Note.—The work of Emil Senn upon which Professor Fierz-David bases his objection to a statement which occurs in my paper (THIS JOURNAL, **49,** 473 (1927)) unfortunately was never published in any chemical journal, nor have I been able to find any reference to it or abstract of it in *Chemical Abstracts, Chemisches Zentralblatt* or in the *British Chemical Abstracts.* I learned of this work quite recently and have since carried out the condensation of 3′,4′-dichloro-2-benzoylbenzoic acid according to the directions given in Senn's dissertation and succeeded in obtaining 4% of the total yield of 1,2-dichloro-anthraquinone. The inference that one might draw from the statement in my paper that no 1,2-dichloro-anthraquinone is formed in this condensation is therefore incorrect and I wish to correct it accordingly. I may add, finally, that in my experiments the yield of 3′,4′-dichloro-2-benzoylbenzoic acid was invariably 70% or better.

M. PHILLIPS

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NEW BOOKS

General Inorganic Chemistry. By M. CANNON SNEED, Professor of Chemistry, University of Minnesota. Ginn and Company, 15 Ashburton Place, Boston, 1926. vi + 674 pp. 132 figs. 21.5 × 14.5 cm. Price, $3.00.

In this textbook, written for students beginning a college course in chemistry, descriptive and theoretical matter are well balanced, probably more so in the first thirty-one chapters than in the remaining fifteen, which are given over largely to descriptive matter on the metals; but in this latter part we find special coördinating chapters on "Ionic Equilibria," "Colloids," "Chemistry in Living Processes" (written by R. A. Gortner), "Electrochemistry" and "Radioactivity." In arrangement and method of presentation, the author has followed a conservative course. Modern theories and recent industrial applications, however, have not been neglected. The structure of the atom is adequately presented in the splendid chapter on "The Periodic System," and the electron concept as applied to chemical changes is clearly and fully illustrated by well-chosen examples in the chapter on "Oxidation and Reduction."

The style is clear; fundamentals are emphasized by a judicious use of heavy type; misprints and mistakes are very rare; the format is of high standard; most of the diagrams of apparatus show complete set-ups; the illustrations include twelve full-page portraits of noted chemists; the historical matter interspersed adds interest and introduces the human element; nearly every chapter is closed with a limited but well-chosen set of questions and exercises of the type which require careful thought and induce discussion in class conferences; a serious, scientific tone

pervades the book; it deserves rank in the group of up-to-date and scholarly texts for first-year work in general chemistry—new and revised—which have appeared within the past three years.

Other distinctive and valuable features are: A model study outline at the end of Chapter II, "Oxygen and Ozone," helpful both to student and instructor. Much information for reference use is incorporated in the 67 tables, for example, Clarke's full table showing abundance of common elements, p. 17; activity of metals, p. 50; critical temperatures and pressures, p. 107; solubilities of some inorganic substances, p. 197; types of organic compounds, p. 424; composition of alloys (3 tables); silicic acids and their salts, p. 431; constants of metals, pp. 442–443; etc. The chemical equation and heat changes are illustrated in the chapter on "Thermochemistry."

Small volumes are expressed in ml. and not cc. As new terms in elementary texts we note: reactants, dissociants, electrovalence, covalence, monosilane, disilane, electrodialysis, heterocyclic compounds. The millimicron is defined correctly, p. 554, but is designated by the symbol for the micromicron. The use of exact atomic weights is stressed in the chapter on "Calculations" by expressing atomic weights to the third decimal place. The role of ions in electrolysis is emphasized, p. 228, but the equally important part the electron plays fails to receive proper recognition. More exercises are needed to show the student how to use the tables and to appreciate their value. There are no lists of references at the end of chapters to stimulate and guide the ambitious student in further study. This help to both student and teacher will probably be supplied in a practical "Teacher's Manual," which the author has in preparation.

HERMAN SCHLUNDT

Properties of Inorganic Substances. A Second Revision and Enlargement of Tables of Properties of Over Fifteen Hundred Common Inorganic Substances. By WILHELM SEGERBLOM, A.B., Instructor in Chemistry at the Phillips Exeter Academy. The Chemical Catalog Company, Inc., 19 East 24th Street, New York, 1927. 226 pp. 23.5 × 16 cm. Price $6.00.

The purpose of this book, as indicated by the author in the preface to the first edition, is to provide a list of properties of inorganic substances to corroborate tests made in qualitative analysis. The common metallic elements and compounds are grouped in the Fresenius order. Properties are tabulated in parallel columns, facilitating the comparison of thirty-six similar compounds of each of these elements. Thirty-four acids and about sixty less common elements are described in the closing fifty pages of the book.

The present edition is considerably larger than the first edition, and has, apparently, been revised in accordance with data made available during the past two years; about fifty per cent. new material has been

included. Quantitative data on solubilities replace qualitative statements made in the first edition, and a number of new compounds have been added to the tables of elements listed. In the opinion of the reviewer it is unfortunate that the price of the book is somewhat greater than the individual student may care to pay for a supplementary textbook.

There is little doubt that the amount of information a student of one or two year's experience in inorganic chemistry is called upon to acquire very greatly surpasses the amount expected from those who studied chemistry when the general sub-division of the subject, at present in vogue, was instituted. It is a natural result of a study of the needs and abilities of students that teachers are turning more to special aids to memory, such as this book, as a supplement to regular textbooks, and it is the opinion of the reviewer that most of those interested in the successful teaching of chemistry welcome these aids as a means of increasing the usefulness of the student's chemical training and improving his method of study.

While it is possible to list some typographical errors and items of doubtful value in this book, it appears that the general reader will not be helped in evaluating the work by such tabulation. In general, it may be said that the book is relatively free from errors, considering the nature and the wide variety of sources from which the information is necessarily drawn. The reviewer is inclined to approve the publication of such books, and feels that other teachers might well examine the descriptive material given in their courses with a view to rendering it more readily available for students.

C. R. HOOVER

Gmelins Handbuch der anorganischen Chemie. (**Gmelin's Handbook of Inorganic Chemistry.**) Edited by R. J. MEYER. Eighth edition, revised. System—No. 2. **Hydrogen.** Published by the Deutsche Chemische Gesellschaft, Verlag Chemie, G. m. b. H., Corneliusstrasse 3, Berlin W 10, Germany; 1927. xxi + 273 pp. 3 figs. 18 × 26 cm. Price, to subscribers, 27 M.; singly, 34 M.

This volume follows closely the lines of the earlier instalments. There is first a single paragraph on the history of hydrogen, quite inadequate in itself and equally so in its references to the literature of the subject. There follow excellent sections on the occurrence, formation, preparation and manufacture of hydrogen, totaling 54 pages, and one on its physical properties, occupying 139 pages. Finally, there are sections of about 20 pages each, on the chemical properties of hydrogen, on the two forms of active hydrogen and on the hydrides. Aside from this connected account of the hydrides, the compounds of hydrogen with other elements are not discussed except incidentally, since hydrogen is preceded in the numerical system adopted for this handbook only by the inert gases.

The literature has been covered up to the end of 1926. The collaborators with the Editor in the preparation of this volume were Erich Pietsch, Reinhold Johow, Friedrich Struwe, Heinrich Böttger and Gertrud Wilcke.

ARTHUR B. LAMB

The Problem of Physico-Chemical Periodicity. By E. S. HEDGES AND J. E. MYERS. With a Foreword by Professor F. G. Donnan. Longmans, Green and Company, 55 Fifth Avenue, New York City, 1926. 95 pp. 15 figs. 22.5 × 14.5 cm. Price $2.75.

The scope of this monograph is indicated by the titles of the chapters: I, Introduction. II, Static Periodicity ("where the periodic property is expressed in terms of some other quantity than time or distance"). III, Periodic Structures (for example, Liesegang rings). IV, Periodic Chemical Reactions. V, The Periodic Catalytic Decomposition of Hydrogen Peroxide. VI, Miscellaneous Periodic Reactions. VII, Periodic Electrochemical Phenomena. VIII, Periodicity and the Metastable State.

There is a Subject Index and a Bibliography arranged as an Author Index. The opinion of the authors that the bibliography is very nearly complete seems well founded.

"The examples of periodic chemical reactions which have been discussed are characterized in the main by heterogeneity of conditions." In the cases considered in Chapters IV and V "periodicity is only realized in the presence of a third constituent," and "the source of the periodicity is in this activating material." It is believed that this material is in a metastable, amorphous form. A close relation to catalysis is evident.

To quote Professor Donnan, "The present work may be warmly commended to the attention of biologists and geologists as well as chemists and physicists."

WILLIAM C. BRAY

Physico-Chemical Geology. By R. H. RASTALL, Sc.D., F.G.S. Longmans, Green and Company, 55 Fifth Avenue, New York City, 1927. vii + 248 pp. 62 figs. 22 × 14.5 cm. Price $6.00.

This little book is the best of its kind that has come to the attention of the reviewer. It reminds one of the "Principles of Chemical Geology," by J. V. Elsden. It is not a mere compendium of physico-chemical investigations, like the German texts, but discusses in a practical way selected topics in geology that are helpfully presented in terms of physical chemistry. Several chapters are first introduced on elementary physical chemistry, dealing with equilibrium, change of state, solutions, etc. The petrology that follows is then elucidated in those terms. This part of the subject matter may be indicated by some of the chapter headings: igneous rocks, mineral formation in igneous rocks, metamorphism, rock-weathering,

salt deposits, ore deposits, refractories and colloids in geology. This material has been critically selected and is consequently free from old, discarded or conventional explanations.

Comparatively few references to recent papers and texts are given. For much that is necessarily omitted in a book of this size the reader is referred to United States Geological Survey Bulletin 770, Clarke's Data of Geochemistry. Reference is also made to Boeke's Grundlagen der phys.-chem. Petrographie, 1915 edition, but not to the 1923 edition or to Eitel's physikalisch-chemische Mineralogie und Petrologie, 1925.

The author adheres to a few chemical terms used more by geologists than by chemists. He also shows a strong preference for British authorities in his references. The geologist should be benefited by the physical chemistry and the physical chemist will find considerable mineralogy, or, more broadly speaking, petrology, in this book. On the whole it is a happy dovetailing of the two fields. The chapter on metamorphism is especially good.

ROGER C. WELLS

Titanium. With Special Reference to the Analysis of Titaniferous Substances. By WILLIAM M. THORNTON, JR., Associate in Chemistry in the Johns Hopkins University. American Chemical Society Monograph Series. The Chemical Catalog Company, Inc., 419 Fourth Avenue, New York City, 1927. 262 pp. 26 figs. 15.5 × 23.5 cm. Price $5.00.

This book is one of the series of monographs prepared under the auspices of the American Chemical Society. It aims to present in compact form all the more important information which has heretofore been presented in dictionaries and in current literature on the subject of titanium.

An introductory section gives in broad outline the circumstances under which the metal was discovered, its occurrence in nature, a general account of the isolation of the metal and the preparation of its important compounds and their industrial applications.

A second section deals with the detection and estimation of titanium in its various associations. The analytical procedure is given in detail for rutile, ilmenite, ferro-titanium, titanium pigment and titanium zinc paint. In other cases the partial procedure is given for the isolation and estimation of titanium alone when associated with other metals. In this analytical section the author has performed a valuable service in collecting and in some cases critically reviewing the large mass of analytical information to be found only in current literature.

The last section gives the methods used by the author in preparing the various reagents with the necessary degree of purity, which are serviceable in the analysis of titaniferous materials.

The book is of special value to the analytical chemist. To the layman the introductory part may give the false impression that titanium plays

a more extensive role in chemical technology than it actually does. As the author states titanium is widely distributed throughout the earth's crust and occurs often in large aggregations from which titanium as oxide is easily extracted. Yet in spite of this it performs but a small function in industry. Its outstanding use is in the preparation of titanium pigments. The alloys of the metal, particularly with iron, have been used as "scavengers" in the past, but this outlet for the material, never very extensive, does not appear to be on the increase. Outside of these two functions the metal is but little used.

It would seem to the reviewer that the research chemist of the future has an important duty to perform in bringing the element titanium into the service of man. To this end Dr. Thornton has taken the first step in bringing all available information into the compass of one volume.

M. A. HUNTER

Colloid Chemistry, Theoretical and Applied, by Selected International Contributors. Collected and edited by JEROME ALEXANDER. Volume I. Theory and Methods. The Chemical Catalog Company, Inc., 19 East 24th Street, New York City, 1926. 974 pp. 324 figs. 16 × 24 cm. Price $14.50.

This is the first volume of a three volume compendium on colloid chemistry. The sub-title of the first volume is Theory and Method; that of the second, Biology and Medicine; that of the third, Technology.

There are in this volume sixty contributions covering the most diverse branches of chemistry and physics, and for that matter of the other physical sciences. One will find not only papers dealing with the behavior of colloids in biology, geology and meteorology but there are papers even on the colloidal aspects of astronomy!

The list of contributors is remarkably cosmopolitan in character, almost every civilized country in the world being represented. It is also a very distinguished one; it includes five Nobel Prize winners.

The articles in general are not cursory and impromptu notes; they are for the most part well considered and thorough reviews of the particular field of colloid chemistry in which the authors are authorities, frequently accompanied by recent and previously unpublished accounts of new researches.

It is beyond the limits of this book review to list the titles of the sixty contributions. I shall, however, in order to indicate the scope of the collection, arrange the papers in classes and give the names of the authors as follows:

There are seven papers dealing with the general theories of colloids, by Jerome Alexander, P. P. von Weimarn, G. Friedel, E. Buchner, J. W. McBain, E. F. Burton, R. A. Millikan; four on surface energy, surface films, etc., by W. D. Harkins, W. H. Bragg, P. L. du Noüy, R. E. Wilson;

thirteen on processes of aggregation, on optical phenomena, meteorology and the cosmos, by W. E. S. Turner, W. B. Hardy, H. R. Kruyt, Albert Einstein, W. H. Martin, René Audubert, Hsien Wu and Daisy Yen Wu, W. E. Gibbs, Carl Barus, W. J. Humphreys, H. T. Barnes, H. N. Russell, W. D. MacMillan; six on thermal, electric and osmotic effects and on the critical state, by F. L. Browne and J. H. Mathews, Leonor Michaelis, J. Errera, J. Duclaux, Irving Langmuir, W. Kopaczewski; thirteen on various aspects of adsorption, by H. Freundlich, H. B. Weiser, Jerome Alexander, H. Wislicenus, H. J. M. Creighton, G. A. Hulett, J. Traube, T. Hagiwara, S. Utzino, A. Lottermoser, A. de G. Rocasolano, Richard Lorenz, L. L. Bircumshaw; three on viscosity, by E. C. Bingham, W. H. Herschel, Emil Hatschek; six on gels and diffusion, by S. C. Bradford, Dorothy J. Lloyd, R. E. Liesegang, H. N. Holmes, H. A. Endres; and finally eight on apparatus useful in colloid chemistry, by Max Poser, R. Zsigmondy, H. Bechhold, T. Svedberg, E. E. Ayres, Jr., Sven Odén, Henry Bassett.

This collection is a splendid achievement and a real tribute to the energy, enthusiasm and breadth of view of its Editor. Indeed, to have secured so distinguished a body of contributors and to have had them function individually and collectively with such success establishes him as an impresario of the first rank. Finally, his phrase in the Preface that "It is we who are simple, not Nature" deserves perpetuation.

ARTHUR B. LAMB

Enzymes: Properties, Distribution, Methods and Applications. By SELMAN A. WAKSMAN, Associate Professor of Soil Microbiology, Rutgers University; Microbiologist, New Jersey Agricultural Experiment Station, and WILBURT C. DAVISON, Associate Professor of Pediatrics, Johns Hopkins University; Associate Pediatrician, Johns Hopkins Hospital (more recently, Dean of the School of Medicine, Duke University). The Williams and Wilkins Company, Baltimore, 1926. xii + 364 pages. 11 Figs. 23.5 × 15.5 cm. Price $5.50.

The purpose of this book is stated by its authors in their preface as follows: "It has been our endeavor to collect in as concise form as possible the available information in regard to enzymes and to indicate the original sources from which more detailed knowledge may be obtained. Anyone who attempts a study of enzymes cannot fail to be struck by the vast accumulation of literature on the subject, while at the same time he will be confused by the many apparently contradictory results that have been published. Over two thousand references have been consulted—most of them in the original—the others in abstracts which have appeared in various journals. To piece these irregular and loosely fitting fragments together into a mosaic upon which future studies may rest is the object of this book." In the judgment of the reviewer, the authors in thus stating their purpose have also offered a word which well characterizes their work;

it is a carefully wrought mosaic rather than a unified thesis or a flowing narrative.

The section entitled "properties of enzymes" occupies 56 pages; "distribution of enzymes," 62 pages; "methods for the preparation and study of enzymes," 131 pages; "practical applications of enzyme activity," 14 pages; bibliography, 78 pages; index, 14 pages.

In view of the professional interests of the authors, as mycologist and physician respectively, it is natural to find that the medical and microbiological aspects of the subject are more fully developed than the technological or the purely chemical. Chemical theories of enzyme action are much less ambitiously treated than by Falk, and many descriptive matters are developed less fully than by Oppenheimer and Kuhn; but Waksman and Davison, defining enzymology as a branch of biology and reviewing with special care and thoroughness some of the more biological aspects, have also presented to the science of chemistry the best effort which the reviewer has yet seen to condense into a single readable volume, a judicial and reasonably symmetrical account of those whole fields of science in which enzymes play a dominant role and to connect effectively their concise text with the original literature of this comprehensive subject. And the chemist, realizing his debt to these authors, does not feel inclined to dwell too heavily upon the occasional loose use of a chemical term, as when zymases are said to "hydrolyze" sugar (p. 244), nor to complain too bitterly at a choice of boundaries which includes less well defined oxidases while omitting glutathione. Dogmatic statements are encountered to a somewhat greater extent than might be anticipated in view of the preface; but the prevailing tone of the book is commendably unbiased throughout, and its breadth of view and careful correlation of readable text with comprehensive bibliography will make it useful both to students of divergent interests who wish general information on enzymes and to special students of the subject who will profit by this introduction to the extensive original literature of both animal and vegetable enzymes, including those of the microörganisms.

Perhaps as an inevitable concomitant of its comprehensiveness, the text sometimes presents a compilation of opinions rather than an attempt to analyze the actual experimental evidence upon a doubtful or disputed point. It is a pity that this should result in a failure to recognize the importance of the excellent work upon the chemical nature of malt amylase which was published by T. B. Osborne in THIS JOURNAL over thirty years ago.

H. C. SHERMAN