fications, followed by a slower interconversion of α and β pyranose modifications. These velocity coefficients, $m_1 = 0.0792$ and $m_2 = 0.357$, are greater than any which have been reported previously in the sugar series.[4] The velocity coefficient for the rapid reaction is approached closest by the value $m_2 = 0.311$ for the compound D-mannose·$CaCl_2$·$4H_2O$ of Dale,[5] which appears from the evidence of Isbell[6] to be a furanose form. It is possible that our crystalline D-altrose also represents a furanose form. By extrapolation, the initial specific rotation of D-altrose would be about $-69°$; in accordance with the usual nomenclature it is designated tentatively as a β-modification.

In view of the extremely rapid change of rotation which occurs within the first three minutes after altrose is dissolved in water, and the resulting uncertainty in the calculated rotation at zero time, we plan to make additional measurements within that period, as well as at a lower temperature, the results to be reported in a subsequent communication.

(4) See F. J. Bates and Associates, "Polarimetry, Saccharimetry and the Sugars," United States Government Printing Office, Washington, D. C., 1942, pp. 442, 762.

(5) Dale, THIS JOURNAL, **51**, 2788 (1929).

(6) Isbell, *ibid.*, **55**, 2166 (1933); Isbell and Pigman, *J. Research Natl. Bur. Standards*, **18**, 141 (1937).

DIVISION OF CHEMISTRY NELSON K. RICHTMYER
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RECEIVED MARCH 8, 1943

NEW BOOKS

A Textbook of Biochemistry. By ROGER J. WILLIAMS, Ph.D., D.Sc., Professor of Chemistry, University of Texas. Second edition. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y., 1942. x + 533 pp. Illustrated. 14 × 22 cm. Price, $4.00.

The first edition of this textbook was published in 1938. In the present revision, the author states in the preface that he has attempted to introduce the most outstanding advances of the past few years without altering in any essential manner the original outline of the text. The chapters on "Essential Food Constituents" and "Biochemical Catalysts" have undergone the most revision. Most of the other chapters remain largely unchanged. Errors in the first edition, pointed out by THIS JOURNAL'S reviewer, still remain. There is also carried over from the first edition the misleading statement (page 90) that hemoglobins may *unite* with oxygen to form methemoglobin.

It is disappointing to find that the chapter on intermediate protein metabolism presents so little of the data obtained by the use of isotopes which provides us with our current concepts in this field. The name of Schoenheimer does not occur once in this chapter. The synthesis of creatine in the body from glycine, arginine, and methionine is briefly stated without giving any of the beautiful evidence that has been obtained to warrant such a statement. Limitations of space undoubtedly make this necessary where there is so much ground to cover, and certainly the author does an excellent job of covering all the essential phases of biochemistry. The reviewer is, however, apprehensive that the growing trend in textbooks to present only the "cold dope" without the experimental evidence behind it tends to develop students lacking in the ability to critically judge and evaluate scientific information.

As users of the first edition can testify, the author possesses the ability to present the facts in a clear and lucid manner. This textbook can be recommended as a valuable aid for the introduction of the general student to the subject matter of biochemistry.

ERIC G. BALL

General Inorganic Chemistry. By M. CANNON SNEED, Professor of Chemistry, and J. Lewis Maynard, Assistant Professor of Chemistry, in the School of Chemistry, University of Minnesota. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y., 1942. xviii + 1166 pp. 180 figs. 14.5 × 22 cm. Price, $4.50.

A partial examination of the book before looking at the preface left the reviewer in doubt as to whom the book was intended to serve. Chapter 1, "Some Fundamentals," gives simple definitions and elementary descriptions of a few typical chemical phenomena. Chapter 2, "Atomic Theory and Structure of the Atom" seems to take for granted a wide knowledge of descriptive chemistry, of electrical phenomena and the laws of physics, and it deduces chemical properties including ionic valence, covalence and coördinate covalence, from the assumed electron groupings. Chapter 3, "The Periodic System," deals with the historical development of the idea, without the reader having been given more than a hint that there are a number of elements. Chapter 4, "Oxygen and Ozone," is mostly conventional descriptive matter evidently, except for a few theoretical points, at the level of absolute beginners in science.

The whole book is one of 1166 pages, which is much larger than the usual college textbook of chemistry and

a quick running through of the remaining pages revealed that many of the perplexing modern developments of science were treated: X-ray analysis, electron diffraction, resonance, hydrogen bond, Brönsted–Lowry formulation, Debye–Hückel theory, activity coefficients, ionic strength, leveling effect of water on acid strength, theory of indicators, oxidation and reduction potentials, indicators for oxidation and reduction titrations, isotopes, mass defects and packing fractions, plastics, vitamins, hormones, coordination complexes, inner complex salts, natural and artificial radioactivity, uranium fission, alloy phase diagrams. The seeming inconsistency of completely elementary descriptions and explanations on the one hand and delving in very advanced and still controversial matters on the other hand left doubt whether the book was intended for beginning college students or mature chemists who sought information concerning the new developments.

A glance now at the preface revealed that the authors did intend the book for elementary students. They admit that it is more extensive in scope than most Inorganic Chemistries and that the subject matter is too extensive to be covered completely in any course, yet the fullness of the treatment permits the selection of material. It is rather a comfort to be told that fourteen of the forty-seven chapters may be omitted *in toto* without breaking the continuity of the treatment, but one then gets quite a shock to find that Chapter 2 is not included in the fourteen.

Acids, bases, and salts are treated entirely in terms of the Brönsted–Lowry formulation. But it may be said of the authors of this book that they do not commit the grievous mistake of most expounders of the Brönsted formulation, of making it appear that the hydrogen ion is the only ion which is hydrated in aqueous solution. It is true that they do without exception write the hydrogen ion as H_3O^+ and for the most part give the formulas of metal ions without showing the hydration. Yet they do state clearly that hydration of ions is general and at least once they even give the formula with hydrate water, $[Ag(H_2O)_2]^+$ on page 467.

The reviewer admits that although he admires the ingenuity of the Brönsted formulation, he dislikes its use in beginning chemistry.

In the first place it is awkward to untangle the meaning of H_3O^+—it would be less difficult if it were written $H{\cdot}H_2O^+$; but even then why is it any more necessary to put the H_2O in this formula than in, for example, $[Ca{\cdot}6H_2O]^{++}$. To write H_3O^+ every time instead of H^+ needlessly consumes a lot of space.

In the second place the Brönsted formulation distorts the long established meaning of the terms acid and base. The enthusiasts who use this formulation should have adopted new words. No one can object to calling the chloride ion a proton acceptor, but it is irritating to have it classed as a base.

And in the third place there is no phenomenon connected with acids and bases which can be any better formulated in the Brönsted language than in the old fashioned language of hydrogen ion as a component of an acid and hydroxyl ion as a component of a base, if only one keeps in mind that the simple hydrogen ion H^+ exists in water only when hydrated—maybe H_3O^+, maybe $H_5O_2^+$ or $H_7O_3^+$. Failure of the Brönsted advocates to be consistent and write the formulas of metal ions with hydrate water obscures the important fact that hydration is a necessary condition to the existence of the kind of ions that are found in water solution.

One wonders why the authors did not go all the way in modernity and adopt the electron pair acceptor and donor formulation of acids and bases.

All three formulations are of course so exactly equivalent to each other that one should not get heated over the difference. They simply place the emphasis somewhat differently. It does seem, however, as if the beginning student should first acquire the formulation that is simplest to use. Then, as he advances, it will complete his comprehension when he can see that all three formulations are equivalent.

The book abounds in historical citations and pictures of the great men of chemistry. Many of the pictures and their accompanying descriptions are taken from the *Journal of Chemical Education*. Also many of the reading references are to that Journal, all of which gratifyingly shows that it is fulfilling some of its intended functions.

Many excellent tabulations appear throughout the text, but there is no appendix where condensed information and data may be found without hunting.

Any teacher who wants a thoroughly up-to-date book and one which has an abundance of material from which to choose, and one which gives an excellent treatment of the standard facts and generalizations of chemistry as well as historical developments and modern economic conditions and industrial processes, will find great satisfaction in this book.

On the other hand, up-to-dateness has drawbacks. Undigested and still foggy theories certainly cause bewilderment and perhaps unwarranted discouragement. Imagine a book which avoided any development, theoretical or practical, of the last twenty years. No publisher could be induced to take such a book, but some teachers know that it would give the student of first-year chemistry a foundation that would enable him in later courses to really comprehend recent developments.

Mere acquaintance with the new words introduced during the last twenty years does not promote an understanding of chemistry. It may give one an ability to impress an uninformed audience, but it does inculcate slipshod habits of thinking.

ARTHUR A. BLANCHARD

How to Solve Problems in Quantitative Analysis. By SAUL B. ARENSON, Professor of Inorganic Chemistry, University of Cincinnati. Thomas Y. Crowell Company, 432 Fourth Avenue, New York, N. Y., 1942. viii + 89 pp. 14.5 × 21.5 cm. Price, $0.75.

This little book first appeared as a lithoprinted edition (reviewed THIS JOURNAL, **60**, 3091 (1938)) and its reception has warranted a regular printing. It has been expanded considerably in revising, but the author has retained in the text sections the conversational conference style of the earlier edition, while presenting logarithms and significant figures, gravimetric calculations of all sorts, acidimetry work including double indicator titrations, oxidimetry (with permanganate, iron, calcium, dichromate, iodine, thiosulfate, copper and sulfur), and a short section

of precipitation titrations. The discussion is written in very understandable form, with good illustrative examples. Work for the student is provided by 272 problems, the answers being given without decimal points.

ALLEN D. BLISS

An Outline of Organic Chemistry. By ED. F. DEGERING and ninety-six Assistant Editors. Fourth Edition. Barnes and Noble, Inc., Fifth Avenue at 18th Street, New York, N. Y., 1942. xi + 386 pp. 13.5 × 21 cm. Price, $1.25.

The Quadri-Service Manual of Organic Chemistry. By EDWARD F. DEGERING, Associate Professor of Chemistry, Purdue University, under the general editorship of Herman T. Briscoe, Professor of Chemistry, Indiana University. Houghton Mifflin Company, 2 Park Street, Boston, Mass., 1942. 221 pp. 21.5 × 28 cm. Price, $2.50.

The Work Book of Fundamental Organic Chemistry. By ED. F. DEGERING, Department of Chemistry, Purdue University, Lafayette, Indiana, and One hundred eleven Collaborators. Barnes and Noble, Inc., Fifth Avenue at 18th Street, New York, N. Y., 1941. 256 pp. 21.5 × 28 cm. Price, $1.25.

Fundamental Organic Chemistry. By ED. F. DEGERING, Chemistry Department, Purdue University, West Lafayette, Indiana, and One hundred six Collaborators. John S. Swift Co., Inc., Third and Vine Streets, Cincinnati, Ohio, 1942 (Reproduced by Photo-Offset and Planographed). x + 485 pp. Illustrated. 15.5 × 23 cm. Price, cloth binding, $3.00; paper binding, $2.00.

The material used in, and adapted to, Professor Degering's vigorous and independent teaching methods at Purdue has been made available to other instructors of organic chemistry by this set of four companion works.

Outline.—In some quarters "outline" books are regarded with suspicion. From first-hand experience with this one in an intensive six weeks' course covering the work of two semesters, the reviewer can say that this little volume is well and discriminatingly prepared and that it makes a very satisfactory book for student use, when the material presented is amplified and modified, as the authors have suggested, by the lecturer's own presentation. The present volume differs from its predecessor in that it contains a complete revision of the chapter on heterocyclic compounds and new chapters on fibers, surface agents, and the literature of organic chemistry.

Quadri-Service Manual.—As its name indicates, this volume is designed to serve a four-fold purpose. It offers (1) a set of well-chosen experiments with an approach to semi-micro procedures, (2) a duplicate note-book, (3) a set of objective tests, and (4) a theoretical approach to the laboratory work. The advantages of each of the characteristics need no elaboration. The objective tests are designed for student self-testing. With chagrin the reviewer admits his failure to create sufficient student initiative consistently to bring about self-testing unless "teeth" are involved in student failure to participate. It is a pleasure to find ruled but otherwise blank pages for reports. The armed forces, industry, research institutions, graduate schools, and long-suffering instructors unite to decry the well-nigh universal inability of scientifically trained youth to write decent, concise, informative reports. It is a truism to point out that one learns by doing. The author is to be commended for putting the burden of organizing and writing reports where it belongs—on the student.

Work Book.—The reviewer is of two minds concerning this volume. Its use with any text and well-designed laboratory manual would foster learning by repetition. That is good. The book includes many specific questions for the student to answer. That is both good and bad. From these questions the beginner can get an idea what is most important, what less so, and doubtless learns a lot of facts. Discrimination can, however, the reviewer opines, best be cultivated the hard way. The student should read, try to evaluate the material, select significant things to retain as his own for future use, organize that material, and then possess himself of it. Without meaning to be too severe on the book or on correspondence courses, the reviewer feels the work book would be admirably adapted for courses of the latter type rather than courses wherein exist opportunities for free discussion with questioning in both directions, *i. e.*, by the class of the instructor and *vice versa*.

Fundamental Organic Chemistry.—Shades of Sherlock Holmes and the riddle of the dancing men! A book at the college level with "funny pictures"! The reviewer is perhaps too conservative, and he is also familiar with the Chinese proverb concerning the word-value of pictures, but he could not bring himself to use in college a book employing the cartoon method for teaching even so important a subject as electronegativity. This is the author's justification for the Walt Disney aspect of this otherwise good text. The material given in the little outline has been expanded and presented in usual book form in this volume. The subject matter is carefully organized into five divisions: (1) "kaleidoscopic" survey, (2) the aliphatic, (3) the alicyclic, (4) the aromatic, and (5) the heterocyclic series. Paragraphs are numbered for easy cross reference purposes. Numerous well-chosen footnotes refer the student to the original literature. Hope springs eternal! Will even 5% of a class ever avail themselves of these suggestions? Whatever the answer, their inclusion is more than justified.

G. ALBERT HILL

Semimicro and Macro Organic Chemistry. A Laboratory Manual. By NICHOLAS D. CHERONIS, Chicago City Colleges. Thomas Y. Crowell Company, 432 Fourth Avenue, New York, N. Y., 1942. xiii + 388 pp. 14.5 × 22 cm. Price, $2.75.

In the preface, the author of this manual states that it is based on six years of experience in teaching laboratory practice in elementary organic chemistry on the semimicro scale. In his opinion this method offers the following advantages: "(1) it permits better adaptation of the laboratory work to the varying needs of students; (2) it teaches students greater care, cleanliness, and manipulation; (3) it is more economical; and (4) it reduces substantially the seriousness of possible accidents. . . ."

Accordingly, a considerable portion of this manual is devoted to experiments which have been planned to be conducted on the semi-micro scale. At the same time, the author realized that many instructors would prefer to adopt this new laboratory procedure gradually, by trying at first only a few of their experiments on the reduced scale, and he made it possible for them to do so by incorporating dual directions for most of the experiments so that they can be performed on either a macro or semi-micro scale.

There are seventy experiments described in this manual, nine on introductory exercises in organic laboratory technique, including the theory of basic organic operations, thirty-three on the preparation and properties of simple organic compounds, and twenty-eight on more advanced preparations. However, it may be stated that the experiments chosen offer little novelty, and the outstanding feature of this manual is the description of semi-micro technique. The apparatus and manipulations characteristic of the small scale experiments appear to have been worked out with considerable care, and the experience of the author with this type of operation has aided in the development of satisfactory, workable procedures. The apparatus has been designed for simplicity and availability and should be within reach of almost any laboratory. It is very well described and illustrated with drawings. The experimental procedures are very completely described, with great attention to technical details. The book is, therefore, of particular interest to those who are considering a course of instruction in organic laboratory work on the small scale.

ALBERTO F. THOMPSON, JR.

X-Ray Crystallography. By M. J. BUERGER, Associate Professor of Mineralogy and Crystallography, Massachusetts Institute of Technology. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y., 1942. xxii + 531 pp. Illustrated. 15.5 × 23.5 cm. Price, $6.50.

The rather narrow scope of this admirable book is suggested by the subtitle, "An introduction to the investigation of crystals by their diffraction of monochromatic x-radiation." It is a complete, up-to-date and detailed reference work for three main subjects: the geometry of direct and reciprocal crystal lattices; the ingenious methods used to register monochromatic diffraction effects of crystals on photographic films; and the interpretation and measurement of such films to obtain the complete lattice constants of crystals, and as far as possible their space groups and symmetry properties. Under the second heading are described both the older stationary film-moving crystal methods, and at greater length the newer moving film-moving crystal methods which have been widely adopted, and in whose development the author himself has played a large part. To this reviewer it would have been appropriate to include a chapter on the stationary film-stationary crystal or Laue method as the most direct way of determining axial symmetries, even if it does require continuous X-radiation.

This well-illustrated, well-documented, well-printed and generally well-written book will be widely used by students, systematic crystallographers and structural crystallographers. They will find relatively few exceptionable statements and very few slips of the proofreader. One may hope for a logical companion volume to the present one which will give a similarly detailed treatment of the second part of X-ray crystallography, namely, the deduction from photographic intensity data of the structure of the unit cell; for these two subjects have by now arrived at stages of approximately equal maturity.

C. D. WEST

BOOKS RECEIVED

February 10, 1943–March 10, 1943

EDWIN J. COHN AND JOHN T. EDSALL. "Proteins, Amino Acids and Peptides as Ions and Dipolar Ions." (A. C. S. Monograph.) Reinhold Publishing Corporation, 330 West 42nd Street, New York, N. Y. 686 pp. $13.50.

EVELYN G. HALLIDAY AND ISABEL T. NOBLE. "Food Chemistry and Cookery." The University of Chicago Press. 5750 Ellis Avenue, Chicago, Ill. 346 pp. $3.00.

FRITZ MAYER. "The Chemistry of Natural Coloring Matters." Translated and Revised by A. H. Cook. (A. C. S. Monograph.) Reinhold Publishing Corporation, 330 West 42nd Street, New York, N. Y. 354 pp. $10.00.

JOHN READ. "Explosives." Penguin Books Ltd., Harmondsworth, Middlesex, England, and 41 East 28th Street, New York, N. Y. 159 pp. 9 d.

WILBER STOUT. "Dolomites and Limestones of Western Ohio." Geological Survey of Ohio, Fourth Series, Bulletin 42. Division of Geological Survey, State of Ohio, Department of Education, Columbus, Ohio. 468 pp.

W. SWIETOSLAWSKI. "Coke Formation Process and Physico-Chemical Properties of Coals." Polish Institute of Arts and Sciences in America, New York City. Herald Square Press, Inc., 233–45 Spring Street, New York, N. Y. 145 pp.