

NEW BOOKS

Handbuch der Physik. Edited by H. GEIGER AND KARL SCHEEL. Volume X. Thermische Eigenschaften der Stoffe, edited by F. HENNING. Julius Springer, Linkstr. 23-24, Berlin W 9, 1926. vii + 486 pp. 207 figs. 26 × 17.5 cm. Price Reichsmark 35.40, unbound; Reichsmark 37.50, bound.

This "Handbuch," by a large number of authors (German, with very few exceptions) is appearing in 24 volumes, of which Vols. 1-8 deal with the fundamentals of physics, Vols. 9-11 with heat, Vols. 12-17 with electricity and magnetism, Vols. 18-21 with optics of all wave lengths, and Vols. 22-24 with the structure of matter and the nature of radiation. This tenth volume is made up of eight chapters as follows: Solids (pp. 1-59) by E. Grüneisen; Fusion, Crystallization and Sublimation (pp. 60-125) by F. Körber; Gases and Liquids (pp. 126-222) by J. D. van der Waals, Jr.; Thermodynamics of Mixtures (pp. 223-274) by P. Kohnstamm; Specific Heat, theory (pp. 275-320) by E. Schrödinger; Specific Heat, experimental (pp. 321-349) by K. Scheel; The Determination of Free Energy (pp. 350-404) by F. Simon; Thermodynamics of Solutions (pp. 405-480) by C. Drucker. The book is a characteristic German compilation; as usual the treatment is theoretical and exhaustive but unimaginative and hardly suggestive of new inquiries; and it does not always distinguish sufficiently between formulas based on theory and formulas which involve some approximation or assumption. The mode of presentation would offer some difficulties to an American reader unacquainted with the topic, and might cause him some misapprehension as to the way in which the topic developed historically; for, on a rough estimate, ninety per cent. of the references are to German books and authors of recent date, and most of the remaining ten per cent. are to Hollanders. Indeed, in as far at least as this volume is concerned, the title might almost be "Handbuch der deutschen Physik."

J. J.

L'Énergétique des Réactions Chimiques. (The Energetics of Chemical Reactions.) By Professor G. URBAIN, Paris. Librairie Octave Doin, 8, Place de l'Odéon, Paris, 1925. viii + 267 pp. 102 figs. 21.5 × 13.5 cm. Price 27 fr.

The object of this book is to provide, in a French text, a rigorous treatment of the fundamental propositions of thermodynamics, in a form adapted to the needs of the chemist, as distinguished from the physicist or mathematician. The author strives to eliminate from his work all analogies from mechanical theory and considerations of mathematical elegance, and to proceed always by steps which can be objectively visualized. The use of such abstract functions as entropy and thermodynamic potential is minimized. Considering that the greatest triumphs of modern science are being won precisely by the relentless pursuit of abstractions,

regardless of the possibility of objective visualization, the reviewer is not greatly in sympathy with M. Urbain's aim.

The method of introducing and defining the primary concepts is unusual and interesting. Quantity of heat is first defined as proportional to the mass of a standard substance which melts or solidifies at constant temperature, when the process under discussion is conducted so as to leave no changes in any other body than the calorimetric substance. Temperature receives at once the thermodynamic definition in terms of the efficiency of the Carnot cycle. A perfect gas is defined as a substance of which the energy is independent of the volume and the volume inversely proportional to the pressure at constant temperature. The thermal expansion of such a substance must be proportional to the thermodynamic temperature scale. Several propositions concerning isotherms and adiabatics are demonstrated.

Much emphasis is placed on the distinction between thermal and elastic changes and chemical changes. A system in which the former occur freely, but the latter are inhibited, is said to be in chemical constraint. The operator is supposed to possess suitable catalysts, by means of which he can control the velocity, but not the direction, of all changes.

The material of the rest of the book follows conventional lines. Homogeneous gas systems receive the largest share of quantitative treatment. Solutions are considered only in so far as their osmotic pressure obeys the gas law. Heterogeneous systems are described from the standpoint of the phase rule. The ten pages devoted to the third law are essentially a condensation of the corresponding chapter in Nernst's *Theoretical Chemistry*, and contain no reference to American work in this field.

However well this book may meet the special purpose for which it was written, it can hardly be considered as a significant addition to the world's literature of chemical thermodynamics.

ALBERT SPRAGUE COOLIDGE

Quantitative Analysis. By JAMES M. HENDEL, Ph.D., Assistant Professor of Chemistry, Hunter College of the City of New York. Ginn and Company, 15 Ashburton Place, Boston 2, Massachusetts, 1925. vi + 138 pp. 8 figs. 19 × 13 cm. Price \$1.40.

This book is intended to serve as the basis for one year's work in quantitative analysis. Any criticism must be directed mainly toward errors of omission rather than toward those of commission, for the little book is quite good as far as it goes. It is plain, however, that students using this text would be dependent upon class-room instruction for much information which might well be given in an instruction book in quantitative analysis.

The contents are divided into the conventional groups of gravimetric,

volumetric, electrometric and electrolytic methods. The material given in the first two groups is not quite generous enough to enable students to pass examinations given in many universities on the basis of one year's work. Whether this lack is compensated by the devotion of considerable space to the subject of electrometric titrations is an open question. To the reviewer it seems wiser to lay the foundations more firmly, and to reserve electrometric methods for a later course.

The book is well put together, in the main well written, and if accompanied by well planned class-room work, it should prove quite satisfactory for a short course.

PAUL H. M.-P. BRINTON

Gmelins Handbuch der anorganischen Chemie. (*Gmelin's Handbook of Inorganic Chemistry.*) Edited by R. J. MEYER. Eighth edition. The Noble Gases: Helium, Neon, Argon, Krypton, Xenon and Emanation. System No. 1. Published by the Deutsche Chemische Gesellschaft, Verlag Chemie, G.m.b.H., Leipzig-Berlin, Germany, 1926. xxxii + ix + 251 pp. 6 figs. 25.5 × 17.5 cm. Price, singly, M. 39; to subscribers to the entire work, M. 29.50; postage extra.

This volume, the third instalment to appear, is really Volume I of this excellent encyclopedia of inorganic chemistry. In addition to its specific subject matter, it contains a general introductory section, comprising a preface to the entire work, a statement as to the method of presentation, directions for the use of the handbook and a list of the journals referred to and their abbreviated titles.

In the preface, the Editor-in-Chief, R. J. Meyer, describes in greater detail than in previous notices the guiding principles which have determined the scope and nature of this encyclopedic handbook. He reiterates that the whole undertaking will be completed in ten years (1935) and states that in general the order of appearance of the separate parts will be determined by two main considerations, namely, the period which has elapsed since the corresponding volume of the former (seventh) edition appeared and the importance of the element.

As regards the method of presentation, it is of interest that the use of the suffixes *o* and *i* and *ul* and *ür* has been abandoned and the valence number in Roman type substituted; thus, instead of ferrisulfat and eisenchlorür are written eisen^{III}sulfat and eisen^{II}chlorid.

Furthermore, in spite of æsthetic considerations, whenever feasible and exact, the formulas have been substituted for the names of chemical substances. This has unquestionably led to a great saving of space, and doubtless also has actually increased the speed of reading. It is, however, amusing to find this urge toward brevity becoming so pronounced that the editor, a German, protests strongly against the *long polysyllabic* names used by Mellor in his *Treatise on Inorganic and Theoretical Chemistry!*

In the remainder of the volume dealing with the noble gases, there is an introduction telling of the discovery and occurrence of these gases; thereafter, each gas is described separately. The subject matter is of course largely physics rather than chemistry, but the authors have wisely decided to present it fully nevertheless. The literature up to July, 1925, has been covered.

The volume is unique, and will be indispensable in every laboratory and library at all concerned with the noble gases.

The editors collaborating in this volume were Friedrich Struwe, Reinhold Johow and Erich Pietsch.

ARTHUR B. LAMB

General Chemistry: An Elementary Survey Emphasizing Industrial Applications of Fundamental Principles. By HORACE G. DEMING, Professor of Chemistry, University of Nebraska. Second edition, thoroughly revised. John Wiley and Sons, Inc., New York; Chapman and Hall, Limited, London; 1925. xvi + 650 pp. 128 figs. 22 × 14 cm. Price \$3.50.

The introductory chapters of this book, which attained a marked success upon its first appearance about two years ago, have been entirely rewritten. Generalizations, even including a discussion of the structure of the atom, which were formerly scattered in the later chapters, have been gathered together and placed at the beginning. Thus the chapter on oxygen, which began on p. 17 of the first edition, begins on p. 55 in this edition. Teachers who believe that fundamental definitions, laws, and the use of formulas should be presented before any of the systematic consideration of the properties of the elements and their compounds will undoubtedly consider the change an improvement. Teachers, however, who contend that generalizations require some previous knowledge of descriptive chemistry for a foundation will probably not favor the new arrangement. The basis of this criticism is very much weakened by the very successful way in which the author makes use of common things and familiar phenomena to illustrate principles and of clever analogies to clarify more difficult generalizations.

The chapter on organic compounds has been entirely rewritten and somewhat shortened. Otherwise, the descriptive parts of the book are little changed and it retains that characteristic which the author himself stated in the preface of the first edition as follows: "It is hoped that this book may be appreciated for the things it has left unsaid. Most texts contain too much matter that properly belongs in a course of descriptive inorganic chemistry for students specializing in chemistry." By sacrificing what is termed "museum material," space is gained for topics of more lively interest and for a style of presentation more readable, if less concise, than that of many popular texts.

KENNETH L. MARK

Trattato di Chimica Generale ed Applicata all' Industria. Vol. I. Chimica Inorganica. Parte Seconda. (Treatise on General Chemistry in its Application to the Industries. Vol. I. Inorganic Chemistry. Second Part.) Fifth edition revised and enlarged. By Dr. ETTORE MOLINARI, Professor of Chemical Technology, Milan. Ulrico Hoepli, Milan, 1925. viii + 671 pp. 164 figs. 24 × 16.5 cm. Price L. 45.

This "Part" of Vol. 1, paged from 681 to 1351, covers the elements and their compounds, in the scheme of classification followed, from arsenic to boron, of the non-metals, and then all of the metals. Some idea of the extent to which this book is grown may be obtained by a comparison of this "part" with Feilmann's English translation of the third Italian edition of the volume on "Inorganic Chemistry," in which the treatment of the above-mentioned topics covers 244 pages. Thus, there is an increase of 388 pages in this last edition, but also there is a large increase in the use of lower case type; hence, the increase in matter is really greater than the increase in pages alone would indicate. The evidences of revision are everywhere to be observed and the pure as well as the applied and statistical features have benefited. It is amazing how many-sided this presentation of chemistry is and this fact no doubt has, in a large measure, contributed to the wide acceptance this publication has met. It has been much used as a textbook in former editions, but it is becoming now so encyclopedic as to be likely to be used only as a work of reference. It will be found especially valuable for such use because of its wide range of topics, its many points of view, and its evidence of earnest and capable efforts to keep the record up to date.

CHARLES E. MUNROE

Untersuchung und Nachweis organischer Farbstoffe auf spektroskopischem Wege. By Professor Dr. J. FORMÁNEK, in Prag and Professor Dr. J. KNOP, in Brünn. Second revised and enlarged edition. Part second, third instalment. Julius Springer, Berlin, 1926. 208 pp. 41 figs. 12 plates. 24.5 × 16.5 cm. Price, unbound, Reichsmark 36.

The present instalment, the third in this part, deals with yellow dyes, including numerous orange and brown dyes, under three divisions. In the first division, dyes with bands which may be located exactly or with fair accuracy in the usual solvents by visual methods are tabulated in nine main groups and five additional sub-groups. The tables include 231 color types. In the second division are listed 173 color types of yellow dyes which afford visual identification only in solution in concentrated sulfuric acid. The third division, including 60 color types, comprises yellow and brown dyes of which the bands lie principally in the ultraviolet, necessitating the resort to photographic methods of measurement. The index lists 1365 technical brands which were investigated.

Formánek and Knop's methods are spectroscopic rather than spectro-

photometric. The general constitutional groups of dyes are recognized by the general form of their spectra and the type of their modification under suitable modifications of concentration and solvents, and dependence is placed upon precise determinations of the locations of absorption maxima for the identification of individual dyes within these groups. The methods have their limitations. "Dyes tabulated together are not necessarily chemically identical. Band spectra are less accurately located than line spectra, especially near the limits of the visual spectrum. Qualitative spectroscopic identity indicates close constitutional relationship, however, if not complete identity." It may be admitted, however, that their spectroscopic scheme affords a very convenient means of identifying a large number of yellow dyes with as great precision as is ordinarily desired. For a further differentiation between dyes of closely related constitution the determination of suitable spectrophotometric constants (ratios) will doubtless frequently prove effective.

A wealth of spectroscopic data is presented in a field in which previous investigations have been relatively limited and the volume will be indispensable to the dye spectroscopist. An excellent treatment of photographic equipment and technique for the ultraviolet is included.

The long delay in the publication of this third instalment is attributed to the war, to the severe illness of the senior author and to the necessity of investigating photographic as well as visual methods. The fourth instalment, which will deal primarily with vat dyes and lake colors, is promised at an early date.

W. C. HOLMES

Physiological and Clinical Chemistry. By WILLIAM A. PEARSON, M.D., Professor of Physiological Chemistry and JOSEPH S. HEPBURN, Ph.D., Associate Professor of Chemistry, in the Hahnemann Medical College of Philadelphia. Lea and Febiger, Philadelphia and New York, 1925. xvi + 306 pp. 30 figs. 20.5 × 14 cm. Price, \$4.00.

This book is essentially a laboratory manual. It differs from most laboratory manuals in that it includes a considerable amount of text such as is ordinarily found only in textbooks of physiological or clinical chemistry. The subject matter is astonishingly complete; practically all the common tests and methods are presented. While this is a convenience to the mature worker, it must be confusing to a student and to the average clinician who is capable of exercising little critique in evaluating the relative dependability and accuracy of a test or method. While the book contains the great bulk of the quantitative methods that are in common use, their presentation is not very critical and the book is essentially qualitative rather than quantitative. It is a good representative of the type of book which is useful in the kind of qualitative teaching of biochemistry that is rapidly disappearing. The teaching of biochemistry is becoming

quantitative. The point of view of the most progressive teachers is not that of this book. Modern teaching of biochemistry should be not merely quantitative but must be based primarily on the point of view of physical and colloidal chemistry. This book is almost devoid of any treatment of the subject matter from the point of view of these two important branches of modern chemistry. For example, in considering enzymes there is no discussion of equilibria or of the well-known laws of catalysis. There is no discussion of the colloid state. The whole matter of hydrogen-ion concentration is relegated to the Appendix. Methods for its determination are given without any indication of their significance.

The book is a useful one for those who are giving the type of qualitative descriptive course for which it is designed. It is useful to mature workers as presenting in convenient form a nearly complete collection of tests and methods. For such workers, however, its value is impaired by reason of the complete absence of references to the literature. It is not suitable for modern courses which stress the dynamics of living matter, quantitative measurements, and the point of view of physical and colloidal chemists.

CARL L. ALSBERG

Methoden zur Bestimmung der Zusammensetzung der Nahrungsmittel der Pflanzen. (Methods for the Determination of the Composition of Plant-foods.) By H. NEUBAUER. Urban and Schwarzenberg. Friedrichstrasse 105b, Berlin N 24, Germany, 1925. 145 pp. 3 figs. 25.5 × 18 cm. Price, unbound, M. 6.

This book constitutes an integral part of volume XI of Abderhalden's monumental work, "Handbuch der biologischen Arbeitsmethoden." In consequence, its pages run from 467 to 612 and it lacks both a table of contents and an index since these appear only in the final number of each volume. It would have been far more appropriate to have used the supplementary title, "Analyse der Düngemittel," as the name of this publication since its contents are confined almost exclusively to the methods that are employed to determine nitrogen, phosphoric acid, potash and lime in fertilizers. Section one contains such general observations and directions for the execution of analyses as generally appear in works devoted to analytical procedure; section two gives detailed descriptions of the more important methods employed in fertilizer analysis, the determinations of nitrogen in its several forms, phosphoric acid, potash, soda, lime and magnesia being taken up in turn; while section three contains special directions for the examination of commercial fertilizers and particular agricultural materials used as fertilizers. Though the American chemist usually confines himself to the prescribed methods contained in "Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists" yet there is much in Neubauer's work that will prove of value to referees of that Association in their endeavors to perfect those methods, as well as to those interested in the study of the relative accuracy

of different analytical procedures. References are numerous but restricted, with three exceptions, to German articles.

Cochineal, commonly used in this country as an indicator for nitrogen determinations, is not mentioned. Ammonium chloride and sulfate, prepared from synthetic ammonia, are suggested as convenient and reliable substances for standardization in alkalimetric work. The former of these has, in fact, been adopted by the Verein Deutscher Dünger-Fabrikanten in their "Methoden zur Untersuchung der Kunstdüngemittel," Braunschweig, 1925. The Jodlbauer and Förster modification of the Kjeldahl method (involving the use of salicylic acid and sodium thiosulfate) is considered obsolete and displaced by methods (those of Ulsch, Devarda and Arnd) involving reduction by nascent hydrogen. The Arnd method is especially recommended as likely to displace the use of Devarda alloy, and its use in combination with the Kjeldahl procedure is stated to be simpler and more accurate than our official modified Kjeldahl (and Gunning) method for the determination of total nitrogen where nitrate nitrogen is present.

It appears to the reviewer that too much stress is laid on the Lorenz molybdate method for phosphoric acid, the composition of the dry molybdate precipitate being admittedly uncertain. The use of the Lorenz method in physiological investigation where comparatively small quantities of phosphoric acid are to be determined is, no doubt, highly desirable and sufficiently accurate but it cannot and does not meet the needs of the fertilizer chemist. The discussion of the molybdate method with subsequent determination of the phosphoric acid as magnesium pyrophosphate is unusually thorough and good, doubtless due to Neubauer's extensive study of this procedure. His conclusions and results closely check those of Lundell and Hoffman (J. Assoc. Official Agr. Chemists, Vol. 8, No. 2).

The determination of potash as potassium platonic chloride, while official for this country and used by the Verein Deutscher Dünger-Fabrikanten, is merely mentioned and several pages are devoted to the Finkener-Neubauer method whereby the potassium platonic chloride is reduced by illuminating gas and weighed as metallic platinum.

The final section is especially valuable to the chemist confronted with such problems as the determination of perchlorate and chlorate in nitrates, of cyanamide, dicyanamide and calcium carbide in Cyanamid, and so forth.

ALBERT R. MERZ

Gesammelte Abhandlungen zur Kenntnis der Kohle. (Collected papers on Knowledge of Coal.) Edited by Professor Dr. FRANZ FISCHER, Director of the Kaiser-Wilhelm Institute for Coal Research in Mülheim-Ruhr. Seventh volume (for the years 1922-1923). Gebrüder Borntraeger, Berlin, 1925. viii + 308 pp. 25.5 × 16.5 cm. Price, unbound, Gm. 16.50.

This volume contains 43 papers (of which 33 are previously unpublished) and an appendix of brief abstracts of 43 papers published in *Brennstoff*

Chemie. The work of the Kaiser-Wilhelm Institute for Coal Research for the years 1922 and 1923 is reported in these papers.

The subject matter may be grouped as follows: I, Synthesis, starting with carbon monoxide; II, Oxidation of methane; III, Reduction of phenols to benzene; IV, Investigations on primary (low temperature) tar; V, Properties of various kinds of coke; VI, The lignin origin of coal; VII, Electrochemical researches; VIII, Analytical methods; IX, Lectures.

One-third of the volume is devoted to reviews of the literature and giving results of experiments on the catalytic decomposition of carbon monoxide, formaldehyde, methyl alcohol, formic acid, and "Synthol" at various temperatures and in the presence of various metals, metal oxides and carbonates. Chemists interested in syntheses from carbon monoxide and hydrogen will find much empirical information on the effect of contact substances, principally metals, metal oxides and carbonates, on these reactions, and on the reduction of carbon monoxide to formaldehyde and to methanol, at atmospheric pressure. No attempt is made to develop any systematic theoretical treatment of these catalytic reactions from a physicochemical point of view.

Coal chemists will be interested in the group of papers on primary tar, coke, and the origin and constitution of coal, which comprise another third of the book.

The third important group of papers deals with electrolytic investigations on the production of formic acid, the cathodic behavior of carbon in aqueous solutions, the anodic oxidation of formic acid, the electrochemical utilization of solid and liquid fuels, etc. In studying the cathodic behavior of carbon in aqueous solutions, the principal objective was the reduction of carbon at the cathode to methane by the evolved hydrogen. Although the results were negative, the authors are to be commended for publishing this research as well as a number of other researches which likewise led to negative results.

The work of Fischer and his associates should not be judged from the collected papers of this volume but rather by the collected references in the appendix to papers published during this period in *Brennstoff Chemie*, the major researches being published in that journal. The previously unpublished papers which comprise this volume are largely reviews of the literature, minor researches and the various odds and ends that complete the record of the years 1922 and 1923.

A. C. FIELDNER