

terminations. Identical amounts (0.32 mg.) of the D and L isomers were mixed. The melting point of the mixture was 104–105° which was in good agreement with the melting of the synthetic DL-*threo* derivative,<sup>5</sup> m.p. 104–105°. The mixture melting point of the mechanically prepared DL-*threo* derivative with the synthetic DL-*threo* compound was not depressed, m.p. 104–105°.

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## BOOK REVIEWS

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**Friedel-Crafts and Related Reactions. Volume I.** Edited by GEORGE A. OLAH, Research Scientist, Dow Chemical of Canada, Limited, Sarnia, Ontario. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. 1031 pp. 16 × 24 cm. Price, \$29.50.

Volume I presents the general aspects of "Friedel-Crafts and Related Reactions" and lays the groundwork for three subsequent volumes: II, "Alkylation and Related Reactions"; III, "Acylation and Related Reactions"; and IV, "Miscellaneous Reactions."

Long needed has been an authoritative source book of this type to bring into comprehensive and coordinated review the extensive subject matter relating to Friedel-Crafts chemistry, *i.e.*, "electrophilic organic reactions catalyzed by electron deficient compounds."

Although the product of many contributing authors, this is much more than a disjointed compilation of chapters haphazardly assembled by the editor. As an architect visualizes his final structure, so has Dr. Olah carefully designed this compendium, with a harmonious blending of many parts. The net effect is best described by C. K. Ingold in the Introduction: "The arrangement of chapters is logical and the place of each in the complete account is so obvious and natural that one notices very little the discontinuities of style and approach that so often spoil the reading of multi-author books." The authoritative nature of this work comes not only from the quality of the contributing authors—each an expert in his own field—but also from the stature of the editor and his own contributions. Of the 13 chapters in Volume I, five are authored or coauthored by Dr. Olah.

In his opening chapter, he provides an excellent historical background, starting with biographical sketches of Messrs. Friedel and Crafts. This is followed with a penetrating review of their initial discovery, including clear reproductions of key entries in Friedel's laboratory notebook. In the second chapter, Dr. Olah sets forth the definition and scope of the material to be covered in Vol. I and in later volumes. With its 657 references, this chapter in itself is a significant contribution to the field. The clarity of expression and the underlying logic for setting up the limitations and the scope to be covered bring a remarkable degree of order to what had become a tangled network of fact and theory.

Presented in logical sequence thereafter are background chapters on the nature of Friedel-Crafts catalysts, leading off with a general review of proton acids and Lewis acids. This is followed by a comprehensive outline of active Lewis catalysts from Groups I through VIII, with a thorough treatment of the role of cocatalysts, solvents, and reaction variables. The unique role of boron compounds is recognized in a separate chapter covering coordination compounds of the boron halides, which is followed by a review of coordination compounds of aluminum and gallium halides.

A chapter on intermediate complexes deals with the species involved in the reaction itself. Further mechanistic insights are provided by discussions of spectroscopic investigations and application of isotopic techniques. The three final chapters

cover reaction and selectivity, thermodynamic considerations, and stereochemical aspects.

This work will be of value both to students and to experts in the field. Although it provides a comprehensive review of a rapidly expanding area of research, it is far more than an encyclopedic source of knowledge. In providing a critical evaluation of conflicting data and diverse theoretical interpretations, it achieves a cohesive view of an extremely complex field.

As it comes off the press, it is as up-to-date as a major work can be. The wisdom and courage of the editor are evident in his monumental undertaking of planning the work as a whole and proceeding with all volumes simultaneously. As the first volume was published, Vol. II and III were being printed, with Vol. IV soon to follow. These volumes will serve as a sound and solid foundation on which to build in future efforts to bring up-to-date the story of Friedel-Crafts and related reactions.

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**Molecular Biochemistry.** By EDWARD M. KOSOWER, Department of Chemistry, State University of New York, Long Island Center, Stony Brook, N. Y. McGraw-Hill Book Company, Inc., 330 West 42nd St., New York 36, N. Y. 1962. xii + 304 pp. 16 × 23.5 cm. Price, \$12.50.

The mechanisms of chemical reactions have been and are today of major concern to organic chemists and biochemists. Although the biochemist deals mainly with enzymatic reactions either *in vitro* or *in vivo*, these reactions obey the same laws as do chemical reactions which do not require enzymes. Enzymes may lower the energy of activation of chemical reactions and introduce special steric and entropy factors, but they still can be rationalized by a consideration of the electronic structure of molecules. There exist many text books dealing with mechanisms of reactions, but biochemists have done relatively little in this field. Possibly the biochemists felt that such texts were not urgently needed since the concepts available in existing texts could be applied to enzymatic reactions. However, the need for such a text was visualized by Dr. Kosower and prompted him to write "Molecular Biochemistry." He has defined molecular biochemistry as the study of the detailed mechanisms of the chemical transformations in biology as they are described by biochemists, and has attempted to use the physical-organic approach to explain these chemical transformations.

Dr. Kosower has organized his book into three major parts: the first, a survey of metabolic reactions; the second, a discussion of reaction mechanisms; and the third, a brief treatment of the concept of "active site" of enzymes. Very little use is made of molecular orbital theory in this book.

Biological processes dealing with glycolysis, the Krebs tri-carboxylic acid cycle, biological oxidation and oxidative phosphorylation, photosynthesis, the urea cycle, transamination, biosynthesis of purines and pyrimidines, and the biosynthesis of fatty acids and cholesterol are covered in the first part of the book. The second part covers reaction mechanisms of carboxylation,

decarboxylation, enolization, aldol condensation, hydration, dehydration, ester and amide hydrolysis, and oxidation-reduction. A nice coverage of the chemistry of pyridine nucleotides, flavins, and phosphate esters is also included. In the third section of the book on "active site" of enzymes, the author defines "active site" and discusses the nature of enzymic catalysis and the ways in which the "active site" can be elucidated.

In many cases support for postulated mechanism of biochemical reactions are based on similar organic reactions. This approach leads to many useful and clarifying correlations. The author has attempted to systematize the various types of reactions by use of symbols (p. 61), but the writer is of the opinion that this attempt falls short of the mark and is superfluous. A major aim of the book is to explain biochemical reactions by the established principles of physical-organic chemistry. In this attempt the author has done a good job. The chapter dealing with the chemistry of organic phosphate esters is especially valuable since the organic phosphate ester bond is one of the most abundant and important type of chemical bonds in molecules found in living cells.

This book should be useful to organic chemists who are interested in biochemistry and to biochemists who want to apply modern organic chemistry to understand biochemical reactions. Hence, it may play a role in bridging the gap between biochemistry and organic chemistry. Organic chemists unfamiliar with biology, general biochemistry, and the properties of enzymes will not get the full benefit of this book any more than a biologist who has not had organic and physical chemistry can get full benefit from reading a text dealing only with mechanisms of reactions. The author has written this book at the level of the second-year graduate student in chemistry. The book may thus serve as a valuable supplementary text for a graduate course in biochemistry. It should also be appealing to departments of organic chemistry that desire to include this aspect of biochemistry in their curriculum.

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## BOOKS RECEIVED

July, 1964

- E. J. ARIËNS, Editor. "Molecular Pharmacology. The Mode of Action of Biologically Active Compounds." Volume I. Academic Press, Inc., 111 Fifth Ave., New York 3, N. Y. 1964. 503 pp. \$17.00.
- M. R. F. ASHWORTH. "Titrimetric Organic Analysis." John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1964. 501 pp. \$17.50.
- THOR A. BAK, Editor. "Phonons and Phonon Interactions." W. A. Benjamin, Inc., 1 Park Ave., New York, N. Y. 1964. 640 pp. \$9.50.
- ERNEST BALDWIN. "An Introduction to Comparative Biochemistry." Cambridge University Press, 32 East 57th St., New York, N. Y. 1964. 179 pp. \$2.75.
- A. A. BENEDETTI-PICHLER. "Identification of Materials Via Physical Properties, Chemical Tests, and Microscopy." Academic Press, Inc., 111 Fifth Ave., New York 3, N. Y. 1964. 492 pp. \$18.00.
- H. A. BOEKENOOGEN, Editor. "Analysis and Characterization of Oils, Fats and Fat Products." Volume 1. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1964. 421 pp. \$12.75.
- P. BOITEAU, B. PASICH, and A. RAKOTO RATSIMAMANGA. "Les Triterpenoides en physiologie vegetale et animale." Gauthier-Villars, 55 quai des Grands-Augustins, Paris (VI)<sup>e</sup>, France. 1964. 1370 pp. Cart. 310 F.
- S. COFFEY, Editor. "Rodd's Chemistry of Carbon Compounds." 2nd Edition. Volume I, Part A. "General Introduction, Hydrocarbons, Halogen Derivatives." American Elsevier Publishing Co., 52 Vanderbilt Ave., New York 17, N. Y. 1964. 569 pp. \$29.00.
- MALCOLM DIXON and EDWIN C. WEBB. "Enzymes." 2nd Edition. Academic Press, Inc., 111 Fifth Ave., New York 3, N. Y. 1964. 950 pp. \$16.00.
- D. F. EGGERS, JR., N. W. GREGORY, G. D. HALSEY, JR., and B. S. RABINOVITCH. "Physical Chemistry." John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1964. 783 pp. \$9.95.
- R. GILES. "International Series of Monographs on Pure and Applied Mathematics." Volume 53. "Mathematical Foundations of Thermodynamics." The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. 1964. 237 pp. \$10.00.
- ABRAHAM GOLDIN and F. HAWKING, Editors. "Advances in Chemotherapy." Volume 1. Academic Press, Inc., 111 Fifth Ave., New York, N. Y. 1964. 579 pp. \$17.50.
- MANFRED GORDON. "High Polymers. Structure and Physical Properties." Addison-Wesley Publishing Co., Inc., Reading, Mass. 1964. 158 pp. \$6.75.
- NICHOLAS HAHON, Editor. "Selected Papers on Virology." Prentice-Hall, Inc., Englewood Cliffs, N. J. 1964. 363 pp. \$7.50.
- TERRELL L. HILL. "Thermodynamics of Small Systems." Part II. W. A. Benjamin, Inc., 1 Park Ave., New York, N. Y. 1964. 210 pp. \$12.50.
- ROBIN M. HOCHSTRASSER. "Behavior of Electrons in Atoms. Structure, Spectra, and Photochemistry of Atoms." W. A. Benjamin, Inc., 1 Park Ave., New York 25, N. Y. 1964. 162 pp. \$3.95.
- International Union of Pure and Applied Chemistry. "Reagents and Reactions for Qualitative Inorganic Analysis. Fifth Report." Butterworth, Inc., 7235 Wisconsin Ave., Washington 14, D. C. 1964. 88 pp. \$6.50.
- P. G. JEFFERY and P. J. KIPPING. "Gas Analysis by Gas Chromatography." The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. 1964. 216 pp. \$10.00.
- WILLIAM L. JOLLY. "Preparative Inorganic Reactions." Volume I. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1964. 271 pp. \$9.00.
- A. K. KAMAL. "Laser Abstracts." Volume 1. Plenum Press, 227 W. 17th St., New York, N. Y. 1964. 177 pp. \$12.50.
- V. N. KONDRAT'EV. Translated from the Russian by J. M. CRABTREE and S. N. CARRUTHERS. Translation edited by N. B. SLATER. "Chemical Kinetics of Gas Reactions." Addison-Wesley Publishing Co., Inc., Reading, Mass. 1964. 812 pp. \$17.50.
- PHIL ELLEN LAX. "Taschenbuch für Chemiker und Physiker." Band II. "Organische Verbindungen." Springer-Verlag, Wilmsdorf, 1 Berlin 31 (Wilmsdorf), Heidelberger Platz 3, Berlin (West), Germany. 1964. 1178 pp. DM 48.
- G. LÉPOUTRE and M. J. SIENKO. "Metal-Ammonia Solutions Physicochemical Properties." W. A. Benjamin, Inc., 1 Park Ave., New York 25, N. Y. 1964. 317 pp. \$10.50.
- PER-OLOV LÖWDIN and BERNARD PULLMAN, Editors. "Molecular Orbitals in Chemistry, Physics, and Biology. A Tribute to R. S. Mulliken." Academic Press, Inc., 111 Fifth Ave. New York 3, N. Y. 1964. 578 pp. \$22.00.
- GEORGE H. MARKSTEIN, Editor. "Nonsteady Flame Propagation." The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. 1964. 328 pp. \$16.00.
- JON MATHEWS and R. L. WALKER. "Mathematical Methods of Physics." W. A. Benjamin, Inc., 1 Park Ave., New York, N. Y. 1964. 475 pp. \$12.50.
- JEAN MATHIEU and ANDRE ALLAIS. Published under the direction of LÉON VELLUZ. "Cahiers de Synthèse Organique. Méthodes et Tableaux D'Application." Volume XI. Masson et Cie., Editeurs, 120 Boulevard Saint-Germain, Paris VI, France. 1964. 343 pp. Cartonnette 120 F.