

More recently, the sequence of this peptide has also been described.⁹ In the later paper, the authors changed the composition of the original reported peptide, replacing a threonine residue with a serine residue. Our results favor the composition as described in the earlier publication.⁸

From the present results and from the suggested primary structure of chymotrypsinogen⁹ it is interesting to note that the histidine residue directly involved in the catalytic mechanism is linked to a cystine residue and, therefore, is subject to greatly restricted flexibility. The second histidine residue is held in the same general area due to an intrachain disulfide link, and an auxiliary role may exist for this residue in the

(9) B. Keil, Z. Prusik, and F. Sorm, *Biochim. Biophys. Acta*, **78**, 559 (1963).

catalytic mechanism of chymotrypsin, as seems to be the case in ribonuclease.¹⁰ In the tertiary structure of chymotrypsin, the active center serine located in the C-chain must be spatially close to the histidine residue of the newly isolated peptide.

A detailed account of our results will be published later.

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(10) A. M. Crestfield, W. H. Stein, and S. Moore, *J. Biol. Chem.*, **238**, 2421 (1963).

(11) Data taken from the dissertation to be submitted.

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BOOK REVIEWS

Chemical Plant Taxonomy. Edited by T. SWAIN, Low Temperature Research Station, Cambridge, England. Academic Press, 111 Fifth Avenue, New York 3, N. Y. 1963. ix + 543 pp. 16 × 23.5 cm. Price, 110 s.

Perhaps the oldest method of classifying plants is based upon their chemical constituents even though these constituents could not have been recognized as chemical entities. But as our knowledge of plant constituents became more extensive, it became apparent that there was often more than a fortuitous relation between the chemical constituents of plants and their interrelations.

For well over a century chemists have amused themselves by examining plant material, but it is only during the last three or four decades that this activity has become the major one of an increasing body of chemists. It is little wonder, therefore, that plant chemists and taxonomists have finally cooperated in effective ways. The immediate result is not one book but two appearing in this year. The first has already been reviewed (R. H. Manske, *J. Am. Chem. Soc.*, **85**, 3532 (1963)) and the second is the subject of this review. It should be remarked here that, fortunately for readers and authors, the two volumes are in every sense complementary and both should be within the reach of every taxonomist as well as of every plant chemist.

The present volume is the outcome of a Symposium held in Paris in October, 1962, at which the reviewer was an interested and impressed spectator. The editor properly describes the spirit of the Symposium in the first paragraph of the preface. "Systems of classification do not necessarily embody implications of relationship in their structure, but in fact, all those concerned with plants do employ such concepts to the greatest possible extent compatible with existing knowledge and practical utility. The ultimate natural system would be one based on an infallible knowledge of the genealogy, from one ancestral type, of every member included in it and, despite the impossibility of deriving such knowledge this is the ideal towards which the more natural systems pretend. In this context, chemistry may have more to contribute than any morphological analysis, not only because of the relative evanescence of most plant tissues in geological deposits, but because the biochemistry of evolutionary processes can be deduced from existing forms."

The volume is in 16 chapters each written by an authority in that subject. Space does not permit detailed discussion of these but some comments are in order. The first three chapters (S. M. Walters, J. Heslop-Harrison, and R. D. Gibbs, respectively) concern modern concepts of taxonomy and give a clear account of this subject and how it may be affected by chemical knowledge. H. Erdtman in Chapter 4 discusses the scope and limitations of chemotaxonomy. Chapters 5 and 8 to 16 are devoted to the usefulness of flavonoids (E. C. Bate-Smith), alkanes (G. Eglington and R. J. Hamilton), acetylenes (N. A. Sorensen), fatty acids (F. B. Shorland), polyols and cyclitols (V. Plouvier), glycosides (R. Paris), anthocyanins (J. B. Harborne), alkaloids (R. Hegnauer), alkaloids of Rutaceae (J. R. Price), and sulfur

compounds (A. Kjaer), in determining possible relations in orders, families, genera, and species. Chapter 6 (A. J. Birch) is devoted to "Biosynthetic Pathways" and Chapter 7 (H. Flück) is addressed to the problems of "Intrinsic and Extrinsic Factors" as they affect production of natural products.

The over-all impression of this volume is one of competence, and we are grateful that so much knowledge has been so well correlated. Misprints are negligibly few and the printing and formulas are excellent.

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Katalyse in der Organischen Chemie. By B. N. DOLGOV. **Organischepräparative Methoden.** Edited by DR. W. KIRSTEN. Band 1. VEB Deutscher Verlag der Wissenschaften, Berlin. 1963. 782 pp. 16.0 × 23.0 cm. Price, DM 74.

This book which was translated and edited by P. Heitmann and K. Urban from the second Russian edition consists of 14 chapters. The first two chapters (162 pp.) deal with the fundamental behavior of catalysts, properties and preparation of catalyst, and with theory and mechanisms of catalytic reactions. The remaining chapters describe catalytic reactions, namely oxidation, dehydrogenation, cracking, hydrogenation and hydrogenolysis, dehydration, hydration and hydrolysis, isomerization of hydrocarbons, polymerization, alkylation and arylation syntheses with oxygen-containing gases, and halogenation.

Although there is a great need for a one-volume comprehensive treatise on catalysis as applied to organic chemistry, the present book does not meet this need. The book is not written critically, and the author did not make an attempt to show whether the various theories dealing with contact catalysis, and which he described in the second chapter, can be applied to explain the experimental observations. The material is presented in a descriptive rather than in a didactic manner.

The chapters pertaining to ionic types of catalytic reactions such as isomerization, alkylation, polymerization, etc., are handled in an isolated manner. The author did not show the relations between the various reactions catalyzed by strong acids. The author seems to confuse the reader by describing under the same heading the alkylation of alkanes and that of aromatic hydrocarbons. It is well known that these two reactions proceed by different mechanisms.

In the chapter dealing with catalytic hydrogenation, the author failed to indicate the importance of stereoselective hydrogenation and of hydrogen-deuterium exchange studies for the understanding of the mechanism of hydrogenation.

The chapter describing the aromatization of alkanes is outdated although the modern aspects of this reaction were already described in 1956.

The book does not include an author index. References pertaining to each chapter are summarized at the end of the book. These references are mostly to the Russian literature. Although the present treatise is based on lectures given by the author at the Lenin State University, it cannot be recommended by the reviewer as a university textbook; this book might, however, be of value to those who are interested in the Russian contribution to the science of catalysis.

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Rates and Equilibria of Organic Reactions, As Treated by Statistical, Thermodynamic and Extrathermodynamic Methods. By JOHN E. LEFFLER, Florida State University, Tallahassee, Fla., and ERNEST GRUNWALD, Bell Telephone Laboratories, Inc., Murray Hill, N. J. John Wiley and Sons, Inc., 605 Third Avenue, New York 16, N. Y. 1963. 458 pp. 6 × 9.5 cm. Price, \$11.00.

Unifying concepts are the beginnings from which new physical laws are built. The "extrathermodynamic method" is a successful, approximate concept which correlates substituent effects, solvent effects, and enthalpy-entropy relationships for rates and equilibria. The concept employs the same philosophy as thermodynamics, that in the absence of complete, microscopic understanding of the behavior of a system of molecules, a study of what is known is better than no study at all.

Interesting and well printed, with few errors noted by this reviewer, the contribution of Leffler and Grunwald details the background for, then the theory of, the extrathermodynamic method they have worked out. Along with their discussion, the authors present a large volume of data about linear free-energy relationships of all kinds and linear enthalpy-entropy relationships (as well as some nonlinear relationships).

Statistical and thermodynamic theories of equilibria and rates are presented in the first five chapters. This part of the book includes a nice introduction to the statistical thermodynamic method, a discussion of classical thermodynamics including a good explanation of standard states and activity coefficients, a very interesting discussion of reaction rates with some fine drawings of energy surfaces (but with an incomplete discussion of the origin of the transition-state rate equation), and a summary of fast equilibria in solution including experimental techniques, molecular collisions, and conformational equilibria.

Extrathermodynamic relationships are discussed in the last five chapters. A theoretical introduction is followed by detailed consideration of substituent and medium effects on free energy, enthalpy and entropy changes, and finally mechanochemical phenomena. The concept of *interaction mechanisms* between substituents provides a semiquantitative foundation for the discussion.

Naturally, any book has some shortcomings. This book tends to treat extrathermodynamic relationships as ends in themselves and purposely avoids much attempt at molecular interpretation.

The book is recommended to physical organic chemists for its unifying discussion, extensive data, and thought-provoking outlook.

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Magnetism and the Chemical Bond. By JOHN B. GOODENOUGH, Lincoln Laboratory, Massachusetts Institute of Technology, Cambridge, Mass. John Wiley and Sons, Inc., Interscience Division, 605 Third Avenue, New York 16, N. Y. 1963. 393 pp. 16 × 24 cm. Price, \$12.50.

The average reader of this journal may well pick up Dr. Goodenough's book with a cry of joyous anticipation. He may soon put it down with a cry of dismay. But the fault is the author's only insofar as the title may be somewhat misleading. The real difficulty is that the average reader is not yet ready for this book. The book is a notable contribution to valence bond theory—even though it is restricted to "the origins of atomic moments and to magnetic ordering in solids." The author expresses the opinion that "an understanding of these two things should provide important foundation stones on which a theoretical superstructure for inorganic chemistry can be built. . . ." Certainly such a development is much to be desired, and certainly when that day comes Dr. Goodenough's book will be found to have helped.

The book is concerned with the magnitudes of the individual atomic, or ionic, magnetic moments, and the cooperative couplings between them. Here is a list of section headings: Description of the Free Atom, Molecules vs. Solids, Magnetism and the Chemical Bond, Ferromagnetism, Antiferromagnetism, Ferrimagnetism, Parasitic Ferromagnetism, Noncollinear Configurations, Neutron Diffraction Data, Atomic Moments and Their Interactions, Insulators and Semiconductors, Ionic Compounds with Metallic Conductivity, and Metals and Alloys. The formula index has over 500 entries. The level of presentation is about as advanced as possible at the present state of knowledge. The book is an intellectual feast, full of rich fare.

Chemists have long considered magnetism and the chemical bond to be one of their private domains. After all, the first relation of the two was developed by a great chemist, G. N. Lewis, and the first experimental proof of his ideas was published in the *Journal of the American Chemical Society*. But if chemists have made important contributions to the area, precious few of them are mentioned in the (extensive) bibliography of Dr. Goodenough's book. Among the people *not* mentioned are (besides Lewis): Orgel, Pacault, E. Müller, Klemm, Michaelis, and the Royal Dutch Shell Group in Amsterdam. Pauling and Nyholm rate one mention each. Any reader of this book would certainly gain the impression that magnetism and the chemical bond is an area in which no chemist has made a contribution worth more than passing mention. We all know that this is not true, yet the fact remains that the more searching recent studies on inorganic solids have all been made by physicists, and that solid state physics is today the most active branch of inorganic chemistry. Let us hope that chemistry is never reduced to snatching crumbs tossed them by the physicists, but rather that the new discipline of solid state chemical physics will grow as a natural and fruitful result of cooperative effort on the parts of both chemistry and physics. This means that both chemists and physicists should have an even better understanding of each other's methods and limitations, and, for the chemists it means an opportunity to obtain a much more complete foundation in mathematics and in atomic and molecular structure than many present curricula permit.

The book is a model of effective presentation. Errors are few and trivial, and the typography is well up to Interscience standards. One can hardly escape the feeling that in this book there will be found many a key to elusive problems in many areas of inorganic chemistry. And many a reader will see for himself how far from reality are most elementary presentations of both magnetism and of valence bond theory.

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Grundlagen der Arzneimittelforschung und der synthetischen Arzneimittel. By DR. JAKOB BÜCHI, Professor für Pharmazeutische Chemie an der Eidg., Techn. Hochschule Zürich; Direktor des Pharmazeutischen Instituts. Birkhäuser Verlag, Basel 10, Switzerland. 1963. 744 pp. 17 × 25 cm. Price, sFR. 96.

Any author who ventures to write a book entitled "The Principles of Drug Research and Synthetic Drugs" has set himself a formidable task. Many an intrepid explorer has searched the Seven Seas for the mysterious philosopher's stone of the 20th century, the Secret (punch card) Codex that gives the chemical structure required for any desired biological activity. He sets foot in the land of Natural Products, only to be told that the secret lies on the nearby islands inhabited by the Organic Chemists. From there he is sent to visit their relatives, the Physical Chemists, the Pharmaceutical Chemists, the Analytical Chemists, and their cousins the Biochemists. None have the Secret Codex, although each in his own language is able to quote from it at some length. He travels further, and comes upon other tribes: the Bacteriologists, the Chemical Pathologists, the Pharmacologists, the Endocrinologists, and the Clinicians—each (in his different language) claims to have the Codex, but has in fact only part of it. Finally our explorer, older, sadder, and wiser, returns and realizes that it is only the sum of the individual contributions that together make up the document.

The author has admirably recognized this truth, and while many monographs exist which deal with highly specialized sections of drug action, he has endeavored to present a comprehensive panoramic view of the whole field of the present status of drug research, and has by this means made a valuable addition to the literature of the subject.

The book is divided into six chapters. An introductory chapter traces the many disciplines that take part in the creation and evaluation of a new drug, and the closely integrated teamwork which this requires. Gone are the days when a lone scientist, working in his attic through the vigils of the night, could discover a sensational new drug. The author points out that, because of the large teams involved, the development of new drugs has today become almost totally the province of the phar-