

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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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; " β -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.

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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

those parts that do not adequately represent the best modern views.

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Reaktionen in und an Festen Stoffen. By KARL HAUFFE, Zentralinstitut für Industrielle Forschung Blindern, Oslo. Anorganische und Allgemeine Chemie in Einzeldarstellungen Herausgegeben von G. JANDER UND W. KLEMM. Band II. Springer-Verlag, Reichpietschufer 20, Berlin W 35 (West-Berlin), Germany. 1955. xi + 696 pp. 16.5 × 23.5 cm. Ladenpreis: Ganzleinen DM 78.-.

This book is the second in a series of monographs in general and inorganic chemistry under the editorship of G. Jander and W. Klemm. It contains extensive and detailed treatment of numerous solid state reactions selected from the recent literature in this rapidly developing field. The author has chosen to omit descriptions of many interesting technical processes so that a thorough discussion of his selected examples would be possible.

Many of the several hundred figures appear to be based directly on the original literature, reference to which is cited. Each figure is accompanied by a discussion which in the main is built around the Schottky-Wagner disorder theory which the author says runs through the entire book like a red thread. It is pointed out that Jost in 1937 first used this theory for a comprehensive presentation of processes fundamental to solid reactions.

The Schottky-Wagner theory as described is based on three assumptions necessary to electroneutrality: (1) An excess of metal over the stoichiometric composition is to be considered as an excess of cations + quasi-free electrons; (2) an excess of anions over the stoichiometric composition is to be considered as an excess of anions + electron holes; (3) an excess of B (especially in mixed metal phases) occupies, here and there, lattice positions of component A. In the first assumption two cases arise: (a) the cation excess is possible because a few places, here and there, in the anion lattice are unoccupied; (b) the cation excess may occupy interstitial positions. In the second assumption two cases arise: (a) the anion excess occupies interstitial positions; (b) the anion excess is possible because a few places, here and there, in the cation lattice are unoccupied.

The theory has been expanded, where necessary, to treat recently obtained data. For example, it was found possible to apply the Wagner oxidation theory at high temperatures but the theory lost its validity at medium and low temperature due to the formation of thin oxide films and it was necessary to develop a new theory. This has been done by Mott and Cabrera and by the author and his co-workers. The presentation is mathematical throughout but at places a rather generalized treatment has been used which the author hopes will enable persons with less mathematical training to apply the various diffusion equations.

Following the introduction, the various chapters deal with disorder phenomena in ionic crystals and in semi-conducting crystals; disorder and electric behavior in ionic and valence crystals; semi-conducting crystals and chemisorption; diffusion processes in solid materials; oxidation processes in metals and metal alloys; the mechanism of the formation of ionic compounds of higher order by means of reaction in the solid state; reduction and roast processes.

The importance of nuclei formation to crystal growth is not considered because of a recent comprehensive presentation of this material by I. N. Stranski and co-workers. Ordered precipitation (epitaxial) has likewise not been treated because of a recent publication on the subject by A. Neuhaus.

In his closing remarks the author points out that he has attempted to make a practical selection of solid state reactions for discussion but that the many new situations that are developing require that the solid state chemist and the solid state physicist concern themselves especially with 1. the real structure of the crystal, 2. the thermodynamics and kinetics of the building of crystals from ions and electrons and 3. physicochemical characteristics of crystals. In the last paragraph the author expresses his belief that there is scarcely an industry that is not touched in some way by solid state reactions and that therefore fundamental research in this field is of great industrial importance.

It is the feeling of this reviewer that the author has, in the main, achieved his purpose although one could wish that a more thorough treatment could have been given to work originating outside of the author's geographical area. The author and publishers should be congratulated on a monumental piece of work well done.

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BOOKS RECEIVED

October 10, 1955—November 10, 1955

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