

The first chapter is a very brief summary of chemical kinetics. The second describes experimental methods used in the study of polymerization reactions. The next five chapters cover in great detail the mechanism and kinetics of free radical addition polymerization. Chapter 8 presents an excellent summary of copolymerization. The ninth chapter treats heterogeneous liquid-phase polymerization—suspension and emulsion systems. This is followed by a very long and detailed chapter on degradation reactions of high polymers. The last two chapters are on ionic polymerization and condensation polymerization, respectively.

The treatment of condensation polymerization was somewhat disappointing to this reviewer. The theoretical, particularly the mathematical, aspects of the subject were very adequately covered; but these theoretical principles could have been accompanied, to advantage, by a considerably broader selection of qualitative information on the chemistry of polycondensation reactions. However, this is less a criticism of the author than of the literature available for him to survey. The experimental literature on polycondensation reactions consists of a very few studies designed to test or illustrate theoretical principles, plus many purely qualitative papers and patents which completely ignore theory. The boundary line chosen by the author is a logical one, corresponding to an existing chasm in our knowledge of these reactions; he has left to some future reporter the more ambitious task of bridging this chasm and integrating the mass of qualitative information into the theoretical framework.

The other topics are all covered in a thoroughly satisfactory manner. The book will prove invaluable to all persons who are interested in the mechanisms of polymer reactions.

PHYSICAL RESEARCH LABORATORY  
DOW CHEMICAL COMPANY  
MIDLAND, MICHIGAN

TURNER ALFREY, JR.

**Chemical Engineering Science. Genie Chimique. The Proceedings of the Conference on Oxidation Processes.** Editorial Board: J. CATHALA, Toulouse, P. V. DANCKWERTS, Cambridge, BARNETT F. DODGE, New Haven, Conn., M. B. DONALD, London, F. GIORDANI, Naples, A. GUYER, Zurich, W. L. DE KEYSER, Brussels, D. W. VAN KREVELEN, Geleen, Netherlands, R. W. SOUTH-WORTH, New Haven, Conn., S. G. TERJESEN, Trondheim. Pergamon Press, Ltd., 4-5 Fitzroy Square, London, W. 1., England. 1954. 135 pp. 19.5 × 25.5 cm. Price, £1.15.0.

This symposium is notable for the wide scope of oxidation processes covered, ranging from the mechanism of liquid phase oxidation to the use of oxygen in the steel industry. Emphasis is generally on processing and less on theoretical considerations although both points of view are represented. Chemists and chemical engineers interested in oxidation processes will find this collection of papers a valuable source of information.

Industrial practice is discussed for the established commercial processes of the preparation of fatty acids by air oxidation of paraffins, adipic acid by nitric acid oxidation of mixtures of cyclohexanone and cyclohexanol, and the production of acetylene by partial oxidation of methane.

Papers are included on the use of oxygen in steel making and in gasification processes. The technical aspects of tonnage oxygen production are also discussed.

Liquid phase hydrocarbon oxidation is well represented by papers on the oxidation of cumene to cumene hydroperoxide, and of *p*-*t*-butyltoluene to *p*-*t*-butylbenzoic acid and on the mechanism of liquid phase oxidation.

In a discussion of the use of vanadium oxide catalysts the commercially interesting oxidations of sulfur dioxide, naphthalene and benzene are viewed from a kinetic standpoint. Conclusions are related to industrial practice.

The direct oxidation of benzene to phenol is described in which the addition of cyclohexane is shown to have a marked effect on the yield of phenol.

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F. B. MARCOTTE

**The Structural Chemistry of Proteins.** By H. D. SPRINGALL, M.A., D.Phil., F.R.I.C., Professor of Chemistry, University College of North Staffordshire. Academic Press Inc., Publishers, 125 East 23rd Street, New York 10, N. Y. 1954. x + 376 pp. 15 × 22 cm. Price, \$6.80.

During recent years great progress has been made in the field of the structural chemistry of proteins through the application of a number of techniques. These techniques are so different in nature that it is hard to find someone who is able to discuss all of them in a thoroughly competent way. Professor Springall, an organic chemist who has been interested in physical chemistry and modern structural chemistry as well as organic chemistry, and who has himself carried out investigations in the field of the determination of molecular structures by diffraction methods, is admirably suited to the task of writing a succinct, reasonably detailed, and up-to-date account of proteins, including their chemical composition, chemical properties, physico-chemical properties, and molecular structure. His book can be recommended both as a textbook and as a reference book.

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LINUS PAULING

**The Nucleic Acids. Chemistry and Biology. Volume II.** Edited by ERWIN CHARGAFF, Department of Biochemistry, Columbia University, New York, N. Y., and J. N. DAVIDSON, Department of Biochemistry, University of Glasgow, Glasgow, Scotland. Academic Press Inc., Publishers, 125 East 23rd Street, New York 10, N. Y. 1955. xi + 576 pp. 16.5 × 23.5 cm. Price, \$14.50.

This excellent book and its companion volume will be indispensable to all workers in the many fields that contact each other on the common ground represented by the nucleic acids. Here investigators in biochemical genetics, cytology, virology, radiation, differentiation, growth metabolism and cancer research will find a masterful account of the present status of the role of the nucleic acids. The two volumes are subtitled Chemistry and Biology and in a general way volume I was on the chemistry of the nucleic acids, while volume II has more to do with their biology. But there is so much of both chemistry and biology in each volume that it would have been misleading to label them separately and both volumes are essential. Surely no individual could have written these books, and the editors were wise in selecting separate authors for their 28 chapters. In the present volume the chapters on biosynthesis of nucleic acids and their components by Glock, Reichard, Schlenk, and Brown and Roll are moving accounts of the rapid progress in this field, and the chapters on the biological role of deoxyribose nucleic acid by Hotchkiss, of pentose nucleic acid by Brachet, and the metabolism of the nucleic acids by Smellie are even more exciting as they lead into what is surely the beginning of the stage of integration that makes the increasing complexity emerge into simplifying generalizations. These later stages can be reached no sooner than methods are developed and perfected, and the chapters by Leslie, Swift, Dounce, Vendrely, Thorell and Hogeboom and Schneider provide the reader with valuable discussions of methods along with their accounts of progress in the field.

This volume is not just a compendium of references, although as such it is a tremendous collection of over 200 references in most chapters. The references are skilfully assembled into a highly useful picture. The authors were each given the opportunity to add an addendum to their chapter in which the latest reports were included. Thus it is seen that no one had guessed that the nucleosides would be bypassed as intermediates in nucleic acid synthesis with the ribose and phosphate brought in together by means of 5'-phosphoribosylpyrophosphate. While there was time to note the occurrence of di- and triphosphates of all the mononucleotides derived from pentose nucleic acid, there has not been time to assess the significance of these findings or to evaluate reports that the diphosphates may be the immediate precursors of the nucleic acids. The growing realization that nuclear pentose nucleic acid is metabolically more active than the cytoplasmic counterpart was brought out in several chapters but no one was prepared to come out flatly with the pronouncement that at least a part of the cyto-

plasmic pentose nucleic acid must have been synthesized independently of the nucleus. These questions bring us back to the familiar question of isotopic incorporation or exchange *vs.* true synthesis. The ultimate answer is not available but the means are at hand to provide the answers to many of the questions that remained as this book went to press. One has the feeling that the questions that remain will require many additional volumes to record the attempts to provide answers. But those who attempt to go on cannot do better than to study and restudy the two volumes edited by Chargaff and Davidson.

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VAN R. POTTER

**Advances in Enzymology and Related Subjects of Biochemistry.** Volume XVI. Edited by F. F. NORD, Fordham University, New York, N. Y. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1955. v + 584 pp. 16 X 23.5 cm. Price, \$11.00.

In contrast to some previous volumes of this series, in the present volume the editor restricts most of the subject matter to reviews concerning enzymology. The reviews are: "Structure of Coenzyme A" (the story of how the structure of coenzyme A was established by combination of chemical, enzymic and microbiological procedures) by J. Baddiley; "Coagulation of Blood" by W. H. Seegers; "Comparative Biochemistry of the Phenolase Complex" by H. S. Mason; "Transamination" (the transfer of the amino group by enzymes) by A. Meister; "Intermediates in Amino Acid Biosynthesis" by B. D. Davis; "Structural and Functional Aspects of Myosin" (structure and organization of fibrous proteins, and transfer and utilization of energy by protein systems) by A. G. Szent-Györgyi; " $\beta$ -Glucuronidase" (distribution, properties, occurrence, physiology and relation to disease) by W. H. Fishman; "The Chemistry of the Cell Nucleus" by V. G. Allfrey, A. E. Mirsky, H. Stern. Page 172 is followed by pages 172a and 172b, and the page that follows 492 should be 493. These, however, are minor discrepancies in book production. All 8 chapters, without exception, are excellently presented, and contain much useful and interesting material.

VENEREAL DISEASE EXPERIMENTAL LABORATORY  
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**Theoretical Principles of Organic Chemistry.** Volume I. By WALTER HÜCKEL, Dr.Phil., Professor of Pharmaceutical Chemistry, Tübingen University (Germany); formerly Professor of Organic Chemistry at the University and Technische Hochschule of Breslau. Elsevier Publishing Company, 402 Lovett Boulevard, Houston, Texas. 1955. xi + 904 pp. 18 X 25.5 cm. Price, \$15.00.

Almost every adult has had the experience of returning to a scene with which he was familiar as a child, and of observing that the lofty mountains which he had remembered so clearly were, after all, only hills, that the mighty rivers were only creeks, and that many of the majestic trees had been cut down. Any organic chemist who, like the present reviewer, became acquainted with "Theoretische Grundlagen der organischen Chemie" as a graduate student and found it exceptionally stimulating is likely to experience a similar disappointment when he encounters this translation of the seventh edition. The book is still stimulating, and the reader can still profit from its critical and comprehensive survey of the theoretical principles of organic chemistry. The old thrill of standing at the very frontiers of the science, however, is harder to recapture, and one cannot help feeling that much of the material is now outmoded or can be found better presented elsewhere.

The order of presentation and the general approach are unchanged from the earlier editions. The historical discussions, with their wealth of experimental detail and with their emphasis on the classical organic-chemical viewpoints, are not only interesting for their own sakes but also serve as valuable reminders that our present theories are the results

of long and slow developments and may well be no more permanent than their predecessors. Frequently, however, it is disconcerting to find that Hückel's treatment ends with an annihilating discussion of the views current at about 1900, or perhaps 1930, and with a brief statement, in parentheses or in a footnote, that the modern quantum-mechanical approach cannot be described here but will be given more fully in the second volume. The theory of mesomerism (or resonance), for example, is often mentioned, and the reader may be misled into believing that, with its aid, almost all of the remaining unsolved problems can be successfully treated. The theory itself, however, is not described in sufficient detail to be of much use; it is instead one of the topics reserved for the second volume.

In some instances, the explanations are far from clear, if not misleading or incorrect. For example, on pages 382, 691, and elsewhere, the reader can hardly avoid the impression that the reactivity of a mesomeric ion or molecule is determined by the frequency with which it goes over into a particular, especially reactive one of the limiting structures; on page 707, the order of a reaction is identified with its molecularity and, although the distinction is stated correctly later, the original erroneous impression is likely to be retained; on page 807, there is mention of a first-order reaction with velocity "almost independent of the concentration," and the passage has to be read carefully several times before its meaning becomes clear. In other instances, the author is apparently forgetful as, for example, when he states positively on page 594 that, in the catalytic hydrogenation of conjugated dienes, "1,4-addition products are never observed" (italics his), but on page 604 that catalytic hydrogenation of butadiene gives "*cis*- and *trans*-butene-2 (1,4-addition)." On some occasions, presumably as a result of the unavoidable delay in translation and publication, the conclusions reached in the book have been invalidated by more recent work, as, for example, with the mechanism of the *para*-Claisen rearrangement, discussed on pages 812ff. In the final chapter, after a careful and critical discussion of the pit-falls encountered in the use of kinetic data for the determination of reaction mechanisms, the author concludes with a series of hurried and largely uncritical and unsupported statements regarding the detailed mechanisms of a great many different types of reaction.

It has long been recognized that Hückel is hard to read in the original German. Unfortunately, he is still hard to read in this English translation. Part of the difficulty is due to the fact that the translation is often too literal; the book abounds, for example, with such passages as "These molecular compounds of the oft by-themselves already colored unsaturated ketones are often distinguished by . . ." (page 135). In other instances, the original German could hardly have been brought into smooth and idiomatic English by any translation, as, for example, with "The final conclusion, drawn by Claisen, which hence leads to a contradiction with experience, does however contain hidden away an assumption that is certainly not generally valid, namely, that the relation (ratio) of the reaction velocities of two compounds,—here of the O- and of the C-metal derivatives—of under similar conditions similarly built compounds—here of the halides—must be relatively always the same or nearly the same" (page 389). With this passage, only a complete paraphrasing could have led to a satisfactory version. In still other instances, the book could have profited from more careful proof-reading and editing. Although the misprints are remarkably rare in view of the fact that the language was presumably foreign to the type-setter, there are a few. Even the most serious of these, however, such as the replacement of "due" by "ore" and simultaneously of "for" by "duf" (page 198) do not greatly confuse the reader. It may be noted also that the spelling is sometimes British ("aluminium"), sometimes American ("center"), and sometimes neither ("where-ever"). The unfamiliar expression "lonesome electron-pairs" (page 32) possibly adds a certain interest, but the frequent use of rare and obscure words like "chemism" and "schemata" tends to prevent easy reading. The explanatory remarks inserted by the translator are frequently more confusing than helpful.

In conclusion, "Theoretical Principles of Organic Chemistry" may be described as a book which, although sometimes disappointing, is well worth careful study. The reader must, however, be willing to wade through many long and frequently difficult discussions, and he should be sufficiently mature to fill in missing details and to discount