

180) or a legend that says succinate while the figure shows α -ketoglutarate (p. 141) are not likely to mislead even the less-experienced student. More unfortunate perhaps are insufficiently qualified statements about the discharge of accumulated calcium by uncoupling agents on page 164. Also, the formulas used on page 73 to indicate how Coenzyme Q can undergo reduction and cyclization show a hydroxyl group in the side chain not present in Coenzyme Q. There is also some confusion about the identity and type of protein in C-factors I and II on pages 194, 198, and 199.

The schemes presented on page 230 offer relatively little conceptually except possibly for (a), which contains potentialities for a mechanism. The newcomer to swelling and contraction may be confused by the fact that mitochondria are indicated as swollen when the ATP/ADP ratio is low, when evidence earlier in the book indicates contraction of mitochondria with the uncoupler DNP both *in vitro* and *in vivo*. The scheme is undoubtedly based on the known ATP contraction, but it does ignore known energy requirements for certain kinds of mitochondrial swelling. But these matters involve some very contradictory situations with uncouplers that are for current and future research, not points that can be settled in this book, which is highly recommended.

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Chemical Infrared Spectroscopy. Volume I. Techniques. By W. J. POTTS, JR., Chemical Physics Research Laboratory, The Dow Chemical Company. John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. xvi + 322 pp. 15.5 × 23.5 cm. Price, \$8.50.

Dr. Potts is himself eminent in the world of chemical spectrometry and he dedicates this book to his mentor, Dr. Norman Wright. In so doing, he establishes a chain of communication with the Harrison Randall school of infrared spectrometry which played a dominant part in developing the basic techniques of the subject at the University of Michigan in the earlier decades of this century. Dr. Wright brought the academic techniques of infrared spectrometry from the University of Michigan to the Dow Chemical Company. He was joined there later by Dr. Potts, and these two with their colleagues, listed in the preface of this book, have done as much as any other single research group to establish infrared spectrometry as a tool in industrial analysis and process control.

This book, the first of two volumes, deals with the techniques of infrared measurement. It is to be followed later by a companion volume in which interpretation will be the main theme. Two introductory chapters on the nature of infrared radiation and on the absorption of infrared radiation by molecules ease the neophyte into the intricacies of this complex subject without scaring him prematurely by erudite displays of matrix algebra and partial differential equations. Those are saved for the eighth and last chapter, by which time the student should be hardened enough to face the mathematical facts of life. This final chapter effectively bridges the gap between the empiricism of "group frequencies" which induces shudders down the spines of true spectroscopists, and doctrinaire preoccupation with normal modes of vibration which deny analytical spectroscopists any hope of extending exact spectroscopic theory to the 99% of organic molecules that lack simple symmetry and contain more than half a dozen atoms. One might question whether this last chapter is not out of place in a volume dealing with technique, but this can be better judged when we have the whole work and see what is to follow.

Between these first two chapters and the eighth, the reader will find the best account of the instrumental aspects of infrared spectrophotometry that has yet been written. Successive chapters deal with spectrometer optics, the performance and operation of infrared spectrometers, sample preparation techniques, quantitative analysis, and a catch-all chapter headed "auxiliary devices and special techniques." The principles are all described with the assistance of clear and simple diagrams which concentrate on general principles rather than the incidental details of individual manufacturers' hardware. The information is all basic and there is no padding out with glossy pictures lifted from commercial catalogs. Particularly useful is the discussion of recorder noise, the practical illustrations of properly and im-

properly measured spectra, and the section on practical spectrometer operation and testing.

It is unfortunately only too evident from the published literature that many infrared spectroscopists do not know how to set the knobs on their instruments correctly. In this book Dr. Potts tells them. . . and many other useful things as well. We will be looking forward with interest to the appearance of Volume II.

DIVISION OF PURE CHEMISTRY
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R. NORMAN JONES

Survey of Progress in Chemistry. Volume I. Edited by ARTHUR F. SCOTT, Department of Chemistry Reed College, Portland, Ore. Academic Press, Inc., 111 Fifth Ave., New York 3, N. Y. 1963. 340 pp. 15.5 × 23.5 cm. Price, \$7.95.

The rapid growth of research effort and its reporting has led to much concern with information retrieval schemes. It is frequently tempting, as the literature grows and it becomes more difficult to "keep up," to contemplate large data processing installations providing rapid and complete access to our accumulated knowledge. It is, however, worth remembering that this effort will be done by human beings and that its success will depend entirely upon the ability and competence of individuals. The review article is certainly our most common means of information retrieval, and illustrates well the variation in success that may be expected of any scheme.

This modest book is a collection of seven review articles. No attempt has been made to interrelate the material presented in the different articles. The announced intended average reader is the college teacher 10 years out of school. It is apparent that the dispersion of this sample will be quite large, but to this reader (whose qualifications are very close to the average) it appears that the range of subject matter covered is large enough that almost all will find something old, something new. In addition to the range of subject matter there is, of course, a large range in the efforts expended by the individual authors. It makes little sense, therefore, to review this book as a whole. The articles, with this reviewer's opinion of them, are listed below in the order they appear in the collection.

"New Research Tools of Chemists," by Riley Schaeffer.—This is a perfunctory survey of a few physical techniques which have found widespread application in chemical research. The level of presentation is shallow and the only purpose that it can serve, namely, to direct the reader to other works on the methods discussed, has been obviated by an inadequate bibliography. In summary, this chapter is better dead than read.

"High-Temperature Reactions" by Alan W. Searcy.—This chapter presents an informative discussion of the principles governing chemical equilibria at high temperatures. These principles are nicely illustrated by a large number of examples systematically presented which form in themselves an interesting section of descriptive inorganic chemistry. Since chemistry at high temperatures is qualitatively quite different from that of aqueous solutions at room temperature, this chapter will be of considerable value both practically and intellectually to a large group.

"The Implications of Some Recent Structures for Chemical Valence Theory" by R. E. Rundle.—It has always been and perhaps will always be the hope that the vast body of observation constituting chemistry can be explained by a few well-chosen principles which are relatively simple (mathematically) to apply. At the outset of this chapter, Professor Rundle points out clearly that these principles of valence theory must be in accord with quantum mechanics. The bulk of the chapter is a descriptive molecular orbital treatment of electron-deficient compounds, transition metal compounds, and, for want of a better title, outer d-orbital compounds (PCl_5 , I_3^- , etc.). The central theme in the article is that the Lewis concept of molecules having rare gas structures can usually be maintained if a flexibility in the choice of molecular orbitals is accepted. A goodly amount of attention is paid to the symmetry classification of orbitals and some discussion of the qualitative energy order of orbitals is presented. In the course of presenting this description of chemical bonding, the author discusses the molecular structure of many novel species. This reviewer has reservations toward believing that qualitative molecular orbital theory does more than give an explanation of observation and is generally nonpredictive with

respect to molecular geometry and thermodynamic stability. The diversity of descriptive chemistry, however, does require some skeleton on which to hang the meat of the matter. This chapter will serve as an excellent aid in learning and remembering facts of chemistry. Considering that so much of the present literature is devoted to explaining stability and structure in simple terms, it seems quite appropriate that this volume include a chapter such as this one.

"Metalloenes" by William F. Little.—In contrast to the chapter by Professor Rundle, this chapter is devoted almost entirely to the preparation and chemical reactions of ferrocenes and other metalloenes. There is little doubt that the metalloenes form one of the most interesting chapters in modern inorganic chemistry and have served to stimulate much novel inorganic synthesis and thought concerning chemical bonding. This chapter, together with that of Rundle, presents the reader with a considerable (and contrasting) discussion of transition metal chemistry.

"Oxidation Reduction Mechanisms in Organic Chemistry" by Kenneth B. Wiberg.—There is a large body of systematically gathered data on the oxidation-reduction chemistry of organic compounds. Professor Wiberg presents a well-organized classical mechanistic discussion of a goodly section of this area. The article is well flavored with the difficulties of deciding likely mechanisms and also of the modes of resolution of these difficulties. The presentation is by highly specific example and is crisp. The article serves the avowed purpose of this book splendidly.

"The Chemistry of Biological Energy Transfer" by William B. Jencks.—This chapter is certainly the grandest of the collection in area of material. The amount of material covered is vast, and yet much detail is included. This is not a chapter which can be skimmed profitably. The reading is difficult and certainly requires a reasonable working knowledge of the details of chemistry. In view of what the author attempts (and succeeds in), it could not be otherwise. The content of the chapter is just what the title says. One cannot be other than deeply impressed by the depth of chemical understanding of metabolic processes available today. In summary, this chapter is to this reviewer, the most valuable of the collection.

"The Structure of the Grignard Reagent and the Mechanisms of Its Reactions" by Rudolf M. Salinger.—The historical and practical importance of the Grignard reagent is well known. It would seem likely that by now the structure of the Grignard reagent would also be well known. The present chapter shows the latter not to be the case. The difficulties of the determination of molecular geometries in solution are seen clearly in this chapter. The first part of this work shows that even the molecular units present in solution are quite uncertain and quite likely to vary with solvent, halide, and aryl or alkyl groups. The second part of this chapter discusses the mechanisms of reactions in terms of detailed transition-state structures. In view of the difficulties in ascertaining the structure of the Grignard reagent itself, these transition state structures seem of dubious permanent value. It would seem to this reviewer that systematic studies of polymerization of magnesium halides, and of magnesium dialkyls and diaryls would be the first step in understanding the solution composition. The question of whether the species $RMgX$ exists and is "the" Grignard reagent is obviously the basic question.

In summary, there is a considerable range in the quality of the articles presented. Some will have a relatively long life of usefulness. Considering the purpose of this series it seems fair to consider it a modest success.

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Catalysis and Inhibition of Chemical Reactions. By P. G. ASHMORE, Lecturer in Physical Chemistry, University of Cambridge, Fellow and Tutor of Churchill College. Butterworth, Inc., 7235 Wisconsin Ave., Washington, D. C. 20514. 1963. 375 pp. 16 × 25.5 cm. Price, \$14.95.

In the preface to this book the author states that he has "... chosen as wide a definition of 'catalysts' as allowed in order to compare and contrast mechanisms. . . ." Such a goal requires coverage of a wide variety of reactions, and in this respect, the book lives up to its promise. The discussion ranges

from thermal decomposition to polymerization—from proton and electron transfer in solution to atom transfer in gas reactions—from heterogeneous catalysis to enzyme catalysis. These topics are developed in some depth as attested by the 900 references at the chapter ends. Thus, here we have a book that should be of particular interest to researchers in one of these areas who seek to broaden their outlook as well as (to quote the author) "students of all branches of chemistry."

Books written for specialists can be effective even when terms and concepts are unclearly presented so that familiarity with the literature is required for understanding, but a summary for non-specialists must be clear. In this respect the book falters. Clarity is sometimes lost because of muddy presentation. For example, in his discussion of adsorption on heterogeneous catalysts the author observes: "The specific effects of crystal face may also be due to the possibility or otherwise of multiple bonding of an atom to several surface atoms." (Italics are mine.) In the same chapter he also observes: "Some recent evidence (see p. 139) suggests that the pattern of sites may be *between* the surface atoms at low coverage, but changing to the surface atoms at higher coverage³." On page 139, there is no elaboration on this statement, nor is the evidence revealed. Furthermore, the reference cited is a 35-page review article on chemisorption of metals with 125 references.

In some sections the author sacrifices precision for brevity. This is most distressing in his discussion of the kinetics of polymerization kinetics where he uses m_j^* to indicate a radical chain with j segments; then, without redefinition, he (apparently) uses the symbol $[m_j^*]$ to represent the *total* concentration of *all* radical chains. Such lack of precision also appears in the running text. For example, in this same chapter he states that activation energies obtained by different workers for the same reaction are "not very different"; in the accompanying table we find that different workers report 0 and 5.2 kcal./mole for the same reactions.

Finally, the density of typographical errors seems higher than usual. True, some of these are trivial, but some are troublesome.

In evaluating any book, the good points must be weighed against the bad points. On the plus side, we find a variety of reactions presented in considerable depth; on the minus side, we find the defects mentioned in the preceding paragraphs. In the balance, the book is a valuable reference in spite of its defects. But without these defects, it would have been outstanding.

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Indolalkaloide in Tabellen. By MANFRED HESSE, Assistent am Institut für Organische Chemie der Universität Zürich. Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf (West), Germany. 1964. 212 pp. 21 × 29.5 cm. Price, DM 24.

Indole alkaloids have been in recent years the subject of extensive investigations in different laboratories throughout the world. This has been the result of the discovery of remarkable physiological properties of various representatives of this class of natural products such as reserpine, lysergic acid diethylamid, and, more recently, vincalkebostine (VLB), a useful therapeutic agent in the treatment of human neoplasms. According to Manfred Hesse, the author of the newest catalog of indole alkaloids, an average of eight new indole alkaloids appeared monthly in the literature in 1963. In this era of structure elucidation by mass spectrometry and X-ray method, it is hard for a standard textbook on alkaloids to keep up with the new findings. This is one of the reasons why Hesse's Tables will certainly be a most useful catalog for all those who are working in this field.

Hesse's Tables contain data on 511 alkaloids. At the time of printing, the structures of 304 of these were known. Alkaloids are listed in groups according to certain types, such as Olivacine (I), Canthine (II), Iboga (III), Aspidosperma (IV), etc. A great virtue of the Tables lies in the presentation and placing of the various data to the right of the structure. Each position (occurrence; structure determination; melting point; optical rotation; infrared, n.m.r., mass, and ultraviolet spectra; and synthesis) is accompanied by a reference number, with references to be found on the bottom of the same page. Only those who assemble this type of data can appreciate the enormous amount