topics and the manner of their presentation offer most formidable difficulties to an author who attempts to present physical chemistry to biologists and students of medicine. Bull's treatment has broken new ground in several respects, and I believe that it will have a definite influence on the character of instruction of this sort in the future.

JOHN T. EDSALL

A Text-Book of Inorganic Chemistry. By FRITZ EPHRAIM. English Edition by P. C. L. THORNE and E. R. ROBERTS. Fourth Edition, Revised and Enlarged. Interscience Publishers, Inc., 215 Fourth Avenue, New York, N. Y., 1943. (Gurney and Jackson, London, W. C. 1, England, and Oliver and Boyd, Ltd., Tweeddale Court, Edinburgh.) 924 pp. \$8.75.

Earlier editions of this book have been reviewed in *THIS JOURNAL*, 57, 593 (1935), and 63, 1171 (1941). This edition differs only slightly from the preceding one. It contains ten additional pages and the revisions have been relatively minor.

The popularity of this text is shown by the increasing frequency with which new editions have appeared, only four years having elapsed since the publication of the last edition. This popularity is easily understood, for to the student familiar only with the usual order of presentation of the bewildering array of the facts of inorganic chemistry, it is certainly illuminating to have them presented in the less usual order adopted here.

ARTHUR B. LAMB

Industrial Chemistry. By WILLIAM THORNTON READ. Dean of the School of Chemistry, Rutgers University, 3rd ed., John Wiley & Sons, Inc., New York, N. Y.; Chapman & Hall, Ltd., London, 1943. 631 pp. 92 illus. 14 × 20 cm. \$5.00.

This book gives a general descriptive survey of the more important chemical industries. It is intended primarily for students in their junior or senior year in college who are specializing in chemistry and assumes a knowledge of chemistry which may be expected of a student who has taken introductory courses in general descriptive, analysis, physical, and organic chemistry. At this stage of his career the most important problems facing such a student are the selection of his future wife and a decision as to the kind of job he would like to hold twenty or thirty years later. Shall it be Mary, Sue, or Betty, and shall he go into medicine, or electronics, or sanitary engineering, or chemistry? If we assume that he has selected Betty and has decided to become a professional chemist he is now ready to begin serious work in preparation of his career. He will tentatively set his ambition on the future title of Professor, Research Director, Chief Chemist, Factory Superintendent, Sales Manager, Purchasing Agent, or President of a chemical manufacturing company. This book is designed as a textbook in a course which should help him to reach a wise decision and start the process of fitting himself for an executive position where he will have the responsibility and authority to make decisions on matters of policy. Such an official must make his decisions and put them into effect on the basis of foresight and then a year or a decade later the wisdom of his decisions will be judged by hindsight. A good batting average requires exceptional ability and training, and a little luck may not come amiss.

The success of a factory built to manufacture chemicals is not assured merely by a simple and direct chemical process with good yields and good machine design. It is not enough to make a chemical efficiently but it must also be salable at a profit. The factory may succeed technically but fail financially because it is built in a poor location or it is too big for its markets and therefore cannot operate steadily. A suit for patent infringement may result in an injunction stopping all operations. A foreign war may cut off an imported raw material or a change in tariff make it too expensive. A new scientific discovery or a new invention may make the process of manufacture, or the product itself, obsolete. Persistent disloyalty among employees may outweigh the most skillful chemical engineering. Therefore the young chemist who hopes to rise to positions of executive responsibility should train himself to be a broad man capable of understanding, weighing and anticipating the significance of many outside influences upon the industry with which he is connected. A good knowledge of chemistry and chemical engineering is not enough. He may need some sound knowledge of thermodynamics, electronics, geology, biology, marketing, law, foreign relations, psychology and labor relations. His college course should give him a good start on his education and above all get him in the habit of reading and thinking on many subjects. A textbook of industrial chemistry should, therefore, not be too narrowly confined to chemistry and chemical engineering and should stimulate the student to think on broad lines. This book of Read's meets these specifications to a substantial degree but misses many good opportunities to give practice in con-

sidering the comparative advantages and disadvantages of alternative procedures or methods. Thus, for example, it is mentioned that both platinum and vanadium oxide are used as catalysts in the contact process of making sulfuric acid but the student is not encouraged to think about the comparative advantages of these catalysts. Similarly, there are now two competing methods of making caustic soda—the electrolytic, and the treatment of Solvay soda with lime—but these are described in different chapters without any discussion of this interesting competitive situation.

The dramatic interest, significance and pedagogic effectiveness of the book could be appreciably increased by more attention to the historical development of the chemical industries. In the chapter on sulfuric acid, the contact process is discussed first, followed by the lead chamber process. Why not follow the historical order by discussing the chamber process first and then the contact process and thus give more realism to the half page devoted to the "Comparison of Contact and Lead Chamber Processes?"

In the chapter on Fixed Nitrogen the order of discussion is: fractional distillation of liquid air, helium, by-product ammonia from coal, ammonia synthesis, calcium cyanamide, the arc process, nitric acid from ammonia, nitric acid from Chile saltpeter, and sodium nitrate from caliche. This horrible scrambling of the historical sequence of development of these processes sacrifices much of the interest and significance. The ammonia synthesis is discussed without mentioning Haber's name or any allusion to the fact that this process was available to Germany during World War I and in combination with the Ostwald Process made Germany independent of Chilean saltpeter whereas England, France and the United States were compelled to rely upon Chilean saltpeter, which was dangerously threatened by the German submarines. The frantic efforts to escape this menace by the construction of the Muscle Shoals plant or the reasons for the choice of the cyanamide process do not rate even a mention. The later controversies over the disposal of this plant and the dam which eventually resulted in the great T. V. A. projects are ignored although they have had great influence on the development of the chemical industries in America. And why discuss the making of nitric acid from ammonia, then from Chilean nitrate and finally the recovery of Chilean nitrate from caliche?

The American potash industry is described before the German. There is no adequate presentation of the industrial difficulties created in America when German potash was cut off in 1915. Why was it that with potash prices averaging more than ten times the previous level for the four years of World War I the U. S. production in 1918 was only 20% of the prewar imports and all except two of the eighty-eight producers in 1918 have gone out of the potash business? And yet in the interval before World War II an American potash industry has arisen which can now care for every need. This extremely interesting and significant story is entirely missing.

The chapter on rubber contains no allusion to the acute situation created by the Japanese capture of Singapore or to the revolutionary changes which are being forced on the American rubber industry. There is no reference to the Baruch-Conant-Compton Report itself, or to its subject matter, or to subsequent developments. The discussion of synthetic rubber is extremely weak for a book dated August, 1943. Why not encourage the students to form an opinion on the prospects of survival of this new industry?

The author avoids mentioning the name of companies so completely that it shows a definite policy. Trade names of materials and even names of great inventors or personalities are used extremely sparingly. He does mention the name of Goodyear, Solvay, Baekeland, Acheson, Hall, and a few others. Glover and Gay-Lussac are towers rather than men. He avoids mentioning Liebig, Nobel, Perkin, Baeyer, Ostwald, Knietsch, Haber, Bergius, Hyatt, Sabatier, Onslager, Burton, Wesson, Dow, and Carothers.

It is perhaps unavoidable that at the time they graduate

from college young chemists will be more familiar with the personalities of professional baseball players than of the great chemists and know more about the achievements of football teams than of teams of chemists and engineers representing our great chemical companies. But why encourage this weakness in our educational system? Why describe Neoprene and Nylon without mentioning the du Pont Company? Or the recovery of bromine and magnesium from the ocean without mentioning the Dow Chemical Company?

These criticisms refer to relatively minor matters since they concern missed opportunities rather than actual blunders. The book contains a great deal of information clearly and accurately presented. Any young chemist, whether still a student or at the beginning of his industrial career can broaden his knowledge and substantially improve his prospects of professional advancement by a study of this book.

A comparison of the third edition with the second shows that the changes are relatively minor and are scattered throughout the book.

GRINNELL JONES

Inorganic Qualitative Analysis. Semi-micro Technique.

By HAROLD A. FALES, Ph.D., Professor of Chemistry at Columbia University, and FREDERIC KENNY, Ph.D., Professor of Chemistry at St. Francis College, Brooklyn. D. Appleton-Century Company, Inc., 35 West 32nd St., New York, N. Y., 1943. ix + 237 pp. 15 × 22 cm. Price, \$2.65.

This book, which is intended for a one-semester course, follows much the same pattern as most contemporary texts in this field. The first 150 pages deal with theoretical topics, and the remaining 75 pages are devoted to systematic schemes of analysis employing semi-micro technique.

The usual theoretical topics are discussed, including types of compounds, strong and weak electrolytes, hydrolytic equilibria, solubility product, complex ions, and oxidation-reduction theory. The characteristics of electrolyte solutions and of various types of ionic equilibria are thoroughly and clearly presented. Each of the theoretical chapters concludes with a comprehensive set of problems, which in general appear to be well chosen. Among the few exceptions may be noted the fictitious equation $S = \sqrt{K/108}$ on p. 72 for the relation between the molar solubility S in pure water and the solubility product K of lead phosphate, which is unrealistic and misleading because it ignores the extensive hydrolysis of the phosphate ion. Fortunately, there appear to be few synthetic examples of this sort; most of them display excellent didactic judgment.

In the reviewer's opinion the chapter on oxidation-reduction theory is outstandingly good, particularly the sections on pp. 139-145 which discuss a number of examples of oxidation-reduction equilibria that are important in qualitative analysis.

The semi-micro laboratory procedure provides for the detection of the usual twenty-four metallic elements, and the scheme of analysis adheres closely to the classical Noyes and Bray system with a few minor modifications. The various group analyses are summarized in clearly executed tabular diagrams. Equations are given for all reactions, and happily these have been written with a realistic appreciation of the ionic or molecular states of the substances involved.

Unfortunately the analytical chemistry of the non-metallic elements is almost completely ignored, and all that one finds is tests for four anions (chloride, sulfate, nitrate, and carbonate) on pages 221-222. The reviewer fails to appreciate the point of view which this neglect implies; certainly the importance of the analytical chemistry of the non-metallic elements warrants the inclusion of systematic schemes for anion analysis in even a one-semester course in qualitative analysis. It is true that in the past the laborious and time-consuming features of the classical macro procedures provided a more or less cogent argument for

limiting one-semester courses to cation analysis, but surely the development of relatively rapid semi-micro techniques has invalidated this argument. Also the fact that anion analysis is somewhat less systematized and generally presents chemically more complex situations than cation analysis cannot be denied, but these attributes are actually more advantageous than disadvantageous from a didactic viewpoint. A student cannot be expected to acquire even a modicum of critical chemical sense, or a true perspective toward analytical chemistry, unless he is given an opportunity to wrestle with a few difficulties. It is hoped that in future editions of this otherwise sound text anion analysis will receive the attention it deserves.

JAMES J. LINGAN

Manometric Methods as Applied to the Measurement of Cell Respiration and Other Processes. By MALCOLM DIXON, Ph.D., Sc.D., F.R.S., University Lecturer in Biochemistry in the University of Cambridge. Second edition. The Macmillan Company, 60 Fifth Avenue, New York, N. Y., 1943. xiv + 155 pp. Illustrated. 13 × 19.5 cm. Price, \$1.75.

This useful and standard manual gives an up-to-date account of all the most common methods in use in biochemical laboratories for following the time course of oxygen uptake and carbon dioxide output by cell and tissue enzyme systems. The author writes "It has of course not been possible to include every modification of manometer which has been described in the literature: my aim has been to select those forms which are already in fairly general use or likely to become so." In this aim he has been extremely successful. The book contains full instructions for, and precautions in, the use of the chief biochemical manometers, *i. e.*, the Barcroft and the Warburg apparatus and their various adjuncts and accessories. It also describes in detail the various methods of calibration, including an original theoretical treatment of the author not published elsewhere.

In the edition just published the main new features consist of short descriptions of (i) the beautiful, but rather special, ultra-micro-methods introduced since 1933, (ii) the recently developed modifications of the standard types, (iii) further applications of the methods. The older features have been thoroughly revised and brought up-to-date, and the list of references expanded. The book can be confidently recommended to all biochemists and might also be of occasional service in "pure" chemical departments.

F. J. W. ROUGHTON

Organic Chemistry. By C. W. PORTER AND T. D. STEWART, Members of the Faculty of the College of Chemistry in the University of California. Ginn and Company, Statler Office Building, Park Square, Boston, Mass., 1943. v + 577 pp. 15.5 × 23 cm. Price, \$4.00.

All text-books for a year's instruction in elementary organic chemistry will necessarily present certain essential facts in the subject. The chief interest is in how the facts are presented. The beginning of this text is a preview of the whole subject in the first chapter. The student is hurriedly introduced to hydrocarbons of all kinds, alcohols, aldehydes, ketones, acids, esters, amines, amino acids, halogen-containing compounds and ten varieties of sulfur compounds. The tetrahedral atom, atomic dimensions, optical isomers, physical properties, solubility, chemical reactivity, atomic structure, isotopes, radioactive and heavy atoms, and the electronic valence pass rapidly in these first twenty-six pages. The object of this generalized survey is, to some extent, to overcome "the practical difficulty of learning an enormous number of new names and facts in a short time" by presenting the more commonly used new ideas "in anticipation of more detailed treatments."

There may be many, including the reviewer, who will question whether such an aerial photograph will mean much to a student who is unacquainted with any part of the detailed view; or doubt whether reference to the fact that sulfur is present in thiamine or vitamin B, or that Nylon is an amino acid, will have any real significance to a student when these subjects are not mentioned again until the latter half of the text. For those who favor such a method of instruction, however, the authors have given a very good preview.

The remainder of the text follows the more conventional order of hydrocarbons, alcohols, ethers, halides, aldehydes and ketones, acids, etc. The current interest in hydrocarbons as sources of organic compounds is stressed. The trend toward compounds of biological interest receives due attention by a considerable amount of space allotted to pyrimidines, purines, sulfa drugs, alkaloids, sterols, vitamins and enzymes.

The book is divided into 489 pages of discussion, 26 of supplementary notes and appendix, and forty-one pages of very good problems. The chapters are not numbered, but otherwise clearly indicated. The work is relatively free from errors, though the omission of a bond in the formula for quinine is unfortunate. In general the work is a very satisfactory addition to the collection of texts available for elementary organic chemistry.

AVERY A. MORTON

Plants and Vitamins. By W. H. SCHOPFER, Director of the Botanical Institute, University of Bern, authorized translation by NORBERT L. NOECKER. Chronica Botanica Company, Waltham, Mass., and G. E. Stechert and Co., New York, N. Y., 1943. xiv + 293 pp. Illustrated. 18 × 27 cm. Price, \$4.75.

As may be guessed from the title, this book covers a relatively large field including the synthesis of vitamins by plants and the responses of plants including microorganisms to vitamins.

Some of the chapters (24 in number) have to do with specific organisms, *e. g.*, yeasts, lactic acid bacteria, etc.; others have to do with specific vitamins, and others deal with more general topics. The author has not been signally successful in the organization of the material.

It is unfortunate, due primarily no doubt to war conditions, that the literature has been reviewed completely only up until 1941, and that from this point on the review is incomplete. Inasmuch as the field covered by this book has undergone very active investigation in recent years, and many important matters have been clarified during the interval involved in its translation and publication, this book cannot be recommended as a critical and up-to-date summary.

For those whose interests are in plant physiology and to whom the vitamin field is largely unfamiliar, Professor Schopfer's book will be especially valuable.

ROGER J. WILLIAMS

BOOKS RECEIVED

January 10, 1944–February 10, 1944

HAROLD SIMMONS BOOTH and VIVIAN RICHARD DAMERELL. "Quantitative Analysis." Second Edition. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York, N. Y. 303 pp. \$2.50.

PAUL H. DAUS, JOHN M. GLEASON and WILLIAM M. WHYBURN. "Basic Mathematics for War and Industry." The Macmillan Company, 60 Fifth Avenue, New York, N. Y. 277 pp. \$2.00.

H. G. DEMING. "General Chemistry." Fifth Edition. John Wiley and Sons, Inc., 440 Fourth Avenue, New York (16), N. Y. 706 pp. \$3.75.