
 BOOK REVIEWS

Superfluids. Volume I. Macroscopic Theory of Superconductivity. By FRITZ LONDON, Duke University. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1950. viii + 161 pp. 15.5 × 23.5 cm. Price, \$5.00.

This first volume of "Superfluids" is an excellent addition to the Wiley Structure of Matter Series. The book is largely devoted to an exposition of the electrodynamic theory of superconductivity which was first developed in 1934 by the author and his brother, H. London. Following a review of the crucial early experiments and the thermodynamics of the transition from the normal into the superconducting state, the electrodynamic theory of the pure and intermediate superconducting state are discussed in detail. The mathematical treatment is presented in a very lucid fashion and wherever possible the consequences of this macroscopic theory are compared with experiment. Particularly interesting features of the book are the suggestions for additional experiments and the concluding section in which Professor London discusses the eventual form of the molecular theory.

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Advances in Enzymology and Related Subjects of Biochemistry. Volume X. Edited by F. F. NORD, Fordham University, New York, N. Y. Interscience Publishers, Inc., 99 Livingston Street, Brooklyn 2, New York, 1950. ix + 533 pp. 16.5 × 23.5 cm. Price, \$7.50.

This marks the tenth anniversary of a publication which has been well received from the start and has proved its value to those interested in enzyme research. An increasing number of workers in all branches of the biological sciences have come to regard enzymatic reactions as basic to the interpretation of biological phenomena. This intensified interest makes critical and up-to-date reviews of selected topics of considerable importance. The editor, F. F. Nord, has exercised sound judgment in the selection of authors (on an international scale) and subject matter, and it is largely this factor on which success of a publication of this sort depends.

The present volume, somewhat bigger than its predecessors, contains the following articles: "Blood Clotting and Related Processes" by Tage Astrup. Although this subject was reviewed by E. Chargaff in Volume V, important new developments in this field made it desirable to present certain aspects of the problem in the light of recent findings, particularly as they relate to the mechanism of formation of thrombin. "Tryptophanase-Tryptophan Reaction" by F. C. Happold. A number of bacterial species, particularly the *Escherichia coli* group, are known to convert tryptophan to indole. With cell-free, purified bacterial enzyme preparations which require pyridoxal phosphate as coenzyme, the products of the anaerobic reaction are indole and pyruvic acid in molar ratio and a somewhat greater proportion of ammonia. Synthesis of tryptophan from indole and serine has been effected with enzyme preparations of *Neurospora* which also require pyridoxal phosphate as coenzyme. "Alkaline Phosphatase" by Jean Roche and Nguyen-Van Thoi. The fact that this enzyme has not so far been obtained in pure form has made it difficult to arrive at definite conclusions with respect to substrate specificity, pH optimum, effect of activating ions and of inhibitors. Prolonged dialysis of phosphatase preparations at certain characteristic pH zones leads to dissociation into an apoenzyme and a dialyzable coenzyme. Reconstitution of the enzyme can be effected only in the presence of certain divalent cations, of which Mg⁺⁺ is probably the physiologically active one. The nature of the coenzyme is being investigated in several laboratories and an elucidation of its structure would mean considerable progress in this field. "Synthesis of Disaccharides with Bacterial Enzymes" by W. Z. Hassid and M.

Doudoroff. Some species of bacteria possess an enzyme which catalyzes the following reversible reaction, sucrose + orthophosphate \rightleftharpoons glucose-1-phosphate + fructose. The equilibrium of the reaction is unfavorable for sucrose synthesis and this leaves open the question whether such a mechanism is in operation in higher plants containing often a high percentage of sucrose. Fructose can be replaced by several other monosaccharides and in this manner new disaccharides have been synthesized of which 3-[α -D-glucopyranosyl]-L-arabinopyranose is the most interesting. Of particular importance for the mechanism of the enzymatic reaction was the demonstration by these authors that the enzyme, when acting on glucose-1-phosphate alone, catalyzed an exchange of phosphate (labelled with P³²) between the organic and inorganic fractions. "Some Aspects of Streptomycin and Other Streptomyces Antibiotics" by Norman Brink and Karl Folkers. Over 1,000 papers on streptomycin have appeared in the literature since the isolation of this substance in crystalline form in 1945. The present paper gives a complete exposition of the chemistry of this and related antibiotics. "Problems of the Citric Acid Cycle" by C. Martius and F. Lynen. This is a clearly written and very readable presentation of one of the most active fields of biochemistry—the oxidative pathway of carbon fragments (C₃ and C₂) derived from our common foodstuffs. The similarity of this pathway in yeast and in animal tissues is emphasized. "Sulfur Compounds in Plant Tissues" by Theodor Bersin. A comprehensive review containing nearly 400 references. "Chemical Changes in the Harvested Tobacco Leaf. Part II. Chemical and Enzymic Conversions during Fermentation and Aging" by Walter G. Frankenburg. Part I appeared in Volume VI. This review is primarily of technological interest; it contains rather extensive tabular material and references to otherwise not easily accessible sources of literature. "Assimilation of Hydrocarbons by Microorganisms" by Claude E. ZoBell. Practically all kinds of hydrocarbons are susceptible to attack by bacteria and allied organisms. These include gasoline, kerosine, lubricating and fuel oils and paraffins, to name but a few. Even toluene, xylene and naphthalene, ordinarily regarded as antiseptics, are attacked by certain microorganisms. Hydrocarbons can be utilized as the sole carbon and energy source by certain bacteria. Oil prospecting methods are being developed, based on an analysis of soil bacteria. A number of other practical applications are pointed out.

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Physical Chemistry of High Polymer Systems. High Polymers Series. Volume II. Second Edition. By H. MARK, Director, Institute of Polymer Research, Polytechnic Institute of Brooklyn, Brooklyn, New York, and A. V. TOBOLSKY, Assistant Professor of Chemistry, Princeton University, Princeton, New Jersey. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1950. xi + 506 pp. 16.5 × 23.5 cm. Price, \$6.50.

The science of high polymers was born and passed through its infancy in the second and third decades of this century. During that interval the naïveté, as well as the mercurial nature, of childhood gave way to more careful and reasoned observation; a new discrimination brought into focus the really essential problems. The necessity of seeking a physical chemical solution to these problems and indeed of applying the methods and philosophy of physical chemistry to all aspects of the new polymer science were never more stoutly advocated than by Professor Mark. To emphasize this approach was the mission of the first edition of "The Physical Chemistry of High Polymeric Systems" published in 1938 (American edition, 1940). It is likely that the rapid coming of age of polymer science in the short time since 1938 has been in no small degree due to this book. The in-

fluence of this book stems as much from its service in enlisting many physical chemists in the exploration of this rich field as from its essential correctness in approach. It is, therefore, a particular pleasure to examine the second edition of this work in which Professor Tobolsky has joined.

In the first edition the first two-thirds of the book were devoted to a review of physical chemical considerations thought to be relevant to high polymers and the remaining third treated the important theoretical and experimental studies of high polymers. In the present edition this proportion is reversed mostly by expanding the later sections. We find that the first seven chapters are primarily discussions of the determination of molecular structure, valence, crystal structure and the liquid state with the application to polymers holding second place. Then there is an abrupt shift of emphasis to high polymers with detailed treatments of the thermodynamics and kinetic behavior of polymer solutions, mechanical behavior of solid polymers, polymerization and degradation. The continuation of this pattern in the second edition may be questioned since the prerequisite of some physical chemical knowledge for the study of high polymers is now conceded on all sides. However, there is a pedagogic advantage in that the reader is gradually introduced to polymer molecules and is made to feel that their study is a natural extension of his previous chemical training. If this book is used for a course at the senior or first year graduate level, it will provide a review and extension of physical chemical training as well as a sound introduction to polymer science.

A few minor criticisms and opinions may be of interest. It appears, for example, that the integration of the material covered could have been carried further. Thus many of the general points mentioned in the first seven chapters could have been revived with profit in the later sections. To be specific the excellent treatment of intermolecular forces in Chapter IV could well have been used to provide a more useful discussion of solubility in Chapter VIII. It might be argued that the review of physical chemical principles in the first seven chapters could have been done more efficiently by a rigorous exclusion of those points which have little bearing on polymers, such as the metallic bond, and by bringing some of the discussion more closely up to date. The occasional lack of balance in several sections is illustrated by the absence of considerations involved in the interpretation of fiber diagrams although many pages are devoted to X-ray studies of crystals and liquids and by the absence of a derivation of such an important formula as that for the distribution of chain-end separations.

However, these are relatively trivial matters. The treatment of polymerization and degradation is probably unrivaled. The same can be said for the treatment of viscoelastic behavior although it is regretted that more attention was not devoted to the mechanical behavior of fibers, unoriented crystalline polymers and plastics. The emphasis on structural principles throughout is praiseworthy. In short it is clear that a very valuable and much-needed addition has been made to the rather uneven field of texts now available for the student or the graduate chemist wishing to begin the study of high polymers. One can feel confident that this book, like its predecessor, will serve as a gateway to further study and creative activity in polymer science.

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Indium (Discovery, Occurrence, Development, Physical and Chemical Characteristics and A Bibliography of Indium (annotated) 1863-1949 inclusive). Compiled by MARIA THOMPSON LUDWICK. The Indium Corporation of America, 60 East 42nd Street, New York 17, N. Y. 1950. 276 pp. 16 × 23 cm. Price, \$7.50.

The author intended this book to be a comprehensive and complete compilation of all the investigations of indium and its compounds in relation to its sources, chemistry, metallurgy, electrical properties and possible applications from its discovery in 1863 to 1949.

The annotated bibliography in which the references are listed alphabetically by authors is divided into seven sections: (1) Discovery of the element, (2) Occurrence, detection, estimation and extraction of the element, (3) Physical properties of indium, (a) Optical properties, spectro-

scopic, X-ray and sub-atomic data, (b) Electrical properties of the element, (c) Miscellaneous properties, atomic weight, hardness, thermal properties, toxicity and pharmacology, (4) Qualitative and quantitative analyses, (5) Alloys, (6) Chemical properties and compounds, plating information, and (7) Miscellaneous information: Cost of material, commercial production, uses, physiological action and general references.

The arrangement of the references in the various sections would have been greatly improved if the large sections were divided into small sub-sections. Such an arrangement is used in the section on alloys which makes this the best section of the whole bibliography. It is unfortunate that the author did not critically evaluate the references.

The first part of the book is supposed to be a short discussion of the various sections of the bibliography, but it is extremely sketchy and no attempt is made to appraise the references. The style is conversational and devoid of scientific depth.

The chapters on alloys is quite well organized and presented. Phase diagrams for every one of the important commercial alloys are included along with some photomicrographs. A discussion of the important uses of the various alloys is a very helpful inclusion.

Many of the sections are not too well organized, as for example, the section on chemical properties and compounds of indium which includes the electrical characteristics of indium metal which certainly are not a chemical property.

The discussion of the electrochemistry of indium and the electrochemical method of analysis is quoted with the permission of the authors from Moeller and Hopkins' paper in the "Journal of the Electrochemical Society," Vol. 93, March (1948).

It is unfortunate that the author did not organize the material in a better way throughout the bibliography and the discussion sections. Elimination of the commercialism which is all too obvious throughout the discussion sections of the book would have been a further improvement.

The compilation of the literature may be of help to scientists interested in this field, but the annotations of the references are of little service.

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Annual Review of Physical Chemistry. By G. K. ROLLEFSON (Editor), University of California, and R. E. POWELL (Associate Editor), University of California. Volume I. Annual Reviews, Inc., Stanford, California, 1950. vii + 382 pp. 16 × 23 cm. Price, \$6.00.

Annual Reviews has sponsored a series of Reviews in the field of Biochemistry (1931); Physiology (1939) and Microbiology (1947), "designed for those engaged in teaching and research, and whose background knowledge of the subject is already well established. Substantially the same subjects are reviewed annually or biennially, thus permitting the reader to obtain, at a somewhat advanced level, a report of the principal advances in the entire field throughout the period under review." The appearance of this volume signals their entry into the field of the physical sciences under a distinguished Editorial Board, which is responsible for the annual selection of topics and authors.

The topics selected in this volume constitute for the most part a well-balanced list of the most important aspects of what is at present called Physical Chemistry. They include well-known and well-established topics of thermodynamics and reaction kinetics in some nine separate reviews; whereas more recently developed aspects such as nuclear reactions, spectroscopy, valence and molecular structure, X-ray crystallography, statistical mechanics, high polymers, etc., represent an additional nine reviews. The average length is twenty pages.

However, as might be expected, the character, penetration, period covered and adequacy of the separate reviews varies widely depending upon the subject matter and author involved. For example, the opening review on "Thermochemistry and Thermodynamic Properties of Substances," by four authors, occupies 41 pages, 825 references and covers the period 1939 through 1949. It is an exhaustive summary of references.

On the other hand, the review on "Colloid Chemistry" is restricted to 10 pages, 44 references and the period 1948 to 1949. This review is inadequate for the subject. Much new and valuable material appearing during the year has been omitted.

Space prohibits a detailed comment on the remaining 16 excellent reviews, which not only give reference but interpret briefly as they should, the meaning of the various contributions. Undoubtedly the Editors will maintain well-established and productive topics for annual reviewing and relegate highly specialized but nevertheless important topics for review at irregular intervals. In such fields, fluctuations in publication may yield either a productive or a sterile year.

The Editors are to be congratulated on making available this timely and important contribution to the progress of Physical Chemistry.

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Melting and Solidification of Fats. By ALTON E. BAILEY, Votator Division, The Girdler Corporation, Louisville, Ky. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y., 1950. xiv + 357 pp. 16 × 23.5 cm. Price, \$7.00.

This is the third of a series of monographs on the chemistry and technology of fats, oils, and related substances by this publisher. The author has collected from widely scattered sources all of the reliable phase-relation data pertinent to the melting and solidification of oils, fats and fatty acids. He has correlated and interpreted this material so as to reveal the interrelationships between the various phenomena associated with solid-liquid and solid-solid phase transformation emphasizing those relationships and phenomena which enter as basic considerations in oil and fat technology.

A well-written introductory chapter supplying sufficient theoretical background enables the unversed reader to understand the later discussions and interpretations, for example, of X-ray data, polymorphism, phase diagrams and deviations from ideal freezing-point behavior. The remaining five chapters deal successively with the preferred important research and control laboratory techniques, the compilation and correlation of physical-constant data for pure glycerides and fatty acids, mutual solubility data for binary and ternary mixtures, solubility in various organic solvents, and, finally, a discussion of practical melting and solidification processes.

The fatty acids might well have been mentioned in the title since about one hundred pages in all are devoted to the consideration of these compounds. Their inclusion is completely justified by their importance in the industry and by the fact that their solidification and melting behavior parallels that of the glycerides for which comparatively little reliable data are available.

The author has been thorough and critical in his collection of the physical chemical data. Few errors or omissions were noted. The left member of the diagrammatic sketch of the unit cell of stearic acid as shown in Fig. 5(a) on page 16 is upside down. Since this error appeared in the original source reference and has been copied by at least one other author, it is mentioned here to forestall its perpetuation. The rather careful work of Verkade and his co-workers on mixed diglycerides and triglycerides seems to have been overlooked so that the following have not been mentioned in the tabulations on pages 156, 157, and 167: 1-palmito-2-stearo-, 1-stearo-2-palmito-, and 1,2-distearo-diglycerides and 1-palmito-2-stearo-3-myristin. The symmetrical stearo-eruco-diglyceride reported by Hunter, Roberts and Kester has also been omitted. In the first paragraph on page 222 the effect of unsaturated fatty acids combined in triglyceride molecules on the melting point is confused with the effect of the free acids in admixture with triglyceride molecules.

The subject matter is presented concisely in a clear, readable style. There are 150 figures, 66 tables, 320 literature references, and a comprehensive index. The printing and binding are excellent.

The author has already made notable contributions to

both the physical chemistry and technology of fats and oils; by this presentation he has performed another good service. After reading this book the technologist will be further impressed by the importance of fundamental thermodynamic and phase rule data to the industry and the physical chemist will be better able to recognize the vital problems toward which he must direct his attack.

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Colloid Chemistry, Theoretical and Applied. By Selected International Contributors. Collected and Edited by JEROME ALEXANDER. Volume VII. Part I: Theory and Methods, Part II: Biology and Medicine, Part III: Technological Applications. Reinhold Publishing Corp., 330 West 42nd Street, New York, N. Y., 1950. xi + 736 pp. Illustrated, 16 × 24 cm. Price, \$15.00.

The present Volume VII of this well-known series differs from its predecessors in that it contains reports in all three of the main sections which have been in use; theory and methods, biology and medicine, and technological applications. With the exception of the war-time Volume V, each of the earlier books had been built about one of the three general subjects. Obviously there are arguments both ways, but one wonders whether the number of purchasers now will be decreased owing to the fact that relatively few people are interested at least at one time in such widely different topics as nuclear reactions, genes and cosmetics.

At any rate every reader will have his favorite subjects and authors, and even admitting to some temptation it would be hardly safe for a reviewer to select a few of these essays for special mention. Rather a better service is rendered by the reproduction of the Table of Contents. Page numbers are included to indicate the length of each article.

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As suggested it is a broad collection of titles, and the connection between some of them and colloid chemistry is not immediately evident. However, the forty-three papers by forty-five scientists meet a high standard of excellence. They are mostly factual in character, critical and authoritative, so that a reader may inform himself of the present state of knowledge in each of the subjects presented.

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A Manual of Organic Chemistry for Advanced Students. Volume One. The Compounds of Carbon, Hydrogen, Oxygen and the Halogens. By G. MALCOLM DYSON, M.A. (Oxon.), D.Sc., Ph.D. (Lond.), F.R.I.C., M.I. Chem. E. Longmans, Green and Co., Inc., 55 Fifth Ave., New York, N.Y. 1950. xiii + 984 pp. 17 × 25.5 cm. Price, \$12.50.

The stated goal of this Manual is fullness beyond the textbook level but below the lofty peaks of thoroughly documented monographs for specialists. Students, teachers and practitioners of organic chemistry have felt the need. Finding it now one-third filled, they will hanker after Volumes II and III.

Broad scope and breadth of view are joined, as any chemist can plainly see from the Table of Contents and the introductory treatment. Intricacies of organic chemical literature (including patents) receive just enough attention to orient readers and help them decide how far to rely on self-help before calling on trained searchers. Nomenclature, an area strewn with booby-traps, is given a whole chapter.

Never are footnotes allowed to crowd text to the top of a page. Wisely, the Manual confines footnote references to first sources and an occasional exceptionally significant review or discussion. General references, cited at chapter ends, are selected only for guidance to more detailed source material.

Dr. Dyson's logical mind shines through his system of linear notation, which he presents briefly in the Manual. It shines also through his arrangement of subject matter: Two volumes for organic compounds, one for organic reactions and molecular structure.

Volume I covers compounds of carbon, hydrogen, oxygen,

halogens and even a few nitrogen compounds. Volume II will cover compounds of nitrogen, sulfur, phosphorus and the metals or metalloids. The arrangement, based on chemical structure, is a simplification of the Beilstein elaboration, skillfully suited to this less elaborate Manual. There is no maze to bewilder the searcher, but enough classification to guide him. The system even allows exceptions when some other community of interest is rated above structure. One is vital functioning, *e.g.*, of vitamins or hormones.

Formulas and tables are used freely, and two folding charts enliven the text. One is on petroleum synthetics and their uses, the other on elastomers. The subject index, bristling with chemical names, gives Dr. Dyson ample range for practicing what he preaches about nomenclature. He practices it.

Chemistry manuals are not lush pastures for prancing literary style, and Dyson is not writing to entertain. But he does have a lucid style, which is of utmost importance to his readers.

Typographically compressed about as far as easy reading would allow, the book is still rather bulky. Considering size and weight it is sturdily built, but constant users may find it hardly sturdy enough. Viewed against content, the price is a bargain as compared with many cheaper books offering far less utility per dollar.

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BOOKS RECEIVED

March 10, 1951–April 10, 1951

ASSOCIATION OF VITAMIN CHEMISTS, INC. (prepared and edited by). "Methods of Vitamin Assay." Second Edition. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1951. 301 pp. \$5.50.

L. F. AUDRIETH AND BETTY ACKERSON OGG. "The Chemistry of Hydrazine." John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1951. 244 pp. \$5.00.

THEODOR FÖRSTER. "Fluoreszenz organischer Verbindungen." Vandenhoeck and Ruprecht Verlagsbuchhandlung, Göttingen 77, Germany. 1951. 312 pp. Brosch. 29.50; Ganzleinen 32.50 DM.

MARTIN D. KAMEN. "Radioactive Tracers in Biology." Second Edition. Academic Press, Inc., Publishers, 125 East 23rd Street, New York 10, N. Y. 1951. 429 pp. \$7.50.

E. H. ERICH PIETSCH (edited by). "Gmelin Handbuch der anorganischen Chemie." (Gmelin's Handbook of Inorganic Chemistry). Eighth Edition. System-Number 10, Selenium. System-Number 18, Antimony. System-Number 28, Calcium. System-Number 35, Aluminum. System-Number 62, Gold. System-Number 68, Platinum. Issued by the Deutsche Chemische Gesellschaft. Verlag Chemie, GMBH, Hauptstrasse 127, 17a Weinheim an der Bergstrasse, Germany. 1950. 585 pp. kart. DM 155.50.

WALTHER UTERMARCK. "Schmelzpunkt Tabellen Organischer Verbindungen." Akademie-Verlag GMBH, Presseabteilung. Schiffbauerdamm 19, Berlin NW 7, Germany. 1951. 571 pp. Unbound 60-, DM, bound 63-, DM.

EDWARD R. WEIDLEIN, JR. "The Biochemistry of Inositol." Bibliographic Series. Bulletin No. 6. Mellon Institute, 4400 Fifth Avenue, Pittsburgh 13, Pennsylvania. 1951. 53 pp.

L. ZECHMEISTER. "Progress in Chromatography 1938–1947." John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1951. 368 pp. \$8.00.