

acid and continuing with an extensive discussion of the physico-chemical literature which led to our present views of solutions in acetic acid. A convenient table of titrations performed in acetic acid is included.

Chapter 2, "Chemie in Essigsäureanhydrid" by Horst Surawski (70 pp.), has a pattern quite similar to the first chapter. Considerable conductance data are presented including the interpretation of phoreographs using Shedlovsky's modification of the Fuoss-Kraus method. A review of conductimetric, potentiometric, and indicated titrations is given. Also included is a summary of displacement and precipitation reactions.

Chapter 3, "Chemie in geschmolzenem Acetamid" by Gerhard Winkler (19 pp.), and Chapter 4, "Chemie in wasserfreier Ameisensäure" by Herbert Knauer (28 pp.), are considerably shorter than the preceding chapters. Both follow the patterns of the previous chapters and are of high over-all quality.

The last chapter, by Lyle R. Dawson, "Chemistry in Formamide and Derivatives of Amides" (40 pp.), is a comprehensive summary of conductimetric data and their significance. The author is well known for his contributions to this area.

As in all books of such wide scope, omissions have occurred. A discussion of photometric and thermometric titrations in *glacial acetic acid* is absent. In Chapter 5 no discussion of acid-base titrations or polarography is given. These and other minor omissions detract slightly from this book's value.

The editors and authors of this volume have filled a void in the nonaqueous chemical literature and have produced a book which will undoubtedly find its way into the libraries of those seriously interested in this field.

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Experimental Methods in Gas Reactions. By SIR HARRY MELVILLE and B. G. GOWENLOCK. St. Martin's Press, Inc., 175 Fifth Ave., New York 10, N. Y. 1964. 446 pp. + vii. 15.5 × 22.5 cm. Price, \$17.00.

Workers in the field of gas reactions are familiar with the book by Farkas and Melville, "Experimental Methods in Gas Reactions." New materials of construction, commercial equipment and components, and experimental techniques in the 25 years since this book was written have made necessary this revision. The authors claim that about half of the book consists of new material, and half contains standard information from the first edition which is of value. The book is divided into broad sections on kinetic theory of gases, pressure control and measurement, temperature control and measurement, the preparation and purification of gases and volatile compounds, gas analysis, photochemical techniques, and a concluding general chapter on the assembly of assorted varieties of apparatus. Material on classical (pregas chromatography) gas analysis is still retained in detail because the authors felt that in some instances these techniques may be more convenient or accurate than chromatographic techniques; there do not exist separate recent works listing these methods in detail for the benefit of people new to the subject. Gas chromatography warrants only about six pages of discussion, probably because there are numerous small and large books now available on the subject. The same is true for mass spectrometry. Many drawings and more detailed discussions are found of special techniques and apparatus which would not be obvious or readily found elsewhere by a person who is not already conversant with the material. An example of such an item is the inefficiency of many common cold traps in the trapping of samples from the effluent gas of a gas chromatography; this is not mentioned in many sources on gas chromatography, although it is found here. Probably the greatest value of the book is the utility as a catalog for a tremendous number of references for items or methods which can only be cited in passing in the text. The equipment items and manufacturers mentioned are almost solely of British origin. The knowledge that an item is available commercially in another country usually encourages the interested experimenter to look for a more readily available domestic counterpart, so this is not a serious hindrance in the use of the book.

The authors are to be commended for their work.

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The Mitochondrion. Molecular Basis of Structure and Function. By ALBERT L. LEHNINGER, Department of Physiological Chemistry, The Johns Hopkins University School of Medicine. W. A. Benjamin, Inc., 2465 Broadway, New York 25, N. Y. 1964. 263 pp + xx. 16 × 24 cm. Price, \$9.00.

This monograph is first of a series in microbial and molecular biology, designed, as stated in the foreword and preface, to present a comprehensive review in broad perspective that will permit the advanced student or research worker to obtain an up-to-date grasp of an actively developing area without having to refer extensively to original papers. It was also the intent to present not an exhaustively documented classical monograph but an easily readable account of many contributions and points of view, coupled with additional interpretations and speculations about developments in the future.

This book does a remarkable job of accomplishing just what is proposed by the editor and the author. The narrative account is thoroughly and easily readable, with clear exposition. The description of the past history, the analysis of our present knowledge, and the looks into the future are well done. One may disagree with some speculations or not favor some given considerable space by the author, but they are all worth careful consideration. The author presents some imaginative ideas and has a keen sense of what may be a significant lead. He has pointed out many of these in his interesting discussions of problems to be faced. There is only an occasional uncritical evaluation of a correlation and essentially no omissions. Possibly there could have been a little more speculation concerning the ferredoxin type of enzyme (non-heme Fe) as an area for future development.

The book should be very useful for students, and it is a wonderful book for the experienced person to use in broadening his appreciation, refreshing his memory, or as a lead back into literature on less familiar points. A careful reading of the foreword and preface should prevent anyone from being misled seriously by any unwarranted generalizations. Although the author clearly understands the importance of separating fact from speculation (p. ix), in such a narrative account it is difficult to avoid a mistake we all commonly make. Many correlated facts are cited as if cause and effect had been thoroughly established, although other explanations may exist. Although this might be slightly misleading to the inexperienced, we must weigh against this possibility the considerable probability that the suggested relationships are close to the true ones. As in any field where developments are rapid, some speculations may be out of date by the time a book gets into print.

The danger that a book of this type might present a decidedly one-sided point of view and interpretation has been avoided. As is to be expected in this type of account, the author at times draws heavily on the work of his own laboratory, but the full picture is completed with accounts of the work in other laboratories. Areas in which there has been considerable controversy are summarized and discussed with a clarity and brevity that should be most rewarding for the reader not actually working in the field. In considering his own work, the author makes several excellent analyses about what has and has not been proven by the experiments to date; for example, the contraction of mitochondria by added ATP.

Especially good or timely chapters are those on mitochondria in the intact cell, controls that may function in the citric acid cycle (such as the list of all possible reactions of oxalacetate on p. 146), and the origin of mitochondria. There is a good brief summary of the implications in one or two electron-transfer mechanisms in the respiratory chain (p. 117), and the explanation for considering reduced as well as oxidized carriers as high energy intermediates should help many who have not fully grasped the suggestions of B. Chance (pp. 120-125).

The bibliographic references, separated into reviews and a limited number of selected original papers, do serve admirably as starting points for anyone wanting to enter the literature to investigate some point in greater detail. Not only is the complete title of the paper included, but a word or two of comment in some cases lets the reader know which reference deals unusually well with a certain point, and whether papers in foreign journals are in English. The index is adequate; the table of contents, with the subheadings in all of the chapters, is very useful.

As in all books some errors have crept in. The usual minor ones, such as listing DNP as an electron-transport inhibitor (p.

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 spectroscopy 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 spectroscopy 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 spectroscopy 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 spectroscopy 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