

Book Reviews*

Mechanisms of Homogeneous Catalysis from Protons to Proteins. By M. L. BENDER (Northwestern University). John Wiley, New York, N. Y. 1971. xii + 686 pp. \$24.95.

In this book the author has succeeded in his attempt to show a bridge between organic and enzymic reactions. The book consists of four parts, which describe homogeneous catalysis, proceeding from very small and simple to very large and complicated catalysts. Part one (128 pages) discusses catalysis by proton transfer, oxonium and hydroxide ions, and the theory and mechanism of general acid-base catalysis. Part two (134 pages) deals with nucleophilic and electrophilic catalysis of organic and inorganic species, salt and solvent effects, and catalysis by metal ions and organometallic compounds. The above two parts are quite fundamental and comprehensive in scope. In part three (115 pages), systems bridging non-enzymic and enzymic catalysis are described, such as intramolecular catalysis, multiple catalysis, and catalysis by complexation. Simple models of enzymes begin to emerge. Part four (264 pages) is devoted to enzyme systems. In this part classification, determination, structure, and kinetics of enzymes, and the concept of active site are first reviewed. Some representative enzymes and most of the co-enzymes then are described to illustrate enzyme mechanisms. Finally, binding and specificity of enzyme catalysis are discussed. It is apparent that the book does not attempt to present exhaustive information on all subjects discussed, and yet certain topics, such as coenzyme Q and vitamins A, E, and K, deserve more treatment.

This book was completed in 1970 and published in October 1971. References are given at the end of each chapter and are generally ample, but literature coverage in date varies from chapter to chapter. References published in 1970 and even in 1971 can be spotted. The index, which covers authors, subjects, and compounds, is highly inadequate for a book containing such a vast quantity of information. It is most properly considered to be a compound index. Subjects, such as catalysis by metal ions, multiple and/or bifunctional catalysis, allosteric kinetics, and conformational change, are extensively discussed in the text but cannot be found in the index. The author share of the index is rather poor also, e.g., only one reference given under M. L. Bender. Despite the above shortcomings, it is a well written and very readable book. The reader will grasp an overall view of the role of homogeneous catalysis both in organic and in enzymic reactions.

J. P. Li, *Aldrich Chemical Company, Inc.*

Light Scattering in Solids. Edited by M. BALKANSKI (University of Paris). Flammarion Sciences, Paris. 1971. Distributed by International Scholarly Book Services, Inc., Portland, Ore. xii + 509 pp. \$45.00.

"Light Scattering in Solids," constitutes the Proceedings of the Second International Conference on Light Scattering in Solids held at the University of Paris VI in July 1971. The first international conference on this subject took place in New York in 1968. The proceedings of the previous conference have been published under the title "Light Scattering Spectra in Solids," and a review of this volume is available elsewhere [*American Scientist*, **58**, 439 (1970)].

The interval between these two significant conferences on light scattering witnessed the death, all within a year's time, of three men who played decisive roles in the development of the field: Léon Brillouin, Max Born, and Sir C. V. Raman. An introductory passage by Professor Kastler reviews the contribution of these extraordinary scientists and includes interesting historical anecdotes on the insight of Brillouin into the interaction of light with thermo-elastic waves, on the delay of the publication of Brillouin's now famous thesis due to the imposition of World War I, and on the heated conflict of views held by Born and Raman that erupted at an earlier conference on the subject.

The volume consists of the results of some 120 research investigations, both theoretical and experimental, reported at the Paris Conference. A few papers are presented in abstract form only, but most of the contributions are complete research articles in journal format. Despite the international nature of the conference and its romantic site, the proceedings are given exclusively in English. The volume is scantily indexed, by author contributor, by material studied, and by scattering mechanism.

The focus of the conference was, to the most part, on Rayleigh, Brillouin, and Raman light-scattering mechanisms engendered in solids by elementary excitations. Topics include phonons (acoustical and optic), magnons, plasmons, polaritons, and excitons. Resonant effects, the ionic Raman effect, stimulated scattering mechanisms, and phase transitions (crystallographic and ferroelectric) are also considered. Materials studied were all in the solid state, regular or imperfect, and range in constitution from simple elements and small molecules (⁴He, Ar, *p*-H₂, etc.) to polymers (of both man made and biologic origin). Some exhibit properties of metals or semimetals, dielectrics or semiconductors, ferroelectrics or ferromagnets. Some are alloys or solid solutions, some amorphous, and some mesomorphic.

Although much of the volume is clearly directed to the solid-state physicist, a number of articles are not without interest to the physical chemist engaged in light-scattering work. Of particular interest are descriptions of a number of new experimental techniques designed to enhance signal recovery in Rayleigh, Brillouin, and Raman spectroscopy. Within these research reports are discussions of new procedures that, for example, offer effective resolving powers in excess of 10¹⁵ by the methods of laser light beating spectroscopy. This new technique has become particularly useful in the analysis of line widths and line shapes of quasielastic (or Rayleigh) spectra. A new interferometric design is also presented that has the potential to increase the contrast ratio by several orders of magnitude in Brillouin spectroscopy by multiple passing of the scattered radiation through a *single* Fabry-Perot etalon. The technique should prove of considerable use in resolution of small Brillouin components bordering on intense Rayleigh lines at and near the laser frequency. Also of interest to the laser Raman spectroscopist are discussions of a new filtering technique utilizing an iodine-vapor cell that allows spectral approach to within ~2 cm⁻¹ of the excitation line of a mode-stabilized Ar⁺ laser. The value of the procedure in the study of otherwise inaccessible low-frequency (<100 cm⁻¹) phonons in polymers is clearly illustrated.

Overall, the volume may be viewed as a collection of boundary-phase research papers by productive workers in a rapidly advancing area of spectroscopy. The proceedings have been published with dispatch and, as the Editor notes, should be of great help to "young scientists who were not able to attend the Conference." It is presumed that even some older scientists with interest in this field of research, and perhaps equally pressed for grant funds for travel, will also benefit from the speedy availability of the proceedings of this important conference.

Donald B. DuPré, *University of Louisville*

Methods in Carbohydrate Chemistry. VI. General Carbohydrate Methods. Edited by ROY L. WHISTLER and JAMES N. BEMILLER. Academic Press, New York and London. 1972. xxvii + 603 pp. \$27.50.

This volume is a continuation of the valuable series of "Methods in Carbohydrate Chemistry" originated by Professors R. L. Whistler and (the late) M. L. Wolfrom. The previous assistant editor of the work, Professor J. N. BeMiller, has become co-editor of this volume and subsequent work which will continue on an open-end basis. In Volume VI, the editors have continued a policy of enlisting the collaboration of leading carbohydrate chemists who themselves either originated a method or possess detailed knowledge of an important technique. The result is a valuable compilation of more than ninety methods proffered by internationally recognized carbohydrate workers.

The standard format, adopted in the initial volume and consisting of an introductory paragraph followed by the procedure and references, is observed throughout the text. The newest treatise contains ten sections, two of which are concerned with physical methods. The first of these (Section I), entitled "Separation and Analysis," updates and extends the valuable technique of gas-liquid chromatography, described in Volume I of this series, to a wider spectrum of sugar analyses. The utility of thin-layer chromatography is amply demonstrated with articles on qualitative, quantitative, and preparative procedures which include a description of ancillary densitometry techniques. Section I also incorporates assays for the carbonyl group in starch and cellulose, a determination of α -glycol groups *via* a direct spectrophotometric determination of iodate

* Unsigned book reviews are by the Book Review Editor.

(from periodate), and the use of the carbohydrate-binding globulin protein, concanavalin A, for structural studies, all under the subtitle "Chemical, Physical, and Biochemical Methods." It is, therefore, surprising to discover such topics as conformational analysis and mass-spectrometry arranged in the final section (X), which is also entitled "Physical Methods." One may further question the purpose served by what is, incidentally, an excellent presentation of the conformational analysis of carbohydrates by nuclear magnetic resonance spectroscopy, in a series designed to provide clearly descriptive and reliable methods in analytical and preparative carbohydrate chemistry.

Sandwiched between the sections on physical methods are descriptions of the preparation of a wide spectrum of monosaccharide derivatives along with techniques for the isolation of polysaccharides from bacteria. There follows in Section III an excellent in-depth presentation on selective catalytic oxidations of carbohydrates with Pt/O₂, ruthenium dioxide, and a variety of chemical oxidations mediated by sulfoxide-carbodiimide and related methods.

Section IV entitled "Acyclic Sugars" consists of but a single general method for the conversion of acylated cyclic aldoses to 1,1-bis(acylamido)-1-deoxyalditols with methanolic ammonia. The accompanying equation contains one of the few obvious misprints wherein HN₃ has been erroneously substituted for NH₃.

Sections V and VI summarize the current methodology for derivatization of mono- and polysaccharides in the form of ethers. The value of the material comprising the division on nucleosides and nucleotides (Section VII) is somewhat reduced by utilizing procedures that have appeared (under the same authorship) in comparable reference texts dealing specifically with nucleic acids.

Section VIII, which carries the broad-range and apparently arbitrary title "Glycosides," serves as a catch-all to include such diverse procedures as a synthesis of a cerebroside, the isolation of a ganglioside, the use of mercuric salts in the Koenigs-Knorr reaction, and an approach to *cis*-1,2-glycosides. The latter, for example, would seem to fit more logically into monosaccharides (Section II).

In general, all methods appear to be provided with sufficient detail and precision to expect that they can be repeated. Confidence in succeeding volumes could be increased by offering in the future procedures that had been checked in a laboratory outside that of the contributor. The methods of cross reference are extremely valuable and the book can be recommended for all carbohydrate chemists and for all libraries.

Jerome P. Horwitz, *Michigan Cancer Foundation*

Protein Biosynthesis in Bacterial Systems (Methods in Molecular Biology. Volume 1) and **Protein Biosynthesis in Nonbacterial Systems (Methods in Molecular Biology. Volume 2)**. Edited by JEROLD A. LAST (National Academy of Sciences, U. S.) and ALLEN I. RASKIN (Esso Research and Engineering Co.). Marcel Dekker, New York, N. Y. Volume 1: 1971. xi + 333 pp. \$16.50. Volume 2: 1972. xi + 336 pp. \$16.50.

These volumes are almost exclusively devoted to methods for the preparation of various components of protein-synthesizing systems from lower and higher organisms. The rationale for these books, according to the editors, is that research workers experience many frustrations in attempting to duplicate a procedure in the conventional scientific literature. What they have done then is to invite investigators to write up certain laboratory procedures in great detail so the reader will hopefully be able to repeat the procedure without difficulty. Whether these volumes will be helpful or not can only be judged by those who try the procedures described.

Both volumes are rather small and address themselves to relatively few subjects (12 in Volume 1 and 10 in Volume 2), most of which are quite specialized. This is fine if you have a specific problem (such as the preparation of skeletal muscle ribosomes), but these volumes cannot be considered to be of general interest to biochemists. In addition, many of the subjects are treated equally well or better (and sometimes by the same authors) in other books, such as "Methods in Enzymology."

The editors are quite right in recognizing a need for volumes such as these, but one would have hoped for a much wider range of subjects and for more chapters with a more general orientation.

Leonard I. Malkin, *Dartmouth Medical School*

Advances in Alicyclic Chemistry. Volume 3. Edited by HAROLD HART and G. J. KARABATSOS (Michigan State University). Academic Press, New York and London. 1971. xi + 314 pp. \$21.50.

This volume contains three monographs. The first, "Carbocyclic Ring Contraction Reactions," by D. Redmore and C. D. Gutsche, is divided into six parts based on ring-contraction mechanism: carbonium ion, anionic, photochemical, thermal, carbene, and miscellaneous. Of most synthetic utility is a section on the Favorskii rearrangement, in the part covering anionic ring contractions. Each section begins with a short discussion on mechanism. This is particularly helpful in the case of the Favorskii rearrangement, since two distinct mechanisms apply. Excellent coverage is given on this high-yield, remarkably useful reaction, particularly for bridged polycyclic systems (example: synthesis of cubanes).

The Wolf rearrangement of α -diazo ketones is another synthetically useful reaction given excellent coverage in the part on ring contractions involving carbenes.

In the remaining parts a host of methods are reviewed. The authors' goal of surveying "all the frequently used and some of the not so frequently used methods" was met admirably. Many of these reactions suffer from low yields and too many products. Examples of synthetically useful processes are buried among a myriad of others. The use of tables may have made it easier to spot these gems.

Examples of preparations of A-, B-, C-, or D-ring norsteroids *via* ring contractions are numerous. For nonsteroid chemists the nomenclature becomes ponderous in some cases.

The second monograph, "Conformational Preferences in Cyclohexanes and Cyclohexenes," by F. R. Jensen and C. H. Bushweller, begins with a first-class introduction to the topic. A vigorous defense of the authors' favorite technique—nmr peak area measurement—for determining conformational preferences (*A* values) in monosubstituted cyclohexanes follows. Equally vigorous is their prosecution of other techniques applied to this problem. The reader is thus led to a table of best "*A* values," almost all of which are based on nmr peak area measurements at low temperatures (-80°). Finally, these values are discussed: Why do certain groups (*e.g.*, SH) strongly prefer the equatorial orientation while others (*e.g.*, HgBr) are indifferent? In short, it is a lucid review of the state-of-the-art in an area of organic stereochemistry where some controversy and uncertainty still remain.

The final monograph, "Eliminations from Alicyclic Derivatives," by N. A. LeBel begins with an introduction including the statement "a plethora of mechanistic opportunity is available to the discriminating chemist who plans to study such reactions." Indeed. This review appears to cover all the mechanisms with examples and discussion of each. Chemists with a keen interest in nuances of mechanism in elimination reactions will be rewarded by a study of this scholarly treatise. However, those not oriented toward elimination mechanisms will probably not muster the necessary effort. The complexity of the subject coupled with long sentences and paragraphs, insufficient drawings, and the use of Roman numerals (all the way to CXLVII) under structures make for difficult reading. But if one wants an example of an E1cb elimination, he will find it here.

Lawrence C. Mitchell, *Ethyl Corporation Research Laboratories*

Carbene Chemistry. Second Edition. By WOLFGANG KIRMSE (Ruhr Universität Bochum). Academic Press, New York, N. Y. 1971. xi + 615 pp. \$25.00.

Kirmse's "Carbene Chemistry" first appeared in 1964, but progress in the area has been so great that this needed second edition is fully *twice* the size (and costs 2.64 times as much). Its literature coverage is rather complete through 1969, and substantial in 1970.

The new edition was prompted not only by new facts, but also by maturation of the field. Carbene chemistry has become a more respectable pursuit, replete with spectroscopic and computational underpinnings, general synthetic applicability, and mechanistic and stereochemical problems. Reflecting this growth, the new edition employs a new format. Whereas the earlier version considered carbenes by structural type, discussing generation and reactivity within each class, the present edition first considers the *generation* of carbenic intermediates (four chapters), and then their *structure* (two chapters) and *reactivity* (six chapters). There is also a chapter by P. P. Gaspar and B. J. Herold on carbene analogs, which deals with divalent derivatives of silicon, germanium, and tin.

Gone are the classic chapters by Gaspar and Hammond ("The Spin States of Carbenes") and Frey ("Excess Energy in Carbene Reactions") who so enriched the first edition. Much material of these chapters has been updated and redistributed under the new format, but the cogency of the earlier treatments has necessarily been diluted. A new chapter, "The Structural Theory of Carbenes," by J. F. Harrison has been added.

Part I contains a short introductory chapter; a chapter on photochemical and thermal carbene generation, with particularly good coverage of ketene reactions; a chapter on carbenes from organometallics, which includes good discussions of metal-catalyzed diazoalkane decompositions and lithium carbenoids; and a chapter on base-induced α eliminations.

Part II begins with the "structure" chapter. Material from the old Gaspar-Hammond chapter appears here, but the connection with experiment has been severed. The calculative material will be difficult for organic chemists, but there follows a good review of the major efforts in this area, chronologically arranged, with methods and conclusions highlighted. It's delightful to watch the theoretical stabs at the ${}^3\text{CH}_2\text{-}^1\text{CH}_2$ energy gap converge with time, but the available experimental evidence is not discussed. A discussion of charge distribution in carbenes suffers similarly. There follows a short chapter on carbene spectroscopy, which already requires revision because of recent work on ${}^3\text{CH}_2$, and the advent of CIDNP. The omission of Closs' 1969 CIDNP work is regrettable.

A lengthy chapter on "Reactions with Carbon-Hydrogen Bonds" includes very helpful tabular surveys of intramolecular insertion reactions. The following chapter, "Addition to Alkenes," is 75 pages long and contains nearly 700 references. It includes good but relatively nontheoretical coverage of stereospecificity and stereoselectivity. Selectivity toward steroidal substrates is not discussed. Olefin discrimination is covered in a large table which includes 25 carbenes and 7 substrate types. The selectivity here (p 296) attributed to $\text{I}\ddot{\text{C}}\text{COOEt}$ is actually that of $\text{H}\ddot{\text{C}}\text{COOEt}$. Unfortunately, there is little real discussion of the meaning of the reactivity data. An enormous (17 pp) table, which summarizes many intermolecular cyclopropanation reactions, will be a very useful guide to the literature. Intramolecular additions are also surveyed. This chapter, alone, represents a large and mostly successful undertaking.

There follow succinct and well-written chapters on the additions of carbenes to alkynes and to arenes; the latter has particularly good coverage of additions to and expansions of heteroaromatic substrates. There is also an excellent chapter on the reactions of carbenes with other heteroatomic substrates. Kirmse's contribution is completed by a chapter on carbene rearrangements, half of which is given over to a very useful review of the Wolff rearrangement. Careful and useful subject and author indices are included.

This book is unique and indispensable, and we are all in Kirmse's debt for undertaking a huge labor and bringing it off so well. No chemist, seriously interested in reactive intermediates, should be without this new edition, nor can any university library fail to include it.

Comparison of old and new editions is inevitable. Little information seems to have been lost, and a very great deal has been added. There has been some loss in critical rigor, due partly to the explosion of data, and partly to the loss of the Gaspar-Hammond chapter. The overall approach remains conservative and, often, the author falls a bit short of that most incisive kind of interpretation which stimulates bright ideas. But even Kirmse can't straighten out all of Nef's legacy. On the other hand, Kirmse is never less than intelligent, fair, and quite thorough in his discussions. There is much here to learn, and, if we work hard at it, we may just finish in time for the third edition.

Robert A. Moss, *Rutgers University*

Kinetics and Mechanism of Polyreactions. IUPAC International Symposium on Macromolecular Chemistry. Plenary and Main Lectures. Edited by F. TUDOS. Akademiai Kiadó, Budapest, 1971. 808 pp. \$28.60.

This volume consists of papers relating to the four plenary and 35 main lectures given at the International Symposium on Macromolecular Chemistry held in Budapest in August 1969.

The four plenary lectures offer a wide variety in style and content: the first, by M. Goodman and H. Mark, presents a large number of "Aspects of Modern Polymer Science and Technology" in such a brief manner that the reader's appetite is only whetted. The following paper, by M. Huggins, is a highly speculative discussion of those "Macromolecular Horizons" which contain sheet- or rod-like or three-dimensional polymers as well as composites of spatially varying compositions and properties. Then follows a review paper on emulsion polymerization by the late S. S. Medvedev which provides an excellent overview of current problems in this stubborn area of polymer science. The last of the plenary lectures, by G. Smets, concentrates on recent activity in the author's laboratory concerning new synthetic techniques involving photoresponsive polymers and photopolyaddition reactions.

The following 35 papers are arranged in a general order covering the topics of polyaddition and polycondensation, ionic, radical, radiation and photochemical polymerizations, heterogeneous polymerization systems, and polymeric reactions. (Some minor inconsistencies in this order to exist; e.g., an engineering review paper by N. Platzer on polymerization processes is awkwardly inserted between research papers on optically active polyamides by C. G. Overberger and R. Schulz.)

One might easily divide these papers into old and new studies on polymers—some authors keeping to "classical" but unfinished areas where mechanistic details are of limited interest, while others are breaking new ground. Outstanding among the new works are those by Smets, Schulz, and Overberger, and the works on complexes by Gaylord and Kabanov. Unfortunately, far too many of the papers are in the classical areas, and this, coupled with the widely varying subject matter, prompts me to recommend against its purchase except for archival purposes.

K. F. O'Driscoll, *University of Waterloo*

Perspectives in Quantum Theory. Edited by W. YOURGRAU and A. VAN DER MERWE (University of Denver). The MIT Press, Cambridge, Mass. 1971. xxxvii + 283 pp. \$17.50.

As the subtitle indicates, this book consists of a collection of essays in honor of Alfred Landé. Most chemists will recognize Alfred Landé as the innovator of the Landé g factor, which provided the key to the unravelling of the anomalous Zeeman effect. Landé was also responsible for the acceptance of the well-known vector model of the atom. The editor's lengthy introduction gives a clear exposition of this important early work.

However, the thrust of the present volume is directed toward Landé's later work, in which he became disenchanted with the "Copenhagen interpretation" of quantum mechanics. Essays on the foundations of quantum mechanics are given by de Broglie, Wigner, Margenau, Bohm, and others. Although there can be no questioning the importance of work along these lines, the present reviewer doubts that many chemists or even many physical chemists will have the time to go through this volume with the degree of conscientiousness it deserves.

Henry F. Schaefer III, *University of California*

Comprehensive Chemical Kinetics. Edited by C. H. BAMFORD and C. F. H. TIPPER (University of Liverpool). American Elsevier Publishing Co., New York, N. Y. 1972. Volume 4: xii + 272 pp. \$29.50. Volume 5: xvi + 779 pp. \$69.00.

These two volumes, entitled "Decomposition of Inorganic and Organometallic Compounds" and "Decomposition and Isomerization of Organic Compounds," respectively, constitute Section 2 of a major publishing effort expected to run to about 25 volumes. Volume 4 contains chapters on Homogeneous Decomposition of Hydrides (K. H. Homann and A. Haas), Decomposition of Inorganic Oxides and Sulphides (K. F. Preston and R. J. Cvetanović), Decomposition of Halides and Derivatives (D. A. Armstrong and J. L. Holmes), and Decomposition of Metal Alkyls, Aryls, Carbonyls, and Nitrosyls (S. J. W. Price). Volume 5 is divided into six chapters, which deal with decomposition isomerization of hydrocarbons (K. J. Laidler and L. F. Loucks), halogen compounds (E. S. Swinbourne), aldehydes and ketones (J. Berces), oxygenated compounds other than aldehydes and ketones (W. H. Richardson and H. E. O'Neal), nitrogen compounds (O. P. Strausz, J. W. Lown, and H. E. Gunning), and sulfur compounds (the same authors).

The scheme in both volumes is to provide access to the published information on the kinetics of specific reactions or types of reactions by describing the data in reasonable detail, and discussing them in a critical way. There are many tables and some graphs, plus equations delineating reaction pathways. Those who have experienced the frustration of reading papers on kinetics that never explicitly state the products of the reaction under consideration will bless the present authors for being lavish with equations. A minor annoyance is that free radicals are indicated without the odd electron (e.g., C_3H_7 rather than $\text{C}_3\text{H}_7\cdot$), but that is essentially a matter of taste. The extensive bibliographies, with references numbering into the thousands, are extremely valuable, although it is regrettable that neither the editors nor the authors tell us the date up to which the literature was searched (some 1970 references are evident, however). The volumes are separately indexed.

Diene Synthesis. By A. S. ONISHCHENKO. Israel Program for Scientific Translations. Distributed by International Scholarly Book Services, Inc., P.O. Box 4347, Portland, Ore. 1964. xvi + 685 pp. \$30.00.

Attention is called to the fact that this useful reference work, which has hitherto been somewhat difficult to obtain, is now available in the United States. It is a systematic survey of the Diels-Alder reaction, originally published in Russian in 1963. The coverage of the literature up to 1961 is nearly complete, and the book thus provides a foundation on which to build literature searches.

Proceedings of the Third Symposium on Coordination Chemistry. Volume 2. Edited by M. T. BECK. Akademiai Kiadó, Budapest. 1971. 287 pp. \$7.20.

The complete texts, with tables, graphs, and references, of the five plenary lectures comprise the major portion of this volume. They are by plenary lecturers J. Bjerrum, D. N. Hume, H. Biebler, Ya. D. Fridman, and A. E. Martell. The rest of the volume is devoted to the discussions that followed the contributed papers, which, however, are not themselves in this volume, but are inconveniently located in Volume 1.

Biochemical Reasoning. Edited by DAVID KERRIDGE and KEITH TIPTON (University of Cambridge). W. A. Benjamin Inc., Menlo Park, Calif. 1972. xv + 265 pp. \$12.50 cloth, \$5.95 paper.

This is a book of exercises and problems of graduated difficulty, filling the first 84 pages, accompanied by a section entitled "Hints" for solving them (35 pp), and a highly detailed section on "Answers" (120 pp). The problems are of considerable sophistication and stress the handling and interpretation of numerical data.

Organic Chemistry Problems. 2nd Edition. By D. N. HARPP, T. H. CHAN (McGill University), J. D. ROBERTS (California Institute of Technology), and M. C. CASERIO (University of California, Irvine). W. A. Benjamin, Inc., Menlo Park, Calif. 1972. 375 pp. \$4.95.

The relation of this edition to the original one is not stated. The problems are organized in relation to the textbook "Organic Chemistry: Methane to Macromolecules," by Roberts, Stewart, and Caserio, but they could be used with profit by students in general. They are unusually interesting problems, which involve many timely applications of organic chemistry, such as, for example, identifying the structure of the active component of "chemical mace" from the nmr and ir spectra. Answers are given in an appendix.

Chemisorption and Catalysis. Proceedings of a Conference Organized by the Hydrocarbon Research Group of the Institute of Petroleum, London, 29-30 October 1970. Edited by PETER HEPPLE. Institute of Petroleum, London. 1971. viii + 187 pp. £4.50.

In recent years there have been great advances made in our understanding of the properties of solid surfaces at the solid-gas and the solid-vacuum interface. New techniques that employ electron scattering (low-energy electron diffraction, auger electron spectroscopy, electron absorption, and emission) or atomic and molecular beams have provided information of the atomic structure of clean surfaces and of adsorbed gases and of the dynamics and the electrical properties of surface atoms and of adsorbed species. These new techniques and our increased understanding of fundamental surface properties are being applied with increasing frequency in the field of heterogeneous catalysis and help to decipher the dynamics of complex catalytic reactions. The proceedings of this conference provide an excellent cross section of studies of surfaces using many of these modern techniques and also of studies using some of the more conventional techniques. It is pleasing to note how classical techniques that have helped us in the past blend so well with more modern techniques to provide a more unified picture of heterogeneous catalysis.

The first paper, by D. A. Dowden, is a comprehensive review of the role of electrons in metals in chemisorption and catalysis. Its only weakness is that it neglects the possibility, in its discussion of solid solutions and alloys, that the composition of the multi-component system may be different at the surface from that in the bulk. Based on surface thermodynamic arguments, one would expect the component with lower surface free energy to accumulate on the surface. There is no mention of this effect in this paper. The chemisorption, decomposition, and oxidation studies of methanol over gold and nickel filaments by Roberts and Stewart clearly indicate that nowadays one may use small surface area samples of area less than 10 cm^2 to monitor catalytic surface reactions reliably. Although their reactions were carried out on polycrystalline instead of single crystal surfaces, the study clearly indicates the trend toward well-defined small surface area samples in studying catalytic surface reactions instead of the large surface area samples necessary in volumetric studies. The use of well-de-

fined crystal surfaces allows the probing of the relationship between surface structure and the catalytic activity that is so important in heterogeneous catalysis. The thermodynamic investigation of promoted oxide catalysts by Sachtler and Helle showed in a thorough study how solid state and surface properties are interdependent in the system of molten salt chlorides and cuprous and cupric chlorides. The solid state reactions in such a multiphase system have been investigated in this excellent paper.

Studies of the isomerization of butene over oxide catalysts have shown how more classical techniques are still extremely useful in helping us to understand the mechanism of catalytic reactions. Another study, using more conventional techniques, of the decomposition of N_2O over large-surface-area molecular sieves, is discussed in the paper by Rudham and Sanders.

Raman spectroscopy studies of adsorbed species that are reported by Hendra give a good analysis of the potential of this new technique and point out its limitation—mostly the large surface areas needed to observe reproducible signals. The low-energy electron diffraction studies of nickel surfaces that are reported by Pitkethly show an example of the application of this powerful new technique for studies of catalyst surfaces. McKee has reviewed the application of the important techniques of photoelectron spectroscopy and auger electron spectroscopy to surface studies. These techniques can determine the chemical composition at the surface and also the valency of surface atoms. Infrared spectroscopy was used in studies of the hydrogenation of ethylene over silica-supported metals and in studies of titania and zeolite surfaces. These papers provide proof of the capabilities of infrared spectroscopy in catalysis research.

The conference presented a spectrum of more classical and newer techniques of surface science, as applied to problems in catalysis. Its aim was to bring together researchers from universities and scientists from industries where heterogeneous catalysis plays an important role, to exchange ideas and to demonstrate what each group might contribute to the field. To this extent the conference has certainly succeeded. The proceedings reflect the rapid development of catalysis research, due to a better understanding of many of the fundamental properties of surfaces. As the new advances in surface chemistry are applied in heterogeneous catalysis, an increased understanding of catalytic surface reactions will no doubt follow.

G. A. Somorjai, *University of California, Berkeley*

Advances in Catalysis. Volume 22. Edited by D. D. ELEY (The University Nottingham, England), H. PINES (Northwestern University, Evanston, Ill.), and P. B. WEISZ (Mobil Research and Development Corp., Princeton, N. J.). Academic Press, New York, N. Y. 1972. 368 pp. \$19.00.

This twenty-second volume of the serial publication contains six articles reviewing the approaches and progress made in understanding catalytic sites and chemisorbed species. R. J. Kokes and A. L. Dent treat "Hydrogenation and Isomerization over Zinc Oxide" by outlining the procedures necessary (*i.e.*, infrared spectroscopy, hydrogen isotope studies, kinetic and stereochemical considerations) in determining intermediate surface species in reactions involving simple olefins, such as ethylene, propylene, butenes, and acetylenes. Z. Knor discusses "Chemisorption Complexes and Their Role in Catalytic Reactions on Transition Metals." Model constructions of the metal and of the reactants on the metal surfaces, as well as experimental methods used for testing these models, are presented in a lucid, well-organized fashion. R. VanHardeveld and F. Hartog review the "Influence of Metal Particle Size in Nickel-on-Aerosil Catalysts on Surface Site Distribution, Catalytic Activity, and Selectivity." These authors clearly demonstrate the use of infrared spectroscopic studies of the adsorption of nitrogen and carbon monoxide in providing valuable information about the structure of the metal surface. In addition, statistics of surface atoms and surface sites and deuteration and exchange of benzene are discussed.

R. L. Moss and L. Whalley discuss "Adsorption and Catalysis on Evaporated Alloy Films." The preparation and characterization of alloy films and adsorption and catalysis on alloy films are extensively covered. "Heat-Flow Microcalorimetry and Its Application to Heterogeneous Catalysis" by P. C. Gravelle, first relates the basic principles, theories, and experimental details of heat-flow calorimetry followed by applications of heat-flow microcalorimetry to heterogeneous catalysis. "Electron Spin Resonance in Catalysis" by J. H. Lunsford offers a summary of theory, experimental conditions, and results of investigations of the use of electron spin resonance (esr) techniques in studying paramagnetic species that exist on

various solid surfaces. Appendices are included which extensively add to the theoretical basis of this subject matter.

These six articles present fairly uniform authoritative reviews describing characterization of chemisorbed species on catalytic sites and add much to the understanding of these rather complex and inhomogeneous systems. Throughout the book numerous tables, spectra, illustrations, graphs, comments of practical importance such as experimental considerations and analyses, and exposition of the subject through specific examples aid the presentation.

D. J. Darensbourg, *State University of New York at Buffalo*

Essays in Biochemistry. Volume 7. Edited by P. N. CAMPBELL (University of Leeds) and F. DICKENS (Findon Valley, Worthing). Academic Press, New York, N. Y. 1971. xi + 228 pp. \$4.95.

The stated purpose of this series is to present selected topics in biochemistry to senior students and provide to research investigators an up-to-date picture of topics outside their own specialty. The first essay, "Potentials in Exploring the Biochemistry of Human Skin," by S. L. Hsia, reviews the structure of skin, various aspects of its metabolism, and some of the experimental problems encountered in working with skin. The article contains strong arguments for biochemists directing more attention to studies of the skin. The second essay, "Compartmentation in Relation to Metabolic Control in Liver," by K. Gumma, P. McLean, and A. Greenbaum, discusses methods of calculating the levels of various metabolites in cellular compartments. The point is made that, until the levels of the metabolites in the various compartments are known, the control of metabolism cannot be understood. Brief mention is made of methods of measuring the levels experimentally. The third essay, "The Development of the Cellular Slime Mould *Dictyostelium discoideum*: A Model System for the Study of Cellular Differentiation," by P. Newell, reviews the development of this simple eukaryotic cell. Aspects of intercellular and intracellular regulation and spore germination are discussed. The point is made that understanding such cellular communication is basic to an understanding of cancer cells. The fourth essay, "Types of Metabolic Adaptation in the Brain," by H. McIlwain, discusses the response of the brain to varied neural activity, oxygen lack, inadequate carbohydrate intake, and variations in metabolic status and enzyme content. The last essay, "Enzymic Differentiation in Mammalian Tissues," by O. Greengard, is concerned with the appearance of specific enzymes in various tissues as cellular differentiation proceeds. This approach is contrasted to the more traditional morphological point of view. The pattern is traced from the adult animal back through progressively less differentiated forms. The experimental animal used in this study is the rat.

This volume of the series meets its stated aims well and should be of considerable utility to the intended audience. An author and subject index are provided.

Carlyle B. Storm, *Howard University*

The Sex Steroids. Edited by KENNETH W. MCKERNS (University of Florida College of Medicine). Appleton-Century-Crofts, New York, N. Y. 1971. ix + 454 pp. \$24.95.

This is the third in a series of monographs concerned with biochemical endocrinology. An earlier monograph, "The Gonads," dealt with steroidogenesis and the regulating effect of gonadotrophins. "The Sex Steroids" is devoted entirely to investigations of the mechanism of steroid hormone activity. The various topics were presented at a symposium, the resulting discussions recorded, and the chapters revised when necessary to achieve timeliness, clarity, and thoroughness.

The chapters set forth the detailed approach utilized by various laboratories in their investigations of the steps involved in the stimulation of target tissue by steroids. The contribution of each study to the development of the overall mechanism of steroid hormone activity is thoroughly discussed in the context of each chapter and within the recorded discussions. The essential steps in target tissue response to steroids are considered in detail: *i.e.*, the well-established "receptor" concept, the regulation of transcription, the interaction with the genome, and finally the effect on target tissue metabolism.

The most thoroughly covered sex steroid activities are those of 17β -estradiol and progesterone for which stimulatory mechanisms are explored in vaginal and uterine tissue and in the mammary gland. Less attention is given to the androgens, one chapter being devoted exclusively to androgen activity in the kidney.

While it is not possible for a monograph to be as up-to-date as the latest journal, "The Sex Steroids" has kept pace with most of the recent work (up to 1970) in this fast-moving field of research. The

value of this book lies in the presentation of the state of the art by experts in the field and the description of their diverse approaches to an understanding of the mechanism of steroid hormone activity. In addition, there are the valued theories, opinions, and conjectures which the participants have contributed to the discussions.

S. C. Brooks, *Michigan Cancer Foundation*

An Introduction to On-Line Computers. By W. WAYNE BLACK. Gordon and Breach Science Publishers, New York, N. Y. 1971. xii + 449 pp. \$12.50/\$22.50.

The stated goal of this book is "to start anyone who wants toward the understanding of that breed of computer known as the on-line computer." The book is organized into four major parts: (I) Preliminaries, (II) On-Line Computer Fundamentals, (III) On-Line Computer Utilization, and (IV) Other Considerations. In the first part there is a brief introduction to on-line computers that is followed by a chapter describing the binary, octal, and hexadecimal number systems. The second part covers, in five chapters, the organization of computers, computer instructions, and computer programming. Part III includes a description of many of the peripheral devices that may be attached to on-line computers, and Part IV includes a discussion of the many considerations involved in the selection of an on-line computer system.

The author's attempt to provide, for "anyone," an understanding of the on-line computer, unfortunately, but perhaps inevitably, has produced a book that is extremely non-uniform in its treatment of various topics. In many instances it is assumed that the reader knows little or nothing about computers while in others it is assumed that the reader is familiar with concepts and jargon that are usually known to people who have had experience in the use and programming of computers.

The discussion of number systems is rather extensive and provides examples of computations in the binary, octal, and hexadecimal number systems. The concept of a bit of information is never clearly defined although reference to groups of bits is made in the discussion of binary to octal and binary to hexadecimal conversions. The index makes reference to the word "bit" on only one page, whereas important references to the word are found on several other pages but not on the page cited in the index.

Discussion of computer organization, instructions, and programming techniques are based on the PDP-8 computer. For the beginner there is a rather good description of the iterative procedure that is followed in the preparation, editing, assembling, and debugging of computer programs. The discussion of peripheral devices includes some of the details of encoding information and techniques of error detection. In addition there are descriptions of all the common devices and media that are currently used for information storage and retrieval.

Throughout the book there are many typographical errors as well as many consistently misspelled words. In many areas the discussions lack the clarity that is always desirable but is especially important to a beginner who might be easily confused or misled. There are several appendices giving tables for number conversions, transmission codes, and punched card codes. It is unfortunate that the EBCDIC punched card code table is incomplete.

Although a considerable amount of useful information is contained in this book, the uneven presentation and certain errors and omissions lead the reviewer to the conclusion that the book cannot be recommended for the beginner. The more experienced computer user who wishes to learn more about on-line computers would probably prefer to use sources that are more directly concerned with the differences between on-line computers and large general purpose systems without presenting at considerable length the basic concepts of number systems, assemblers, and the like.

Allan R. Emery, *University of Michigan*

Organic Reactions in Steroid Chemistry. Edited by J. FRIED and J. A. EDWARDS (Syntex Research). Van Nostrand-Reinhold Co., New York, N. Y. 1972. Volume I: xv + 510 pp. \$26.00. Volume II: xi + 464 pp. \$24.00 (2-Volume Set, \$45.00).

Written in an abbreviated *Organic Reactions* format, these volumes cover a vast array of organic reactions that have been studied and used in steroid chemistry. The editors' intent is not only to provide a convenient source book for the steroid chemist, but also to present brief critical reviews on the utility of many regio- and stereoselective reactions that will have value to any chemist engaged in synthesis. Included with each review is one or more recommended experimental procedures and a host of useful, up-to-date references. There are fifteen chapters that include, in addition to the standard "steroid classics," coverage of such transformations

as angular methyl group functionalization (K. Heusler and J. Kalvoda), photochemical rearrangements and cycloadditions (K. Schaffner), and the introduction of fluorine into the steroid (J. Fried and N. A. Abraham). The chapters on metal-ammonia reduction (H. L. Dryden, Jr.), introduction of double bonds (C. C. Beard), ring expansion (G. A. Boswell, Jr.), and ring contraction (R. M. Scribner) particularly should prove to be of general utility to nonsteroid chemists as well as the steroid specialists.

These two volumes are very well prepared, and the authors have conscientiously covered their assigned talks. This set has already seen vigorous use in our laboratories and has begun to "migrate" into other laboratories that have never even known a steroid molecule. The coverage is so broad and complete that organic chemists of most persuasions should find these books to be valuable manuals. The editors and their authors are to be complimented on their effort, and their works are warmly commended to the reader.

Robert E. Ireland, *California Institute of Technology*

Techniques of Surface and Colloid Chemistry and Physics. Volume 1. Edited by R. J. GOOD (State University of New York at Buffalo), R. R. STROMBERG (National Bureau of Standards), and R. L. PATRICK (Alpha Research and Development, Inc.). Marcel Dekker, New York, N. Y. 1972. ix + 252 pp. \$13.75.

This volume is the first in a promised series, to appear at the rate of about one a year. "The purpose of this series," write the editors, "is to provide a compendium of the important techniques in the field, each described in sufficient detail to be immediately useful." Just what the field is, is not yet entirely clear. Certainly the choice of articles in Volume 1 does not cover the scope implied by the title. The itinerant surface physicist whose glance is caught by the third and last words of the title should be forewarned: nothing here about low-energy electron diffraction, sputtering, or field emission microscopy.

Instead we have a chapter by Gershfeld on the use of the film balance and related techniques, and a chapter by Martin Blank on measurements of the permeability of monolayers to the passage of water vapor, other gases, and ions. Carel van Oss contributes chapters on ultrafiltration and visualization of concentration gradients, and we have from Tien and Howard a long chapter—nearly half the book, in fact—on the handling of bilayer lipid membranes.

In line with the intent of the editors, there is much detailed information, such as Fortran programs for data reduction, circuit diagrams, and prescriptions for the preparation of, for example, ultrafiltration membranes. I cannot quite see anyone walk into his laboratory, book open in left hand, right hand gathering equipment, to launch a career making measurements in one of these fields. Nevertheless, the format, which works out to be a sort of combination laboratory manual and review article, seems to me reasonably successful in the area covered by this volume.

No great care is taken to define terms at the outset of each chapter, so that for the novice in any of these fields (your reviewer qualified in all five chapters), some phrases may be mysterious at first, but these problems are usually cleared up before the end of the chapter. For example, the bilayer lipid membranes are referred to as black lipid membranes—it turns out that destructive interference of reflected light occurs when the two faces are much less than a quarter wavelength apart. In some cases, the descriptions are a bit muddy—Gershfeld wants us to distinguish between the edge of the trough, the rim of the trough, and the edge of the rim, as well as various barriers, all without an adequate diagram. In other cases the language, if expressive, is perhaps inelegant: van Oss has a scale of magnitude that includes "enormous," "too enormous," "rather enormous," and "fairly vast," all on the same page (p 105). Overall, however, the book is readable.

The book should be useful, either as a starting point for those wishing to enter one of these fields, or for the information of those considering peripheral measurements involving one of these techniques. The authors all give personal views of shortcomings and dangers in the techniques, which should be helpful, and there appears to be an adequate bibliography in all cases.

David Goodstein, *California Institute of Technology*

Luminescence Spectrometry in Analytical Chemistry. By J. D. WINEFORDNER, S. G. SCHULMAN, and T. C. O'HAVER. John Wiley, New York, N. Y. 1971. xiii + 354 pp. \$19.95.

This book is Volume 38 in the "Chemical Analysis" series of monographs edited by Elving and Kolthoff. It is unusual in that it covers both atomic fluorescence and molecular luminescence and is

a welcome addition to the few texts presently available on these subject matters. The authors feel that the book will be useful as a text, and the specialized nature of the subject matter suggests that it would be most appropriate at the beginning graduate level. It should also be of interest to workers in the field of luminescence as well as to analytical and other applied chemists interested in exploring the possibility of using luminescence spectrometry in their work. The references to trace metal analysis by atomic fluorescence and trace organic analysis by fluorescence or phosphorescence attest to the wide range of application of the technique.

The theory is developed quickly into an exceptionally complete description of the physical basis for both atomic fluorescence and molecular luminescence. Mathematical details are included only to the extent necessary for developing the language used in describing absorption and emission processes. Radiance expressions relating intensity to concentration and measurement conditions are presented along with criteria for applying them to real systems. The theory section, which constitutes nearly half the book, is supplemented with extensive appendices.

The section on instrumentation and methodology presents a unified discussion of instrumental components common to all luminescence techniques along with specific requirements for the individual methods. This is followed by a condensed but comprehensive section on the analytical uses of luminescence spectrometry. No specific applications are given, but the general areas where the techniques have been successfully applied are adequately covered through the use of tables with pertinent references. Elements that have been studied by atomic fluorescence are listed along with detection limits, and a general discussion of sensitivity and selectivity is given. The same approach is used to describe inorganic solution fluorimetry and organic analysis by fluorimetry or phosphorimetry.

The book is recommended for both learning and reference purposes to those having a specific interest in the subject.

Howard W. Latz, *Ohio University*

Reviews in Macromolecular Chemistry. Volumes 6, 7, and 8. Edited by GEORGE B. BUTLER (University of Florida), KENNETH F. O'DRISCOLL (University of Waterloo), and MITCHEL SHEN (University of California). Marcel Dekker, New York, N. Y. 1971. Volume 6: vi + 490 pp. \$19.50. Volume 7: v + 305 pp. \$19.50. Volume 8: v + 337 pp. \$19.50.

The appearance of three more volumes in this review series will be welcomed by research and development polymer scientists. Volume 6 contains ten reviews: Proton Magnetic Resonance Studies of Molecular Interactions in Polymer Solutions (Liu and Anderson); Preparation and Polymerization of Vinyl Heterocyclic Compounds (Takemoto); Catalysis in Isocyanate Reactions (Frisch and Rumao); Thermodynamics of Ring-Opening Polymerization (Sawada); Copolymers of Naturally Occurring Macromolecules (Watt); Molecular Configuration and Pyrolysis Reactions of Phenolic-Novolaks (Winkler and Parker); Physical Properties of Ionic Polymers (Otoccka); Synthesis and Properties of Polyphenyls and Polyphenylenes (Speight, Kovacic, and Koch); Dependence of Flow Properties of Polystyrene on Molecular Weight, Temperature, and Shear (Casale, Porter, and Johnson); and Synthesis Methods and Properties of Polyazoles (Korshak and Tepljakov).

Volume 7 contains six reviews: Linear Polyquinoxalines (Hergenrother); Nylons-Known and Unknown. A Comprehensive Index of Linear Aliphatic Polyamides of Regular Structure (Livingston, Sioshansi, and Glick); Recent Advances in Polymer Fractionation (Tung); Rheology of Adhesion (Kaelble); Solvation of Synthetic and Natural Polyelectrolytes (Conway); and Hydrogen Transfer Polymerization with Anionic Catalysts and the Problem of Anionic Isomerization Polymerization (Kennedy and Otsu).

Volume 8 contains seven reviews: Polymerization by Carbenoids, Carbenes, and Nitrenes (Imoto and Nakaya); Collagen and Gelatin in the Solid State (Yannas); Ring-Opening Polymerization of Cycloolefins (Calderon); Thermodynamics of Polymerization (Sawada); Polymerization of N-Vinylcarbazole Initiated by Metal Salts (Biswas and Chakravarty); Vibrational Spectroscopy of Polymers (Boerio and Koenig); and Polymer Compatibility (Krause).

In these three volumes, the editors have brought together a variety of current research topics which span both synthetic and physical polymer chemistry. The authors attempt to give characterization and physical data, and a few authors discuss physical properties and application uses. References as late as 1971 are found in the many references cited. These volumes are a welcomed addition to this important review series.

Charles D. Rowe, *Rohm and Haas Company*