
NEW BOOKS

Chemical Principles, with Particular Application to Qualitative Analysis. By JOHN H. YOE, Ph.D., Professor of Chemistry, University of Virginia. John Wiley and Sons, Inc., 440 Fourth Ave., New York, N. Y., 1937. ix + 311 pp. 29 figs. 15.5 × 23.5 cm. Price, \$2.75.

A Laboratory Manual of Qualitative Analysis. By JOHN H. YOE, Ph.D., Professor of Chemistry, University of Virginia. John Wiley and Sons, Inc., 440 Fourth Ave., New York, N. Y., 1938. ix + 219 pp. 7 figs. 15.5 × 23.5 cm. Price, \$2.50.

This text is a good example of the modern Leftist tendency in Qualitative Analysis. It offers the student, in a compass of 300 pages, a comprehensive and somewhat amplified review of most of the theoretical material in General Chemistry: fundamental laws, definitions and principles, chemical change, kinetic theory, states of matter, solutions, homogeneous and heterogeneous equilibrium, precipitation theory, complex ions and coordination, pH, oxidation-reduction, kinetics of reactions, thermo-, electro-, and photo-chemistry, atomic structure, colloids. The presentation of each topic is of necessity very brief, with a minimum of mathematics and derivations, but seems satisfactory for general review; the sections on atomic heats, the early periodic table, the gas laws, solubility and washing of precipitates, and osmotic pressure would benefit by revision and a slightly different mode of treatment. The book will provide a substantial basis for a review of chemical fundamentals, but will be criticized by some instructors as containing very little about Qualitative Analysis, being largely a repetition of the student's earlier work, and not offering any appreciable advance in chemical theory for the well-grounded student ready for a course in physical chemistry.

The accompanying Laboratory Manual supplies the basis for a large but flexible course of experimental work, with many preliminary tests in addition to the regular schemes. The method of cation analysis is a composite of the well-known Fresenius and Noyes methods, while the anion identification schemes are based on the groups of volatile, barium, silver, and soluble radicals. The use of organic reagents and spot tests is encouraged and there is a section on Dry Methods of Analysis.

ALLEN D. BLISS

Qualitative Chemical Analysis. Revised edition. By LOUIS J. CURTMAN, Professor of Chemistry, City College, The College of the City of New York. The Macmillan Company, 60 Fifth Avenue, New York, N. Y., 1938. xii + 514 pp. 44 figs. 15 × 22 cm. Price, \$3.75.

A review of the first edition of this text was published in *THIS JOURNAL* in March, 1932 (Vol. 54, page 1257). The second edition resembles the first edition but has been rewritten more nearly completely than most revised texts. The book consists of the usual prefaces, introduction and

appendix and five major parts. The first major part, "Theory," occupies 115 pages and includes discussions of structure of atoms, valence, coordination theory, dipole moments, Brønsted's theory of acids and bases, Kohlrausch's law of independent migration, the complete ionization theory of Debye and Hückel, activity coefficient, ionic strength and all of the other topics usually discussed by texts in qualitative analysis. These ideas are made an integral part of the text, and their applications to analysis are shown. The second and fifth parts of the text furnish information regarding the metal ions and acids or anions, respectively. They include 105 and 48 pages. Besides colors of compounds and their solubilities in water, many applications of theory are made at appropriate points. For instance, solubilities of sulfides are discussed: ZnS in HCl by union of S²⁻ with H₃O⁺; CuS in HNO₃ by oxidation of S²⁻ by NO₃⁻; HgS in aqua regia by oxidation of S²⁻ and also formation of HgCl₄²⁻. Part three deals with problems which would occur in volumetric quantitative analysis. It includes only sixteen pages but part one contains an abundance of problems and exercises based on the other topics treated in the text. Part four, sixty pages, gives directions for preliminary experiments and a systematic analysis for metal ions. Directions for micro analysis and for setting up a system of individual reagents are included in the text. The sixteen-page table of analytical constants included in the first edition has been omitted. The subject matter is well chosen for a year's work in qualitative analysis. The arrangement is logical and the descriptions and explanations as clear and simple as truth permits. References to other books and to journals are frequent. The print is clear and errors are few. It is an improvement on the former edition as well as a modernization and a revision.

F. E. BROWN

Spectroscopy in Science and Industry. Edited by GEORGE R. HARRISON. Proceedings of the Fifth Summer Conference in Spectroscopy and its Applications. Held in Massachusetts Institute of Technology, Cambridge, Massachusetts, July 19-22, 1937. The Technology Press: John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y., 1938. vii + 134 pp. 60 figs. 19 × 25.5 cm. Price, \$3.00.

This conference, held at the Massachusetts Institute of Technology in July, 1937, was probably the largest gathering of practical spectroscopists ever assembled. Thirty-six papers, twenty-nine of which appear in the present volume, comprise discussions of the most varied applications of spectroscopy. The main emphasis, quite understandably, is upon apparatus and method. A spectacular achievement in metallurgical analysis is the posting of a complete quantitative analysis for five impurities in iron by two operators within seven minutes. Absorption measurements, in the visible and in the infrared, serve for rapid analysis of mixtures difficult to separate and

identify chemically; to evaluate degrees of polymerization, molecular arrangements, and reaction rates; and as aids in the solution of biochemical problems in great variety.

Unfamiliarity with modern spectroscopic methods promises to be especially disadvantageous to analysts, but the same will be true, in varying degrees, for workers in other branches of science.

GEORGE S. FORBES

Über die Bildung und den chemische Bau der Kohlen.

(The Formation and Chemical Structure of Coal.)

By PAUL ERASMUS, Ohlau. Verlag von Ferdinand Enke, Hasenbergsteige 3, Stuttgart W, Germany, 1938. viii + 121 pp. 16.5 × 25.5 cm. Price, RM. 10.

This is the twelfth volume of publications in the field of fuel geology, edited by Prof. W. Gothan. The author, Paul Erasmus, who was a colleague of Bergius, was killed in a laboratory accident in 1936, and the purpose of this publication, as stated by the editor in a foreword, is partly to give expression to the interesting points of view of the author, and partly to honor his memory.

That part of the work which has to do with the chemical structure of coal and which will be of greater interest to the chemist, comprises nineteen pages; the balance is devoted to a discussion of investigations of coal formation in nature.

In the part devoted to chemical structure there appear sections on the nature of hydrogen in coal, the oxygen, on the effects of hydrolysis, on the unitary character of coal, and on artificial coal. The greatest part of the chemical investigations upon which these sections are based, are stated to have been carried out in Bergius' laboratory in 1926-1930.

The point of view developed is that coal is a tridimensional polymer of relatively small aromatic and hydroaromatic units, ten carbon atoms each, linked through linear and cyclic ether oxygen bonds, and that the principal mass of the coal is essentially unitary in character. Resins, waxes, coloring materials, cuticles, and so forth, are specifically excluded from the discussion, and the findings are stated to apply chiefly to the bright coals as opposed to the durains.

In discussing the different methods of attack, solvent degradation of bright coal is stated to result in extract fractions of hydrogen-carbon ratios varying from 0.8 to 1.0, but in constant carbon-oxygen ratios of 10.0. The idea that solvent degradation may be due to partial hydrogenation is rejected. By fractional vacuum distillation of the extracts from bright coals it is said to be possible to recover 12.5% of the weight of the pure coal as a substance of composition $C_{10}H_{14}O$.

By primary hydrogenation of bright coals at 360°, a stoichiometric, easily reproducible reaction is said to take place and on the basis of twenty carbon atoms, sixteen are always found in liquid and solid products and four in the form of gases, while half the oxygen remains in organic combination and half is found as water. Based on sixteen carbon atoms the series of products formed contain from twelve to twenty-four hydrogen atoms, but the carbon-oxygen ratio is constant at sixteen to one.

Durain is looked upon as the primary hydrogenation product of bright coal and because of its higher hydrogen

content, its particular value as raw material for commercial hydrogenation is pointed out.

In the section dealing with the nature of oxygen in coal, it is said that up to 50% of the oxygen in the extracts from low rank bituminous coals can be identified as carboxyl by phenylhydrazine. In the degradation products of high temperature alkali treatment, by which yields of 50% of simple products are obtained from natural and artificial bituminous coals, a large part of the oxygen is found as hydroxyl, characterized by acetylation. Hydrolysis is looked upon as taking place in two steps, the first being the opening of the oxygen-containing cycles to form hydroxyl groups, without any considerable change in molecular weight, and the second, the hydrolysis of the linear ether linkages with consequent degradation to small units. This second step is incomplete, conversions are usually 30-40% and in exceptional cases 60-80%, due to the tridimensional structure of the coal as compared with a simple linear polymer like cellulose. Crystalline bodies were obtained by the bromination of the water-soluble hydrolytic products, but no compounds were isolated.

The second part of the book, comprising ninety-four pages, is a comprehensive review of our knowledge of coal formation in nature. There are four broad headings: Humolites, Saprolites, Fusains, and Anthracite and Graphite. Under the Humolites are discussed decay, peat formation, the chemistry of the humic acids, moors and the transformation of various kinds of peat to brown and bituminous coals. Under Saprolites are treated the origins of the dull coals, oil shales, bitumens and petroleum, only a few pages being devoted to the last three. The usual view as to the origin of the Fusains, from forest fires, is accepted. The temperature of transformation of bituminous coals to anthracite is placed at 380° or above.

This book will be of very great interest to fuel geologists and to all those working in the field of coal chemistry. The part dealing with chemical structure is very poorly documented, and important statements and conclusions are inadequately supported by experimental data. Editor Gothan apologizes for this in a foreword, and points out that had the author lived, the experimental data would no doubt have been presented in the scientific journals. Apparently neither author nor editor had knowledge of recent American contributions in the field of the chemistry of coal.

HENRY C. HOWARD

Aanvullingen der Thermostatica. (Supplement to Thermostatics.) By Prof. Dr. J. E. VERSCHAFFELT, University of Ghent, De Sikkel, Antwerp, Belgium. 160 pp. 16 × 24.5 cm.

Instead of preparing a revised edition of his "Thermostatics" [reviewed in *THIS JOURNAL*, 55, 5065 (1933)], the author has preferred to edit an appendix with corrections, in which the same division into chapters and sections is maintained as occurs in the 1933 edition of "Thermostatics." The system of symbols and the nomenclature originally proposed by the Institut International du Froid is still adhered to, although no general agreement among chemists and physicists in different countries has been attained. The significant contributions to physical

sciences of the past decade have been incorporated under new section headings and some space is devoted to familiar topics previously omitted, *e. g.*, the Donnan membrane relationships. In striking contrast to the prevailing tendency of the present day toward specialization, the writer has tried to maintain a proper balance between the physical and the chemical aspects of his subject. Nevertheless, there can be no doubt that *Thermostatics* and its Supplement will appeal more to physicists than to chemists.

H. S. VAN KLOOSTER

Analytische Chemie der Sauerstoffsäuren des Schwefels.

(Analytical Chemistry of the Oxygen Acids of Sulfur.) By Prof. DR. ALBIN KURTENACKER, German Technical Institute, Brünn. Ferdinand Enke Verlag, Hasenbergsteige 3, Stuttgart-W, Germany, 1938. ix + 216 pp. 8 figs. 16.5 × 25 cm. Price, R.M. 18; bound, R.M. 19.60.

This book is a very satisfactory compilation of the information that is to be had on the analytical chemistry of the oxygen acids of sulfur. Methods for the determination of sulfates, thiosulfates, sulfites, sulfides, polythionates, hyposulfites, persulfates and monopersulfates are described and in many cases these are critically discussed. Considerable space is devoted to the determination of the various types of compounds in the presence of one another, and particular attention is given to the interference of one compound in the determination of another. The effects of other substances are also discussed.

The plan of the book is to give qualitative tests for the identification of the different classes of acids of sulfur first, and then to describe quantitative methods of determination. In general, the quantitative discussion includes gravimetric and volumetric methods; in special cases, colorimetric, nephelometric, gasometric and microanalytical methods are also given.

The book carries a good subject index, and is especially rich in references to the literature, some 822 being given. It is a distinct addition to texts that deal with chemical analysis, and should find good use in any laboratory that must analyze for the oxygen acids of sulfur.

G. E. F. LUNDELL

The Analytical Chemistry of Tantalum and Niobium

(Columbium). The Analysis of their Minerals and the Application of Tannin in Gravimetric Analysis. By W. R. SCHOELLER, Ph.D. Foreword by G. ROCHE LYNCH. Nordemann Publishing Company, Inc., 215 Fourth Avenue, New York, N. Y., 1937. xvi + 198 pp. 14.5 × 22.5 cm. Price, \$5.50.

This monograph welds into a comprehensive analytical scheme the analytical methods developed by Doctor Schoeller and his co-workers during the past twenty years, and which have been described in some 33 original papers under the general title: "Investigations into the Analytical Chemistry of Tantalum, Niobium, and their Mineral Associates." In the welding, the old has been liberally fluxed with new material, the scope of which is by no means confined to earth acid analysis.

Of the three parts into which the monograph is divided, the first deals with primary considerations such as tantalum and niobium compounds of analytical importance, the chemical composition of tantalum and niobium minerals, alkaline and acid fluxes, the tartaric acid method for the analysis of tantaloniobate minerals, the hydrofluoric acid method for the analysis of titanoniobate minerals of the rare earths, and other methods.

The second covers quantitative separation methods involving tantalum, niobium, titanium, zirconium, tungsten, thorium, rare earths, uranium, beryllium, aluminum, and iron.

The third contains a discussion of the use of tannin as a reagent, and methods of separation and determination based on its use in the presence of mineral acid, acetate, tartrate, oxalate or ammonia. In addition to the elements just listed, these methods cover vanadium, chromium, manganese, copper, zinc, gallium, tin, and uranium. The monograph concludes with chapters on the detection of tantalum and niobium in minerals, and on the literature dealing with earth-acid analysis.

The monograph brings to fruition the work of a master in the field of earth-acid analysis. It will be found indispensable by anyone who is working in this difficult field, and will be a very worthwhile addition to the library of anyone who is interested in inorganic chemical analysis.

G. E. F. LUNDELL

Hydrophobic Colloids. Symposium on the Dynamics of Hydrophobic Suspensions and Emulsions, under the Auspices of the Colloidchemistry Section of the "Nederlandsche Chemisch Vereeniging." Held at Utrecht on the 5th and 6th of November, 1937. Reprinted from "Chemische Weekblad," 1938. Published by D. B. Centen's Uitg. Mij. N. V., Amsterdam, Holland, 1938. 180 pp. 15.5 × 23.5 cm. Price, Dutch florins 4.

The opening address of the Symposium was made by Dr. J. H. De Boer, President of the Committee on Arrangements. Professor H. R. Kruyt then gave a general introduction in which he pointed out that hydrophobic colloids had been selected for discussion at this Symposium because they are, at least ideally, the simplest of all colloids and offer an opportunity to study advantageously three important types of problems appertaining to all colloidal systems: 1. Why do the particles of a mere suspension tend to adhere to each other? (questions of attraction); 2. what must be done to prevent this? (questions of peptization); 3. what promotes coalescence? (question of flocculation).

The papers were as follows: The first, by Dr. Hamaker, described an ingenious graphical method for the study of the attractive and repulsive forces; the second, by Professor Rutgers, dealt with the electric double layer and its behavior in an external electric field; the third, by Dr. Verwey, on the double layer and stability of lyophobic colloids; the fourth, by Professor Tendeloo, on counter ion exchange with lyophobic colloids; the fifth, by Dr. Voet, on lyotropic effects in lyophobic systems; the sixth, by Dr. Overbeek, on the protective and sensitizing action of hydrophilic colloids on hydrophobic sols; the seventh, by Dr. van der Minne, consisted of (I) general remarks on

emulsions, and (II) emulsification with lyophobic colloids, and the eighth, by I. H. Eilers, dealt with technical applications of base materials in the emulsified state.

After each address there is a printed discussion, often of decided interest.

The account of this Symposium, published in English, will be of great value to students of colloid chemistry, since it represents the most recent work and ideas of an active and progressive group of Dutch investigators.

ARTHUR B. LAMB

A Textbook of Qualitative Chemical Analysis. By ARTHUR I. VOGEL, D.Sc. (Lond.), D.I.C., F.I.C., Head of Chemistry Department, Woolwich Polytechnic. Longmans, Green and Company, 114 Fifth Avenue, New York, N. Y., 1937. xi + 383 pp. 14.5 × 22.5 cm. Price, \$3.00.

Qualitative Analysis. By H. V. ANDERSON, B.Ch.E., M.S., Associate Professor of Chemistry, Lehigh University, and T. H. HAZLEHURST, A.B., Ph.D., Assistant Professor of Chemistry, Lehigh University. Second revised edition. Prentice-Hall, Inc., 70 Fifth Avenue, New York, N. Y., 1937. xiii + 280 pp. Illustrated. 14.5 × 21 cm. Price, \$2.25.

An Elementary Course in Qualitative Analysis. By WILLIAM LLOYD EVANS, JESSE ERWIN DAY and ALFRED BENJAMIN GARRETT, The Ohio State University. Ginn and Company, 15 Ashburton Place, Boston, Massachusetts, 1938. vii + 234 pp. 21 × 27 cm. Price, \$2.00.

The scope of the first of these textbooks of Qualitative Analysis is indicated by the following statement in the preface: "The ultimate object was to provide a textbook at moderate cost which can be employed by the student continuously throughout his study of the subject."

The material is divided into the following sections: The Theoretical Basis of Qualitative Analysis; Analytical Operations; Reactions of the Cations; Reactions of the Anions; Systematic Analysis of Inorganic Substances; Modification of the Systematic Analysis for Phosphate, etc.; Reactions of some Rarer Elements. The theoretical treatment is somewhat more extensive than usual, including the interionic attraction theory, some mention of the proton theory of acids and bases, electrode potentials, calculation of the electromotive force of cells, indicators, and their use for determining hydrogen ion concentrations. This treatment is in general adequate for the purpose, with the minor criticism that in some few cases reactions are explained by mechanisms which seem unnecessary at present. The descriptive material covers the reactions of most importance in qualitative analysis; a considerable number of organic reagents are included. The system of analysis for the cations is, in general, conventional; the procedures are presented in tabular form so that the manipulative directions are somewhat brief. Additional details in regard to the limitations of the methods of separation and the sensitivity of the reactions would be advantageous in a book of this scope. The acidic analysis is confined to certain group tests followed by individual confirmatory tests. The treatment of the rarer elements is brief, the reactions of some thirteen elements being covered in twenty pages.

The text by Anderson and Hazlehurst is a revision of the previous edition by Long, Anderson and Hazlehurst. In the preface to this edition the authors state that they have felt justified in making but few changes in the experimental part of the book; in consequence this review will be largely restricted to the new material. The theoretical presentation has been largely rewritten, has been separated from the related experimental procedures and is now collected in the first hundred pages; in spite of this the treatment appears to be pedagogically effective.

Acids and bases are defined as proton donors and acceptors and an analogy is drawn between the neutralization process and the electron transfer in oxidation-reduction reactions; however, the older viewpoint of the partial ionization of salts is retained. There may be in some cases too great a tendency toward over-simplification for the purpose of clarity of presentation to the student. The physical phenomena of the precipitation process are treated in considerable detail.

A few statements of chemical fact are questioned: for example, the mercurous ion is represented as being monoatomic, while both this text and that of Vogel imply that the cuprous ion is di-atomic, formulas such as $K_2C_{12}(CN)_6$ being given.

An attempt to maintain the interest of the student is made by numerous references to the industrial application of the elements and their reactions. In general, the text appears to be well worthy of consideration for elementary courses where it is not desired to emphasize the more quantitative features of either theory or laboratory practice.

It is stated in the preface that the text by Evans, Day and Garrett is designed for those students for whom elementary qualitative analysis is an integral part of their first or second year study of chemistry. It is more elementary in its approach and more distinctly a laboratory manual than the two preceding books; both the material and procedure of the course are given in considerable detail.

The cation analysis is introduced by a lecture demonstration of the group separations with tabular forms being provided wherein the student is to record his observations. Following this, experiments on the reactions of the cations are given. These are divided into Precipitation and Separation Reactions, Confirmatory Reactions, and Supplementary Reactions. These are followed by the systematic analysis which is shown by tabular outlines carrying the procedures, and by flow sheets. The procedures used are evidently designed more for simplicity of performance than analytical exactness. The anions are presented similarly and some twenty-seven constituents are included. The anion analysis consists essentially of group tests and identification of the individual constituents by separate confirmatory tests.

The theoretical material is collected in the last fifty pages of the book, and the reviewer is pleased to observe that it appears to be designed to explain the experimental phenomena which have gone before, rather than an exposition of the entire field of chemistry. This book should appeal to teachers who feel that the proper approach to qualitative analysis is through demonstration experiments and laboratory work.

The book has flexible cardboard covers and a two-ring-perforated sheet type of binding.

E. H. SWIFT

Combustion, Flames and Explosions of Gases. By BERNARD LEWIS, Ph.D., U. S. Bureau of Mines Experiment Station, and GUENTHER VON ELBE, Ph.D., Coal Research Laboratory, Carnegie Institute of Technology, Pittsburgh, Pennsylvania. Cambridge University Press: The Macmillan Company, 60 Fifth Avenue, New York, N. Y., 1938. xv + 415 pp. 79 figs. 14.5 × 22.5 cm. Price, \$5.50.

It is twenty-five years since Bodenstein first demonstrated, in the hydrogen-chlorine combination, the existence of a chain reaction. That concept has been among the most fruitful in the domain of reaction kinetics in the intervening years not only in pure science but also in the applications of science in industrial life. The present volume is an excellent exemplification of the application of the chain concept to the general field of combustion and in particular to that of hydrogen, carbon monoxide and the hydrocarbons. After a discussion of the theoretical foundations of the chain theory in Chapter 1, three chapters are devoted to the chain reactions of oxidation of the gases just mentioned. One is amazed at the complexity of phenomena revealed by the detailed analysis of processes still largely formulated in the elementary texts by simple stoichiometrically balanced equations of the type $2\text{H}_2 + \text{O}_2 = 2\text{H}_2\text{O}$. The multitude of detailed mechanisms which such an equation hides is revealed in Chapter 2. Even this oxidation is relatively simple compared with the oxidation of even the simplest hydrocarbon. The authors rightly observe that, with these latter, "there is considerably less assurance of discovering unique solutions to the various problems. In any kinetic treatment...at the present time, a certain amount of speculation is unavoidable and it is not surprising to find divergencies of opinion among investigators." The reader should not expect finality in this volume, but may well feel a deep indebtedness to the authors for their incorporation, in the first 125 pages, of the results of their own penetrating and mature consideration, over a period of years, of a great complex of material that has accrued from researches vigorously prosecuted in many important laboratories principally in Russia, Germany, England and the United States. To the assembly of those data a great mass of experiment and excellent technique has been contributed.

The remaining 250 pages of the book, however, have an equally compelling appeal. Emission spectra and ionization, ignition by sparks, the propagation of flames, the influence of vessel shape and motion variables on these flames, stationary and diffusion flames, the theory of burning velocity and detonation, these are among the chapters incorporated in Part II. Beautiful illustrations are employed to clarify the text; see especially pp. 153, 186, 189, 191, 259. Part III discusses the state of the burnt gas with important thermodynamic features properly stressed. Part IV discusses problems in technical combustion including industrial heating and internal combustion engines. It is hard to see how the mind of any chemist, physicist or engineer could not be enormously enriched and enlarged by this presentation of a subject which has al-

ways been rich in fascination to the enquiring mind from the days of the remote ancestors who made the first fires to those who daily put combustion to use either with the Bunsen flame or at the turn of the ignition key in modern motor transportation. Alternatively, the book may be read as an excellent illustration of penetrating scholarship illuminating a by no means elementary field of research.

HUGH S. TAYLOR

Numerical Problems in Advanced Physical Chemistry. By Dr. J. H. WOLFENDEN. Oxford University Press, 114 Fifth Avenue, New York, N. Y., 1938. 227 pp. Price, \$2.75.

This reviewer has never before discovered any set of exercises for students that was even mildly exciting to read through, but here is one that provides very interesting reading indeed. The idea behind this unique book is to give the student of advanced physical chemistry a set of problems each of which is taken from some recently published investigation. In other words, instead of trivial exercises that are obviously merely exercises, these are problems to which some one has actually wanted to know the answers.

There are one hundred and thirty-three problems in the book, covering a very wide range of topics such as Fundamental Constants, Stoichiometry, Gaseous Equilibrium, Heterogeneous Equilibria, Thermochemistry and Thermodynamics, Conductivity of Solutions, Equilibria in Solution, Electrochemistry, Photochemistry, Molecular Structure, Crystal Structure and Radioactivity. References to the original papers from which the data for the problems were taken are given, as well as references to the appropriate parts of certain standard textbooks. In addition, each problem has a footnote containing suggestions and related information. The answers are listed at the end of the book.

Some of the problems are simple enough for use in an elementary physical chemistry course; but probably most of them are more suitable for somewhat more advanced students. They appear to be well chosen and should be of great value to graduate students and advanced undergraduates in physical chemistry.

E. BRIGHT WILSON, JR.

A Text-book on Crystal Physics. By W. A. WOOSTER, M.A., Ph.D., Lecturer in the Department of Mineralogy and Petrology, University of Cambridge. Cambridge University Press: The Macmillan Company, 60 Fifth Avenue, New York, N. Y., 1938. xxii + 295 pp. 107 figs. 14.5 × 22.5 cm. Price, \$4.00.

In this book the author attempts to present the field of classical crystal physics in a form suitable for students having only an elementary knowledge of physics, mathematics and crystallography.

Tensors are introduced in the first chapter and the restrictions imposed upon the tensor components due to the invariance under symmetry operations are discussed. Much space could have been saved in the succeeding chapters if the author had included a little of the algebra of tensors. For instance reciprocal tensors are used implicitly in

several sections of the book, and ought to have been defined in this first chapter.

The following chapters discuss in turn homogeneous deformation, conduction, induction, optics, piezo-electricity, pyro-electricity and elasticity.

In keeping with the assumed deficient knowledge of the reader the presentation is held on an elementary level. As a consequence the treatment is mainly descriptive, and the mathematical formulations, if given, are often sketchy and lack rigor. A discussion of Born's lattice theory was naturally outside the scope of a book of this kind. In a series of tables the author gives, however, qualitative, empirical correlations between observed properties and the atomic arrangement.

The material given in the book is well chosen and organized. While the book is not suited for students who have some knowledge of theoretical physics, it may be warmly recommended to the type of students for which it is written.

W. H. ZACHARIASEN

BOOKS RECEIVED

June 15, 1938-July 15, 1938

- C. G. ANDERSON. "An Introduction to Bacteriological Chemistry." William Wood and Co., Mt. Royal and Guilford Aves., Baltimore, Md. 278 pp. \$4.00.
- WERNER VON BERGEN AND HERBERT R. MAUERSBERGER. "American Wool Handbook." American Wool Handbook Company, 303 Fifth Ave., New York, N. Y. 864 pp. \$3.95.
- ERNEST HAMLIN HUNTRESS. "Problems in Organic Chemistry." McGraw-Hill Book Co., Inc., 330 West 42d St., New York, N. Y. 270 pp. \$2.25.
- L. LANDAU AND E. LIFSHITZ. "Statistical Physics." Translated from the Russian by D. Schoenberg. Oxford University Press, 114 Fifth Ave., New York, N. Y. 234 pp. \$6.00.
- JAMES MURRAY LUCK AND CARL R. NOLLER, Editors. "Annual Review of Biochemistry. Vol. VII." Annual Reviews, Inc., Stanford University P. O., Calif. 571 pp. \$5.00.
- WILLIAM BUEL MELDRUM AND EARL WILLIAM FLOSDORF. "Qualitative Analysis of Inorganic Materials." American Book Company, 88 Lexington Ave., New York, N. Y. 230 pp. \$2.50.
- ADOLPH BERNADOTTE RINGSTROM. "The Ringstrom Three Dimensional System of the Atoms (with Atomic Musical Pitches) and the Theory of Atomic Integration." Vega Publishing Co., 1579 Milwaukee Ave., Chicago, Ill. 87 pp. \$2.50.
- WORTH H. RODEBUSH AND ESTHER K. RODEBUSH. "An Introductory Course in Physical Chemistry." Second edition. D. Van Nostrand Co., Inc., 250 Fourth Ave., New York, N. Y. 468 pp. \$3.75.
- EUGENE P. SCHOCH AND WILLIAM A. FELSING. "General Chemistry. An Introductory Course of Lessons and Exercises in Chemistry." McGraw-Hill Book Co., Inc., 330 West 42d St., New York, N. Y. 524 pp. \$3.25.
- JOSEPH SIYADJIAN. "La Chimie des Vitamines et des Hormones." Second edition. Gauthier-Villars, Éditeur, 55 Quai des Grands-Augustins, Paris VI^e, France. 239 pp. 50 fr.
- HARRY SOBOTKA. "The Chemistry of the Steroids." The Williams and Wilkins Co., Mt. Royal and Guilford Aves., Baltimore, Md. 634 pp. \$8.50.
- A. THIEL, R. STROHECKER AND H. PATZSCH. "Taschenbuch für die Lebensmittelchemie." Walter de Gruyter and Co., Woynschstrasse 13, Berlin W 35, Germany. 173 pp. RM. 8.60.
- C. W. WATKEYS, Editor. "An Orientation in Science." McGraw-Hill Book Co., Inc., 330 West 42d St., New York, N. Y. 560 pp. \$3.50.
- ROBERT R. WILLIAMS AND TOM D. SPIES. "Vitamin B₁ (Thiamin) and its Use in Medicine." The Macmillan Co., 60 Fifth Ave., New York, N. Y. 411 pp. \$5.00.
- JAN ZERNDT. "Les Mégaspores du Bassin Houiller Polonais." Part II. Academie Polonaise des Sciences et des Lettres, 17 Rue Slawkowska, Kraków, Poland. 78 pp. + plates.
- "Gmelins Handbuch der anorganischen Chemie. Systemnummer 22: Kalium." Lieferung 5. Verlag Chemie G. m. b. H., Corneliusstrasse 3, Berlin W 35, Germany 142 pp. RM. 19.50.
- "Gmelins Handbuch der anorganischen Chemie. Systemnummer 25: Caesium." Lieferung 1. Verlag Chemie G. m. b. H., Corneliusstrasse 3, Berlin W 35, Germany. 104 pp. RM. 12.
- "Gmelins Handbuch der anorganischen Chemie. Systemnummer 27: Magnesium." Teil B, Lieferung 2. Verlag Chemie G. m. b. H., Corneliusstrasse 3, Berlin W 35, Germany. 130 pp. RM. 15.75.
- "Gmelins Handbuch der anorganischen Chemie. Systemnummer 63: Ruthenium." Verlag Chemie, G. m. b. H., Corneliusstrasse 3, Berlin W 35, Germany. 124 pp. RM. 16.50.
- "Science in General Education." Report of the Committee on the Function of Science in General Education, Commission on Secondary School Curriculum. D. Appleton-Century Co., 35 West 32d St., New York, N. Y. 591 pp. \$3.00.
- "Tables of Reagents for Inorganic Analysis." In English, German and French. First Report of the "International Committee on New Analytical Reactions and Reagents," of the "Union Internationale de Chimie." Akademische Verlagsgesellschaft m. b. H., Sternwartenstrasse 8, Leipzig C 1, Germany. 409 pp. RM. 34; bound, RM. 36.