



Bromination of desoxyapatulinic acid in dry chloroform led, not to a bromolactone, but to **bromodesoxyapatulinic acid** (V, X = Br), m. p. 136–137.5° (calcd. for C<sub>7</sub>H<sub>7</sub>O<sub>4</sub>Br: C, 35.47; H, 2.98. Found: C, 35.96; H, 3.25). The bromo acid was transformed by excess hot aque-

ous potassium chloride to **chlorodesoxyapatulinic acid** (m. p. 130.5–131.5°, methyl ester dinitrophenylhydrazone, m. p. 188.5–190°; mixture melting points with authentic samples undepressed). Since the chloro acid was earlier<sup>3</sup> converted into patulin acetate, the new transformations provide the hitherto missing stages of a second complete synthesis of patulin.<sup>4</sup>

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## BOOK REVIEWS

**A German-English Dictionary for Chemists.** By AUSTIN M. PATTERSON, Professor Emeritus of Chemistry, Antioch College. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1950. xviii + 541 pp. 13.5 × 17.5 cm. Price, \$5.00.

For more than 30 years Dr. Patterson's dictionary has been a vademecum for both academic and industrial chemists. The second edition went to press sixteen years ago, and now an expanded third edition has appeared, containing a vocabulary of 59,000 terms. The number of words has thus increased by 40%, and most of the additions are drawn from technical fields in which rapid development has been accompanied by a corresponding flood of new *termini technici*, as, for instance, in high-polymer technology, or military chemistry. After an examination of entries concerning fields with which this reviewer can claim a certain familiarity, it appears that the words newly included were well and wisely chosen.

A part of the purpose of this review is to acquaint chemists with the fact that this valuable library tool has been re-edited; although its widespread use speaks, by itself, for the merits of the work, a brief restatement of its special features at this time may not be amiss. Those possessing a rudimentary knowledge of German will welcome the excellent introduction (reproduced as in the second edition), where common pitfalls in German word and sentence constructions are discussed; the listing of suffixes and prefixes with their various meanings is useful. The vocabulary includes a fair selection of nontechnical words which, nonetheless, are commonly encountered in scientific writing. Particular attention is devoted to terms stemming from arts and crafts, some of them archaic or even obsolete, the meaning of which cannot be guessed at or otherwise deduced.

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HANS HEYMAN

**Technique of Organic Chemistry.** Volume III. Editor: ARNOLD WEISSBERGER, Research Laboratory, Eastman Kodak Company, Rochester, N. Y. Interscience Publishers, Inc., 215 Fourth Avenue, New York 3, N. Y., 1950. ix + 661 pp. 16 × 23.5 cm. Price, \$10.00.

Two excellent chapters: IV (140 pp.) on Extraction and Distribution by Lyman C. Craig and David Craig, and VI (121 pp.) on Crystallization and Recrystallization by

R. Stuart Tipson make this book worthwhile. The former is a clear and scholarly treatment of an important subject by outstanding experts in the field. It includes the most recent developments from the senior author's laboratory on the new glass apparatus for multiple extractions in countercurrent distribution. Chapter VI is the best exposition on the subject of crystallization and recrystallization known to the reviewer. It is extremely well written by a man who is obviously thoroughly familiar with the art, and should be required reading for all students of organic chemistry.

The remaining six chapters suffer by comparison, but this is due in part to the nature of the subject matter. Chapter V on Dialysis and Electrodialysis by R. Eliot Stauffer, and Chapter VII on Filtration by Arthur B. Cummins are well written and quite comprehensive. Chapters I on Heating and Cooling by Richard S. Egly, II on Mixing by J. H. Rushton and III on Centrifuging by Harold B. Golding consist largely of detailed descriptions of pieces of apparatus (with drawings) reminiscent of an apparatus catalog, coupled with theoretical sections including mathematical treatment. The main criticism of these chapters is their inadequate treatment of the subjects with respect to the practice of organic chemistry. In Chapter II, for example, a variety of stirring techniques are described without particular consideration of specific uses. For example, in describing the wire stirrer, in addition to the general remarks, it would be helpful to give directions for its construction, to cite specific cases where it is particularly useful, as in heterogeneous Friedel-Crafts reactions, to point out disadvantages as in the formation of Grignard reagents where nichrome wire, particularly if etched by acid, may promote extensive coupling, and to indicate how the difficulty can be eradicated by use of tantalum or platinum wire. It is also unfortunate that the problem of stirring motors, which is a very real one to the laboratory chemist, is dismissed with the statement that "these appliances are commercially available and do not warrant further discussion at this place." Actually very few really satisfactory motors are available which provide all of the virtues of good control of speed, power at low speeds and sparkless features. Suggestions as to the use and availability of the more powerful utility air driven motors would also be appreciated by the reader.

Chapter VIII on Solvent Removal, Evaporation, and Drying, by Geoffrey Broughton is somewhat disappointing since it does not give very much practical information. The subject of drying solvents, for example, is treated mostly in generalities, whereas it could well include a section with directions for or references to preferred procedures and

methods of preparing, as well as criteria for establishing the absolute nature of anhydrous solvents such as methanol, ethanol, dioxane, pyridine, acetic acid, etc. The practical consideration of hygroscopic drying agents is confined largely to a table (p. 625), which contains entries like the following: "Calcium chloride; suitable for drying ethers, esters, alkyl halides, etc. Most generally useful of drying agents; unsuitable for drying alcohols, amines, phenols, fatty acids." Not only are some of the opinions thus expressed open to question, but no attempt has been made to compare the various drying agents with respect to efficiency, capacity for absorption of water, and desirability for use with particular organic compounds.

The editing job has been expertly executed by Arnold Weissberger and a minimum number of errors appears for a first edition. The only one of consequence noted by the reviewer is reference on p. 103 to the hydrolysis of *ethylbenzene* instead of *ethyl benzoate*. With the exception of poor printing on pp. 166, 167, 182 and 190, and a few incompletely cut pages in the reviewers volume, the book is nicely prepared and the format is good.

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WILLIAM S. JOHNSON

**The Chemical Elements and Their Compounds.** By N. V. SIDGWICK, Fellow of Lincoln College. Hon. Student of Christ Church. Formerly Professor of Chemistry in the University of Oxford. Oxford University Press, Publishers, 114 Fifth Ave., New York 11, N. Y., 1950. Two volumes. xxxii and vi + 1703 pp. 15 X 23 cm. Price, \$14.00.

The tireless industry of physicists and chemists stimulated by an insatiable curiosity has garnered through the years a vast body of information on the preparation, properties, and reactions of the ninety-odd elements and their almost innumerable compounds. The encyclopedists, with perhaps even more astonishing pertinacity and patience, have presented this information systematically and succinctly in colossal Handbooks and Treatises of chemistry. This enormous array of diverse, detailed, and disconnected facts is bewildering and overpowering. There is an acute need for a more unified, coherent, and generalized presentation of them.

A similar, though less acute, situation existed a generation ago when Abegg launched his excellent "Handbook of Inorganic Chemistry" in which he undertook the discussion of chemical substances from the point of view of the generalizations that had been arrived at in the then recent and luxuriant growth of physical and theoretical chemistry. The resulting encyclopedia, so far as it has appeared, has been of the greatest value, but the magnitude of this undertaking proved too great for Abegg and his collaborators, and it has never been finished.

During the past fifteen years there has been another great advance in our understanding of matter; the precise architecture of molecules, the nature of chemical linkages, and the relation between chemical properties and atomic structure. Professor Sidgwick, a leader in many of these advances, and wisely appraising the situation, has written a new account of the chemistry of the elements and their important compounds from the point of view of these new, theoretical advances. His objective has been not merely to elucidate and illustrate these generalizations, but rather to utilize them to afford a more coherent, well-ordered, and comprehensible account of descriptive chemistry. He has not, however, undertaken the impracticable task of writing a new, complete encyclopedia of chemistry.

The resulting book is a readable, indeed for the chemist, a fascinating account of the chemistry of the elements and their compounds in the revealing light of recent knowledge. Its correlation of hitherto disconnected and heterogeneous data has revived the whole subject. It does not aim to replace the encyclopedias, but it does, nevertheless, afford a surprisingly complete picture of general descriptive chemistry.

The subject matter is classified and presented on the basis of the Periodic Table; the first five groups in Volume I, the last four in Volume II. Carbon often excluded from books on general chemistry (except for the free element and a few of its commoner compounds) is treated as fully as befits the best-known and most important of the elements. There are copious references throughout the book to the original literature, many useful tables, and two excellent indexes.

There is an Introduction of some twenty pages covering the fundamental particles of which atoms are composed, the periodic classification of the elements, and the theoretical principles of molecular structure, these being generalizations which are utilized throughout the book. These matters are stated carefully, but they are presented so concisely that some prior familiarity with them is necessary for their easy comprehension. They might with advantage, at least for a wider audience, be presented a little more fully.

The book as a whole is written with clarity and simplicity. It is replete with suggestive and illuminating interpretations and comments. It is a splendid contribution to our science and is an eloquent demonstration of the insight, enthusiasm, and energy of its author.

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ARTHUR B. LAMB

**Elementary Pile Theory.** By HARRY SOODAK, Massachusetts Institute of Technology, Cambridge, Massachusetts, and EDWARD C. CAMPBELL, Oak Ridge National Laboratory, Oak Ridge, Tennessee. John Wiley and Sons, Inc., New York, N. Y.; Chapman and Hall, Ltd., London. 1950. ix + 73 pp. 15 X 22 cm. Price, \$2.50.

As the title implies, this book presents the fundamental ideas associated with the chain-reacting pile. Although elementary in point of view, the presentation is much more than qualitative, simple mathematics being used freely to give a quantitative description of the behavior of the fission neutrons. In order to avoid complications, only homogeneous piles are treated and they are considered from the point of view of simple diffusion theory. Within this framework such matters as the slowing down of neutrons, the distribution of neutrons in both space and energy, critical pile dimensions and pile kinetics are discussed. The book is addressed to technically trained personnel but not to specialists in neutron physics. Consequently, the reader is led very carefully through the mathematics with the physical interpretation being continually emphasized.

It is doubtful that this book will have wide appeal among chemists in general, but it should prove very valuable to those nuclear chemists whose work or interests demand a somewhat more than qualitative knowledge of pile theory.

Several misprints were noted, as, for example, the use of the nuclear mass in place of the neutron mass in the middle of page five. However, they are of an obvious nature and should cause no confusion.

G. T. SEABORG

**The Petroleum Chemicals Industry.** By RICHARD FRANK GOLDSTEIN, B.Sc., Ph.D.(Lond.), F.R.I.C., F. Inst. Pet. John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y., 1950. xiii + 449 pp. 15.5 X 24 cm. Price, \$8.50.

This book is largely a review of the American petroleum chemicals industry. To British readers the inspiration to do likewise is clear and the documentation is complete. For American readers the book provides a thorough analysis of the petro-chemicals industry from the organic chemical viewpoint. From an editorial standpoint there are very few errors of which the hydrogenation of diisobutylene to a C<sub>8</sub> hydrocarbon (p. 28) is the required ex-

ception. The continued rapid growth in the development of chemicals from petroleum sources makes this book timely. The aim has been to give a clear and reasonably comprehensive picture of the state of the art on each subject, with special emphasis on developments during the last ten years. The field has been well surveyed and the subject matter brought up-to-date through 1947.

The author discusses in orderly fashion the sources of petroleum hydrocarbons; synthesis and reactions of carbon monoxide-hydrogen mixtures; oxidation, chlorination, nitration and other reactions of paraffins; manufacture, hydrogenation, oxidation, halogenation and other reactions of olefins, diolefins, naphthenes, aromatics, acetylene, aldehydes, ketones, acids, anhydrides and esters, olefin oxides, nitriles and amines, and chemical by-products arising from refinery operations.

While the main objective has been to survey those fields of industrial organic chemistry in which petroleum oil is the most economic starting material, information on alternative non-petroleum routes has been included where appropriate.

The book contains many useful generalizations. However, as might be expected, some conclusions may be either confusing or open to question; for example, in discussions of the Oxo process (pages 49 and 185) the indicated tendency of the aldehyde group to indiscriminately add to either side of the olefin double bond has serious limitations, dependent upon the character and number of radicals already attached to the unsaturated carbon linkages. Again, on page 97, it is indicated that the fluid catalytic cracking process gives considerably higher gas yields. Actually, the fluid catalyst operations were carried out during the war to deliberately produce the large volumes of gases required in the war effort. It was this versatility in the production of gases which made fluid catalytic cracking so important in the war effort. There also may be some question concerning the general superiority of the Caterole catalytic cracking process for making aromatics, as compared with other similar processes now in operation.

The liberal use of charts throughout the book to summarize typical reactions provides a useful reference to those of us whose memories may lapse. Tables and charts given in the appendices give a wide variety of interesting information. Table 90 appears to be in error in indicating that polyisobutylene is made in government plants and that the price in 1943 was 141¢ per pound. This does not detract from the author's intension to present these numerous tables as an indication of the rate of growth and the magnitude of the synthetic chemicals industry in the United States.

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**Geochemistry.** By KALERVO RANKAMA, Ph. D., Docent of Mineral Chemistry, University of Helsinki; Research Associate in Geochemistry, The University of Chicago, and TH. G. SAHAMA, Ph.D., Professor of Geochemistry, University of Helsinki. The University of Chicago Press, 5750 Ellis Avenue, Chicago 37, Illinois, 1950. xvi + 912 pp. 18 × 24.5 cm. Price, \$15.00.

This volume is undoubtedly the most important contribution to the subject printed in English since the publication of "The Data of Geochemistry," by F. W. Clark about twenty-five years ago. The book is written not only for the geologist but also for the chemist possessing a knowledge of the geological sciences. While the authors assert that the treatise is not a textbook, the volume does possess many characteristics of a good text. As a general reference it is excellent and replete with numerous tables,

graphs and extensive bibliographies. The book is well written and the general appearance of the book and the various chapter headings and sub-headings will immediately invite any chemist to browse.

The book begins with an outline of the province of Geochemistry, followed by a brief historical résumé of the subject and then a general introduction. The main body of the book is divided into two parts. Part I deals with the chemical nature of the meteorites, the abundance and distribution of the elements and the nuclides, and the geochemistry of the lithosphere, hydrosphere and biosphere. The ninth chapter summarizes present knowledge on cosmo-chemistry, while the last chapter in Part I discusses geochemical evolution of the earth. Part II is an amplification of Part I in which the manner, occurrence, abundance and distribution of the individual elements and nuclides are discussed in relation to the period system. The last chapter of the book deals with the short-lived radioactive and artificial elements.

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## BOOKS RECEIVED

September 10, 1950–October 10, 1950

F. P. BOWDEN AND D. TABOR. "The Friction and Lubrication of Solids." Oxford University Press, England. 1950. 337 pp. \$7.00.

JEAN BRACHET. "Chemical Embryology." Translated from the French by Lester G. Barth. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1950. 533 pp. \$8.00.

ARTHUR C. COPE (Editor-in-Chief). "Organic Syntheses." Volume 30. John Wiley and Sons, 440 Fourth Avenue, New York 16, N. Y. 1950. 115 pp. \$2.50.

H. C. ENGEL, CHARLES B. HEMMING AND H. R. MERRIMAN. "Structural Plastics." McGraw-Hill Book Company, 330 West 42nd Street, New York 18, N. Y. 1950. 301 pp. \$4.50.

WALTER HÜCKEL. "Structural Chemistry of Inorganic Compounds." Translated by L. H. Long. Volume I. Elsevier Publishing Company, Inc., 250 Fifth Avenue, New York 1, N. Y. 1950. 437 pp. \$9.00.

A. W. JOHNSON. "The Chemistry of the Acetylenic Compounds. Volume II. The Acetylenic Acids." Longmans, Green and Co., 55 Fifth Avenue, New York, N. Y. 1950. 328 pp. \$10.00.

MARIA THOMPSON LUDWICK (compiled by). "Indium." The Indium Corporation of America, 60 East 42nd Street, New York 17, N. Y. 1950. 276 pp. \$7.50.

NATIONAL RESEARCH COUNCIL, BULLETIN No. 118. "Data on Chemicals for Ceramic Use." Report of Committee consisting of A. Silverman, Chairman, H. Insley, G. W. Morey and F. D. Rossini. National Research Council, National Academy of Sciences, Washington, D. C. 1950. 193 pp. \$5.00.

W. THEILHEIMER. "Synthetische Methoden der organischen Chemie." Volume 4. S. Karger A. G., Publishers, Basel, Switzerland. 1950. 360 pp. Bound, Sfr. 37.-.

WILLIAM A. WATERS. "Physical Aspects of Organic Chemistry." Fourth Edition. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y. 1950. 539 pp. \$8.00.