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 structual 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 investigator will find in this book a wealth of interesting investigative leads.

The book consists of chapters on the transport and metabolism of phospate, on amino acids and glucose, on the tricarboxylic acid cycle in the kidney, on the synthesis and secretion of ammonia, on organic acids and bases, and on phlorizin. All who are interested in normal renal physiology or in such functional alterations induced by disease as renal tubular acidosis, the amino acidurias and the benign glycosurias will find the book rewarding reading. Those interested broadly in bodily function will find it a fascinating and stimulating account of modern trends in renal physiology.

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The Nature of the Chemical Bond and the Structure of Molecules and Crystals: An Introduction to Modern Structural Chemistry. Third Edition. BY LINUS PAULING, Professor of Chemistry in the California Institute of Technology. Cornell University Press, 124 Roberts Place, Ithaca, New York. 1960. xx + 644 pp. 16 × 24 cm. Price, $8.85.

Immediately after the quantum theory discoveries by Schrödinger and Heisenberg, a number of investigators fruitfully applied the new equations to problems of chemical bonding. But it was the brilliant series of papers on the "Nature of the Chemical Bond" by Linus Pauling that first yielded a synthesis of the new quantum theory with the valence theory built by generations of chemists. The publication of this work in book form in 1939 was a major contribution to the chemical literature. Your reviewer recalls that his first experience in chairing a seminar came immediately therafter; the subject was Professor Pauling's new book.

In the subsequent two decades much has been added to our knowledge of chemical bonding, and it is most appropriate that Professor Pauling has prepared a new edition. This new edition is the third; a second edition was published only one year after the first. The point of view is the same as before; it is a clear and complete presentation of Pauling's own theory. All due credit is given to others who have made contributions which Pauling incorporates into his theory, but there is practically no discussion of alternate theories for the same phenomena. The new text is approximately 150 pages longer and 50 pages of appendices have also been added. Much of the additional space is devoted to discussion of the bonding in substances whose structures have been determined since the earlier editions. Hydrogen bonding in proteins and nucleic acids is such a topic. The discussion of borane structures is completely revised to accord with the new structures. The greatly expanded exposition of Pauling's theory of metallic binding is a particularly valuable addition.

This edition includes a six-page section devoted to rebuttal of the criticism of resonance theory which arose primarily in Russia about a decade ago. While the reply to this largely ill-founded criticism is certainly appropriate, most readers would be more interested in at least an equal space devoted to the comparative merits of well-founded alternate theories which Pauling ignores. For example, overlap integrals provide a semi-quantitative criterion of bond strength which might have been compared with the criterion based upon the maximum angular magnitudes of the orbitals. Recent theories of the orientation of aromatic substituents consider the structure of the transition state in a more definite manner than Pauling does, and a comparison of results of these theories would be of interest.

Pauling states (on page 12) that he prefers to avoid the use of the word mesomerism (introduced by Ingold) because the true structure of a mesomeric or resonating molecule is not just an intermediate between classical bond structures but is a structure further changed in a manner to lower the energy. This reviewer agrees most heartily with the conclusion about structures but has come to the opposite conclusion with respect to terminology. The word, resonance, has a precise meaning in oscillating mechanical and electrical systems which is readily carried into quantum theory but is substantially different from its use in valence theory. Although the etymology of mesomerism may be less than perfect, that word has no other precise scientific meaning and hence has advantage as a name for this essentially unique situation. An example of the difficulties with the valence theory use of the word resonance occurs on page 26 where the usual rule is stated, "resonance can occur only among structures with the same number of unpaired electrons." This unqualified statement is not true because spin-orbit coupling yields small but non-zero exchange integrals between states of different spin orientation and the general meaning of the word resonance applies to just such weakly coupled phenomena as these. Substitution of mesomerism for resonance, however, makes the statement true without qualification.

In the preface to the third edition Professor Pauling indicates that certain changes were made to increase the value of the book to students at relatively early stages in their careers. A word of caution seems required at this point. The two general quantum theories of chemical bonding, based upon molecular orbitals or valence bond orbitals as initial approximations, have comparable merit. The valence bond theory is more readily coupled to classical chemical valence theory as Pauling has most ably demonstrated. But the molecular orbital theory has equally definite advantages in the treatment of the ground state of some systems, the O_2 molecule for example, and is clearly superior for the discussion of excited electronic states. Thus the student's first general study of valence and structural chemistry should include a balanced presentation of both theories. Since the "Nature of the Chemical Bond" contains nothing about the molecular orbital method, except for a few words about H_2, it is more appropriate as a supplementary reference source than as a text for such a study.

This is a book that all chemists interested in the fundamental theory of their subject will wish to have at hand. The book contains a treasure of well selected experimental structural data and would be valuable on that basis alone. The interpretations of these structures, however, are equally important and are always well presented. The only danger is the one mentioned above, that the uninitiated reader may not even become aware of the existence of alternative interpretations.

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Nouveau Traité de Chimie Minérale. Tome XI. **Arsenic-Antimoine-Bismuth.** Edited by PAUL PASCAL, Membre de l'Institut, Professeur honoraire à la Sorbonne. Masson et Cie., 120, Boulevard Saint-Germain, Paris 6, France. 1958. xxxix + 850 pp. 18 × 25.5 cm. Price: broché, 7.750 fr.; cartonné toile, 8.950 fr.

Nouveau Traité de Chimie Minérale. Tome XIV. **Chrome-Complexed due Chrome-Molybdéne-Tungsténe-Hètèro-polyacides.** Edited by PAUL PASCAL, Membre de l'Institut, Professeur honoraire à la Sorbonne. Masson et Cie., 120, Boulevard Saint-Germain, Paris 6, France. 1959. xxxix + 1014 pp. 18 × 25.5 cm. Price: broché, 9.500 fr.; cartonné toile, 10.700 fr.

The eleventh volume of this classical reference work on Inorganic Chemistry contains chapters on Arsenic by Roger Dolique (403 pages), on Antimony by Pierre Bothorel (162 pages) and on Bismuth by Louis Domange (160 pages). The editor contributes a section on the organic compounds of arsenic (53 pages), but his customary correlating chapter is omitted from this volume. Presumably the correlation will be given in the volume devoted to Nitrogen and Phosphorus.

Volume XIV, on the other hand, follows the more usual pattern beginning with an introductory chapter by Paul Pascal entitled "Group VI sub group chromium, molybdenum, tungsten, uranium, etc." The inclusion of uranium is a sort of vestigial relic of the old Periodic Table but it is retained mainly to emphasize the ways in which it differs from the members of sub-group VI which are the only ones dealt with in the main text. The general chemistry of chromium is described by J. Amiel (389 pages). The complexes of chromium are given a separate treatment by Raymond and Clement Duval (137 pages). A chapter on molybdenum by J. Aubrey (125 pages) and one on tungsten by A. Chretien and W. Freudlich (156 pages) are interlarded with passages on molybdenum oxides and the isopoly and