

figuration is the stereochemical path followed by the hydrolysis and methanolysis reactions herein reported and by many other reactions of  $R_3Si^*Cl$  including the lithium aluminum hydride reduction which previously was given a tentative assignment of retention of configuration.<sup>1</sup>

(1) X-Ray studies show that  $(+)-R_3Si^*H$  and  $(-)-R_3Si^*Cl$  form mixed crystals which comprise perfect solid solutions of the two optically active substances—the component molecules are randomly mixed in the crystal. In sharp contrast,  $(+)-R_3Si^*H$  and  $(+)-R_3Si^*Cl$  form only eutectic mixtures—these molecules cannot mix randomly in the crystalline state.<sup>4</sup>

(2) Grignard reduction of  $(+)-R_3Si^*OCH_3$  gives  $(+)-R_3SiH$  and the olefin derived from the Grignard

reagent in a reaction which is most plausibly interpreted as proceeding through a quasi six-ring transition state whose geometry would demand retention of configuration as the preferred stereochemical path.

We thank Dow Corning Corporation for generous support of this investigation.

(4) For previous use of this difference in phase behavior for correlation of configuration see the review by J. Timmermans, *J. chim. phys.*, **49**, 162 (1952). Conclusions drawn on the basis of a difference in phase behavior have, without exception, proved accurate.

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RECEIVED MAY 17, 1960

## BOOK REVIEWS

**Transactions of the Royal Institute of Technology.** Stockholm, Sweden. Number 132. **A Precision Calorimeter for Enthalpy Titrations.** By KURT SCHLYTER. Royal Institute of Technology Library, Stockholm 70, Sweden. 1959. 41 pp. 17.5 × 24.5 cm. Price, Kr. 5:—.

The author describes an adiabatic calorimeter for measuring heat effects when one liquid is added to another. The first liquid was kept in a buret immersed in the water of the constant temperature bath in which the Dewar flask of the calorimeter also was immersed. The temperature of the calorimeter and contents was maintained within 0.1° of 25.00° which was the temperature of the bath. Such temperature regulation was made possible by a cooling coil through which cold air flowed as well as by the usual electrical heaters. Thus when the first liquid was added to the second they were both initially at 25.00 ± 0.019°. Quantities of heat measured varied between 0.2 to 21 cal. with an estimated uncertainty of ±0.03 cal. After each addition of reagent and temperature measurement, the temperature of the calorimeter was brought back to that of the constant temperature bath. Two consecutive additions of reagents with temperature measurements could be carried out in about 35 minutes.

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**General Crystallography. A Brief Compendium.** By W. F. DE JONG, Lecturer at the Technical University of Delft, with the collaboration of J. BOUMAN. W. H. Freeman and Company, 660 Market Street, San Francisco 4, California. 1959. ix + 281 pp. 14.5 × 22 cm. Price, \$6.00.

This interesting little book is an American edition of the original Dutch version which appeared in 1951. It is stated that some revision has accompanied the translation: the classification of symmetry now follows the International Tables for X-Ray Crystallography, new illustrations have been added and the section of Physical Crystallography rewritten.

The treatment is designed for the beginning student. The author does not consider his compendium primarily as a textbook but rather as a guide for self study. The material presented is divided into four general categories. Part I (92 pp.), entitled Geometric Crystallography, begins with a presentation of geometric relationships, followed by a section on analytical relations for various lattices and projections, and concludes with a brief discussion of crystal drawing, problems in Geometric Crystallography and Geometric Crystal determination. This section is well-illus-

trated and gives considerably more detail on these subjects than is found in most treatments.

Part II (43 pp.) is concerned with Structural Crystallography. A brief historical introduction is followed by discussion of structure theory (symmetry elements, space groups, lattices, etc.) and the determination of structure. The latter includes rather brief presentation of basic diffraction principles, experimental methods, intensities, Fourier analysis, Patterson diagrams and the general procedure for structure analysis. The treatment should be most helpful for general orientation of the beginning student.

Part III, Chemical Crystallography (52 pp.) presents a rather elementary outline of basic chemical features of bonding which are of importance in determining the nature of the structural units in the crystal. A survey of typical structures for the elements is presented, followed by description of representative structures of substances composed of two different kinds of atoms and, very briefly, a sampling of structures of more complex substances.

Part IV, Physical Crystallography (75 pp.), consists of a "phenomenological" (descriptive) section, and an "explanatory" (atomistic) section. In the former a mathematical background in vectors and tensors is presented, followed by consideration of dielectric properties of crystals, the propagation of light, magnetic induction, thermal conduction, electronic conduction, pyro- and piezo-electric properties and elasticity. In the explanatory part, structure, imperfections, and their relation to crystal energy and various physical characteristics are considered briefly.

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N. W. GREGORY

**Mechanism and Structure in Organic Chemistry.** By EDWIN S. GOULD, Stanford Research Institute. Henry Holt and Company, 383 Madison Avenue, New York 17, N. Y. 1959. x + 790 pp. 16.5 × 24 cm. Price, \$12.50.

There are many differences between this text and all others in the field of theoretical organic. It is quite clear that the author has concentrated his efforts on producing a book which will be both comprehensive and easily consumed by students at an intermediate level. I feel that both of these objectives have been accomplished to an impressive extent. As would be expected, achievement of such aims has cost something in rigor and penetrating analysis. On the other hand, Gould has kept his discussions basically sound which is more than can be said of any other author who has set out to present physical organic to the man in the street.

Some readers doubtless will question whether or not the material should really be called "physical" organic. This statement is to be construed as a characterization rather than as a criticism. Students, and others, who wish to have a quick look at what is thought about the mechanisms of randomly chosen reactions will find Gould's book to be a more useful source than any other text as a primary reference work. Furthermore, the discussions will often be found to be remarkably *sensitive reflections, considering their brevity*, of current thinking on the subjects. On the other hand, the expert in any given field will be likely to find that important refinements have not been developed very thoroughly. Furthermore, some readers will be bothered by the dearth of numbers in the book. For example, although Chapter 9, "Reactions of Carboxylic Acids and Esters," contains a modest number of quantitative statements concerning relative reactivity, I have been unable to find a single rate constant. Such a state of affairs is not uncommon even in more sophisticated texts but it leaves me with the fear that readers may spend all of their time worrying about the relative rates of reactions A and B with little regard to absolute facts such as the actual velocities under experimental conditions.

As has been indicated, the scope of the book is wide. The first three chapters deal with various aspects of structural theory. The fourth discusses acids and bases, including the Hammett acidity functions and the significance of Grunwald's activity postulate. Chapters 5 and 6, a very interesting pair, treat non-kinetic and kinetic methods for the study of reaction mechanisms. Chapter 7 treats the general problem of substituent effects on reactivity, including the Hammett and Taft equations. The last two-thirds of the book is devoted to chapters in which various types of reactions are discussed. The chapter titles are as follows: "Nucleophilic Substitution Reactions in Aliphatic Systems," "Reactions of Carboxylic Acids and Esters," "Carbanions and Enolization," "Electrophilic and Nucleophilic Substitutions in Aromatic Systems," "Beta-Elimination Reactions," "Addition Reactions," "Participation of Neighboring Groups in Nucleophilic Substitution Reactions and in Rearrangements," "Further Molecular Rearrangements," and "Free-radical Reactions."

The author has included a large number of exercises at the ends of the chapters which should be an asset in the presentation of courses based upon the text. Some of these problems are subtle and rather interesting.

I foresee substantial use of this book as either a primary or secondary reference in second courses in organic. It also deserves popularity as a quick access source among chemists in fields other than physical organic. I hope that use of the latter sort will often be followed by consultation of the primary literature to which Gould has supplied references in generous numbers (50-200 per chapter).

CONTRIBUTION NO. 2588

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**The Hydrogen Bond.** By GEORGE C. PIMENTAL, University of California, Berkeley, and AUBREY L. McCLELLAN, California Research Corporation, Richmond. W. H. Freeman and Company, 660 Market Street, San Francisco 4, California. 1960. xi + 475 pp. 16 × 24 cm. Price, \$9.50 (Text edition); \$11.40 (Trade edition).

The hydrogen bond is of great interest to chemists and biologists, and it has been subject to a considerable amount of investigation. The volume of literature on this subject is considerable and is steadily increasing. This book represents a comprehensive and critical review of this mass of literature. It is written with emphasis upon the physical and chemical facts with a threefold objective in mind: to compile and summarize the experimental facts, thereby furnishing a basis for interpretation of hydrogen-bond behavior in substances not yet studied; to present a critical discussion of the present state of the theory; and to present a bibliography (through 1956) which will aid workers in the field.

In reading the book it appears that the authors have succeeded in reaching their goals.

"The Hydrogen Bond" consists of twelve chapters. The first is an introductory chapter dealing with definitions,

occurrence, properties and the importance of the hydrogen bond.

The next three chapters deal with methods of detection of hydrogen bond. Dielectric, pressure-volume-temperature, association, conductance, melting point, vapor pressure, solubility, etc., measurements are discussed among the non-spectroscopic techniques. The spectroscopic techniques that are discussed include infrared, Raman, nuclear magnetic resonance, ultraviolet and visible, and nuclear quadrupole spectroscopy.

Chapter 5 deals with intramolecular hydrogen bonds and chapter 6 consists of a stimulating discussion of what groups form hydrogen bonds. The seventh and eighth chapters deal with the thermodynamic properties and the theory of the hydrogen bond, respectively.

Chapters 9, 10 and 11 treat hydrogen bonding in crystals, proteins and nucleic acids, and practical systems such as fibers, cloth, leather, etc., respectively.

Chapter 12 represents the authors' look into the future and consists of a brief discussion of promising experimental techniques, applications and theoretical developments. The book also has three appendices which contain symbols and notations, thermodynamic properties of hydrogen bonds and equilibrium constants for hydrogen-bond formations. An important part of the book is the bibliography of 2242 references. Another attractive feature is the inclusion in each chapter of a summary or conclusions. Critical discussions supplement the factual records. These discussions should be very helpful to the beginning workers in the field as well as the seasoned investigator. In this reviewer's opinion, a shortcoming of the book is the omission of mathematical detail; however, if such detail were included, the size of the volume would increase. In addition, it may be argued that the interested reader can with profit refer to the references included in the bibliography.

This book will certainly be a welcome addition to the libraries of all scientists interested in hydrogen bonding.

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**Metabolic Aspects of Renal Function.** By WILLIAM D. LOTSPEICH, M.D., Professor and Chairman, Department of Physiology, University of Cincinnati, College of Medicine. Charles C Thomas, Publishers, 301-327 East Lawrence Avenue, Springfield, Illinois. xiv + 214 pp. 16 × 23.5 cm. Price, \$7.50.

The functions of the kidney can be analyzed more precisely and in more penetrating fashion in the intact animal and man than can those of any other organ. This derives from the versatility of clearance methods which permit quantification of the rates of glomerular filtration, tubular reabsorption, and tubular secretion of a variety of normal constituents of blood plasma and of foreign test substances as well. Micromethods for the sampling of glomerular filtrate and tubular fluid, for the perfusion of single renal tubules and for the measurement of electrical potential differences, have contributed toward an even more fundamental understanding of tubular functions. Finally, studies of uptake and discharge of materials in kidney slices, of enzyme activities of slices and homogenates, of rates of turnover of intermediates, and of actions of inhibitors give promise of ultimately defining metabolic pathways and membrane carrier mechanisms.

"Metabolic Aspects of Renal Function" is a synthesis of evidence derived from these several lines of approach. Few could have written such a book, for few have had the training and experience in renal physiology and biochemistry which Dr. Lotspeich has had. The book is logically organized and lucidly written in a pleasing style. The scope of the book has been defined by the author's research interests. It is, however, more than an account of his personal research accomplishments. Rather it is an analytic and synthetic review of the present status of those fields to which he has contributed most significantly. Where data specifically related to the kidney are lacking, the author draws on information derived from other organs and tissues, makes reasonable predictions as to their possible application to the kidney, and frequently outlines profitable avenues of investigation. The graduate student and the mature investi-