

Book Reviews*

Defect Crystal Chemistry and Applications. By R. J. D. Tilley (University College, Cardiff). Blackie: Glasgow and London (published in the USA by Chapman & Hall: New York). 1987. viii + 236 pp. \$69.95 (cloth). ISBN 0-412-01331-2.

In *Chemistry of the Defect Solid State* (Methuen's Monographs on Chemical Subjects, 1954), which was designed to "stimulate interest and research", A. L. G. Rees deemed 131 pages of a 4 × 6.5 in. format adequate to provide an introduction to the subject. The book under review covers much the same ground over 30 years later, in 223 pages of standard size, with much the same scope and limitations: "To cover all aspects of the chemistry and physics of defects in all types of solids is an immense task.... This book arises from courses given to advanced undergraduates and immediate postgraduates in chemistry, physics and materials science. It introduces newcomers to the subject with particular reference to nonstoichiometric crystals." Given that the overall level of treatment in the two books is similar, the tripling in size represents a not unreasonable increase if one considers the tremendous expansion of research activity in all branches of solid-state science in the intervening years. In ten sections, the book attempts to deal with point defects and diffusion in stoichiometric crystals; nonstoichiometric materials containing ions with fixed valence (defect chemistry; applications to galvanic cells and sensors); nonstoichiometric materials containing atoms of variable valence (electronic conduction, colour centres, thermodynamics); and the structure of nonstoichiometric phases. Dislocations and the importance of defects for mechanical properties are not included in this selection.

The book is written in an informal style and is deceptively easy to read. However, it is not certain that the nature of some of the phenomena treated can be properly grasped from a highly abbreviated account, and the suggested further reading is likely to be a necessity rather than a desideratum for proper understanding. It is also not clear what the book presupposes by way of mathematical background. For example, pp 6ff give a definition of $N!$ and discuss, somewhat obliquely, the goodness of Stirling's asymptotic approximation (the l.h.s. of eq 1.13 should read $\ln N!$; in fact, a "correct" expression for the approximation is $\ln N! \sim N \ln N - N + \frac{1}{2} \ln(2\pi N) + \ln[1 + (12N)^{-1} + \dots]$). Next, pp 58ff explain the meaning of normal distribution, while on p 29 erf(x) is defined but immediately dismissed as "normally tabulated in books and mathematical tables". If the reader is not expected to be mathematically competent at this level, can he be trusted to come to grips with the equations of diffusion in section 2?

Other reviewers would no doubt have other comments on the coverage and presentation of material in Tilley's book; here are a few random observations of my own. On p 76, the statement that glasses are supercooled liquids ignores the existence of supercooled liquid \rightarrow glass transitions. On p 79, the much quoted relationship $a_{ss}^n = N_1 a_1^n + N_2 a_2^n$, $n = 1$ (a_{ss} , a_1 , a_2 = lattice parameters of the solid solution and components 1 and 2, respectively), was proposed by Vegard for stoichiometric solid solutions, but even there the relationship holds very rarely and its justification even as a limiting law is not quite clear. For inorganic crystals it would be expected to hold (apart from isotopic pairs), within experimentally attainable accuracy, for $Y_2O_3-H_2O_3$; for KCl-KBr Slagle and McKinstry (1966) found $n \sim 3$, in accordance with Retger's law of additive volumes. Why Vegard's law should hold for nonstoichiometric phases is even less clear. In section 4.3.2, the consequences of nonstoichiometry for magnetic properties (magnetism is not discussed in the book) could have been introduced naturally via $Fe_{1-x}S$, together with the more traditional examples of continuous "interpolation", Co-Te-CoTe₂, and NiTe-NiTe₂. In section 6.5 the newcomer could have been alerted to the existence of paired thermoelectric (Seebeck-Peltier) and analogous effects (electrokinetic, Dufour-Soret) and to their generalized treatment by nonequilibrium thermodynamics. A brief mention of the Hall effect would not have been out of place. In section 7, again for the orientation of the newcomer, reference could have been made to the Mollwo-Ivey relation for F-centers ($\lambda_{max} = ka^n$, a = unit cell dimension), which holds with good approximation for pure and mixed alkali halides, and to the use of ionizing radiations for modifying the colour of gemstones. In section 8, reference to interstitial hydrides (Ti-H etc.) and to the dependence of their composition and structures on $p(H_2)$ would have been useful, also because of the current interest in solid materials for hydrogen storage. The book seems to have narrowly missed the recent

explosion of research activity in the field of high T_c (cuprate) superconductors, where nonstoichiometry plays its part, albeit as yet not well understood.

Osvald Knop, Dalhousie University

Organic Chemistry: The Name Game. By Alex Nickon (The Johns Hopkins University) and Ernest F. Silversmith (Morgan State University). Pergamon Press, Inc.: New York. 1987. xii + 347 pp. \$75.00 (hardcover). ISBN 0-08-034481-X. \$29.50 (flexicover). ISBN 0-08-035157-3.

Terminology occupies a prominent position in chemistry, especially organic chemistry. All of us trained in the discipline are familiar with name reactions, unusual compound names, and a variety of wonderfully descriptive terms. *Organic Chemistry: The Name Game* is a collection of coined names and terms that have surfaced over the years, mainly in organic chemistry, and their origins. Dr. Nickon has maintained an extensive file over the years relating to terminology, aided by direct correspondence with the scientists involved, and together with Dr. Silversmith he has transformed his file into a wonderfully readable and informative book. Not only are names and terms presented with the background leading to the particular name selection, but the chemistry involved is concisely described, and the reader becomes refreshed on many chemical topics while enjoying the onomastic lessons. Some of the terms discussed actually never made the chemical literature, but were used in lectures or informally in the laboratories where the research was being conducted. The book is divided into twenty chapters, with such titles as "An Animal is a Chemist's Best Friend" and "Molecules Have Home Towns, Too". Six appendices are included, covering such topics as the etymology of traditional chemical names, Latin and Greek terms for numbers, and Nobel prizes in the sciences. The light style that Drs. Nickon and Silversmith have used makes the book especially readable, and that style coupled with the subject matter makes the book a pleasure to peruse. Alliteration abounds in this book, and science is transformed from a cold academic pursuit to a warm, human endeavor on every page.

A small but tantalizing sampling of specific topics includes the Samson effect, fenestrane, pterodactylanes, ankyrin, brexane, ipso substitution, platyrins, Mogen Davidane, betweenanenes, lariat ethers, peristylane, triptycene, the NIH shift, bullvalene, pagodane, chiron, betaines, smissmanones, the hockey-sticks effect, the bell-clapper mechanism, calixarenes, flyover bridges, the compound with the most different elements in it, and a recounting of a tongue-in-cheek search of the chemical literature for salacious material. Readers will also learn what paedonyms, caconyms, toponyms, and eponyms are. The book provides a great volume of material that can be used to spice up a lecture, it is a delight to read, and it is reasonably priced. Chemists of all types, but especially organic chemists, will be glad that they took the time to read this book.

John A. Secrist III, Southern Research Institute

Solid State Chemistry Techniques. By A. K. Cheetham and P. Day (Oxford University). Oxford University Press: New York and Oxford. 1987. xiv + 398 pp. \$70.00. ISBN 0-19-855165-7.

In the 1980's, solid-state chemistry, like geochemistry, is increasing in its recognition and popularity as a subdiscipline of chemistry, joining the big five: inorganic, organic, physical, and analytical chemistry and biochemistry. It is no longer unusual to find two or more colleagues at a university or industrial laboratory calling themselves solid-state chemists. Recent well-publicized advances in heterogeneous catalysis, zeolites, ceramics, high T_c superconductors, etc., account for much of the new interest in solid-state chemistry.

Elements of solid-state chemistry may be found as isolated chapters in numerous texts, chiefly those in inorganic and physical chemistry. Texts on solid-state chemistry are sparse, with that by A. R. West being a notable exception. A. K. Cheetham and P. Day have identified a gap in instructional and reference materials for solid-state chemistry (although one must only guess at their motivation for preparing this book as there is no foreword or preface). They have gathered a group of well-known English and North American scientists who have written chapters in their specialties. The chapters are the following: synthesis of solid-state materials (J. D. Corbett); diffraction methods (A. K. Cheetham); X-ray photoelectron spectroscopy and related methods (G. K. Wertheim); magnetic measurements (W. E. Hatfield); optical techniques (R. G. Denning); high-resolution solid-state MAS NMR investigations of inorganic systems (C. A. Fyfe and R. E. Wasylshen); computational techniques and simulation of crystal structures (C. R. A.

*Unsigned book reviews are by the Book Review Editor.

Catlow); transport measurements (A. Hamnett); vibrational spectroscopy (D. M. Adams); and thermodynamic aspects of inorganic solid state chemistry (A. Navrotsky). With the possible exception of a more detailed treatment of elemental analysis (XRF is mentioned in the chapters on diffraction methods and surface chemical analysis is included in the XPS chapter) the coverage of topics is extensive.

The two uses of a book of this nature are as a reference and a text. As a hypothetical example of the former, consider the person with no solid-state chemistry experience assigned to the design, synthesis, and characterization of the new high T_c superconductors in early 1987. He or she would find an excellent introduction to synthesis in Chapter 1, including the advice to advance from the originally employed dry, oxide/carbonate mixes to more reactive starting materials mixed on an atomic scale. Descriptions of characterization of the products for phase purity and structure by XRD in Chapter 2, for electrical conductivity in Chapter 8, and magnetic susceptibility in Chapter 4 (the Meissner effect is discussed) would provide the background necessary to seek collaborators having the relevant skills and instrumentation, and to be able to discuss the results. Each topic is presented in sufficient depth so our researcher can appreciate the theoretical background, the operational principles, and basic components of relevant instrumentation. The book is not a lab manual; no step-by-step instructions are given.

As a text, *Solid State Chemistry Techniques* would act as a valuable companion to A. R. West's *Solid State Chemistry and Its Applications* for a one- or two-semester graduate course. However, although numerous applications and worked examples are described, there are no end of chapter problems.

Few of us these days can maintain an in-depth knowledge of each technique in use in our discipline. During the review, this book provided me twice with a succinct overview of unfamiliar techniques that came up in the course of a review paper. I recommend *Solid State Chemistry Techniques* highly as a desktop reference and suggest that instructors of solid-state chemistry courses consider it as a supplemental text.

Gregory J. McCarthy, North Dakota State University

Practical Inorganic Chemistry. Edited by V. I. Spitsyn (Moscow State University). Mir Publishers: Moscow. Distributed by Imported Publications: Chicago. 1987. 304 pp. \$12.95. ISBN 0-8285-3321-0.

Students should find the experiments and experimental techniques in *Practical Inorganic Chemistry* useful, but they will need to be careful of the language. Here one will find triturated and comminuted where powdered or finely ground crystals would suffice. The grammar usage is typical European, with sulphur and sulphuric instead of sulfur and sulfuric being employed as examples.

One also finds all of the diagrams of the experimental setups employing older equipment with rubber tubing and cork or rubber stoppers instead of ground-glass connections. There is one section in the laboratory and techniques chapter that explains the use of ground-glass joints and their proper lubrication, as well as a few diagrams in the advanced experiment sections that display some ground-glass setups. One even finds Kipp gas generators and retorts being described and displayed; these are nearly extinct in a typical American college or university laboratory.

Safety is mentioned, usually when the compound or element is toxic or dangerous. In our laboratories safety glasses, goggles, or face shields are required at all times, not just for specific experiments. There is also minimal mention of waste disposal, which is at most being relegated to the laboratory assistant. Chemical waste disposal is an essential topic and deserves more consideration in a textbook of this nature.

The experiments range in detail and difficulty. Here one will find experiments that are typically done in American high school chemistry classes and in the first-year college chemistry classes. These range from the preparation of O_2 and H_2 , to the determination of the equivalent mass of Zn, the molecular mass of CO_2 , as well as freezing point determinations. One also finds quite detailed experiments such as the preparation of potassium hexachloromolybdate (III), niobium pentachloride, or uranium(IV) chloride. The experiments thus range from those done in typical American first-year courses to some experiments that are typically performed at the junior-senior level.

The book outline starts with three general technique chapters that are quite important and should be required in every chemist's educational background. A chapter on oxygen and one on hydrogen follow the introductory chapters. Four more chapters then present experiments illustrating principles of reaction rates, equilibrium, solubilities, and electrolytic phenomena. The experimental preparations are next grouped (Chapters 11-31) essentially by families starting with chapters on oxygen and hydrogen. The main group elements are treated first, in reverse order; halogen family, sulfur family, nitrogen, phosphorus, to alkali metal family. Here one will find experimental preparations for the rare-earth elements and the transition elements. The textbook frontspace has a periodic table that is the older short form. You will not find any refer-

ence to A or B families or the newer I to 18 groups mentioned.

The experiments employ vacuum, inert atmospheres, nonaqueous solvents, electrolysis, high temperatures, etc., but these are mixed in with simpler experiments. There is a suggested topics list, but this educator would prefer a topic list that employs all of the different experimental techniques followed by the preparations that would employ these techniques. An index would also be most helpful as the Table of Contents does not indicate the difficulty of a particular experiment.

There is an appendix with selected data, such as solubilities, solution densities, dissociation constants, freezing mixtures, electrode potentials, and thermochemical values. These appear to be sufficient as a literature-source table is also given.

The textbook is a good source of preparations for the elements of Groups IV, V and VI (C, Si through Se, Te) and would be quite useful for students in metallurgy and related areas. The price of the textbook is good, but the student will need to be quite familiar with the book in order to make efficient use of its value.

H. O. McDonald, University of Missouri—Rolla

Air Composition and Chemistry. By Peter Brimblecombe (School of Environmental Sciences, University of East Anglia). Cambridge University Press: Cambridge and New York. 1986. ix + 224 pp. \$44.50. ISBN 0-521-25518-X.

Peter Brimblecombe has written a very readable and informative survey on the composition and chemistry of air. To use an expression that is rarely applied to technical texts, "the book was hard to put down". Even for someone working in environmental sciences there were many new and interesting facts to be learned. He covers and expertly blends chemical, physical, social, medical, and agricultural aspects of the atmosphere and atmospheric pollution. When applicable, chemical and physical formulas are included and clearly explained. The book covers a number of topics that the average reader would not encounter. Two of these are the following: a discussion in Chapter 2 of microbial activity that leads to air pollution and a comparison in Chapter 3 of natural sources of pollution with pollution caused by human activities.

The first five chapters deal with atmospheric composition and its variations. Physical and chemical cycles are discussed in terms of non-anthropogenic biological and geochemical atmospheric components. Atmospheric chemistry and photochemistry are succinctly presented; attention is drawn to the role of particulate matter, such as solids, droplets, and aerosols. Oxidative processes, particularly those of sulfur and nitrogen compounds, are examined. Chapters 6 and 7 deal with the chemistry and photochemistry of anthropogenic air pollutants. Everyone hears that combustion of fossil fuels leads to an increase in the concentrations of carbon, nitrogen and sulfur-containing substances in the atmosphere, but the author stresses the concomitant increase in the concentration of toxic trace elements in the atmosphere's particulate components. Less publicized processes such as smelting, brick-making and other manufacturing operations, the escape of natural gas and solvent vapors, and the applications of agricultural chemicals are also considered as major pollutant sources. The fate and dispersion of pollutants and the resultant health effects on human and animal populations as well as on crops and timber are outlined. "Indoor" pollution and its subtle effects on health are included in the text. Finally, a brief discussion of stratospheric and ionospheric chemistry is followed by a most interesting chapter on planetary atmospheres and evolution.

The book is exceptionally well written and packs a great deal of information into its small format. The occasional anecdote enriches the text. The book awakens and sustains attention to an important area, and in these reviewers' opinion it is excellent reading for the nonspecialist and a good introduction for the serious student. Although the author states in the preface that "he has tried to keep references to specialist scholarly literature to a minimum" and points out that review literature gives in-depth references, these reviewers wish that references to original literature had been cited in the text.

S. R. Smith, University of Connecticut
T. E. Smith, Connecticut College

Pulse Methods in 1D and 2D Liquid-Phase NMR. Edited by Wallace S. Brey (University of Florida). Academic Press, Inc.: New York. 1988. ix + 561 pp. ISBN 0-12-133155-5.

This book consists of eight chapters by a number of authors which cover many of the pulse methods currently used in applying NMR to liquid samples. The volume is aimed at readers who have at least a passing familiarity with NMR, and it is entirely suitable for a text for upper-level undergraduate students or beginning graduate students for a course in pulse NMR. The material is slanted toward biological applications and the primary literature is, for the most part, well cited.

The first chapter contains introductory material by W. S. Brey and is a very good treatment of the fundamental ideas in pulsed NMR and

contains a number of helpful exercises. The second chapter, by M. H. Levitt, describes some aspects of density operator formalism and contains a clear description of the basic features that are necessary for understanding many of the current articles in the primary literature. The third chapter is on polarization transfer techniques and tend to be a little too much like alphabet soup: DEPT, SEMUT and so on; and it misses the opportunity to use these primarily one-dimensional techniques to illustrate the concepts introduced in the first two chapters. The fourth chapter is on multiple quantum spectroscopy, by T. H. Mareci, and is a good introduction to not only the methods but the advantages and disadvantages of this class of techniques. The following chapter, by G. A. Gray, discusses the experimental aspects of primarily two-dimensional NMR and contains a large number of illustrative examples and helpful hints on how to do actual experiments and explanations of some common problems. J. H. Prestegard contributes a chapter on applications of two-dimensional NMR to biological systems that discusses not only nucleic acids, proteins, and carbohydrates but several points, such as water suppression and data processing, that are particularly important to these applications. This is followed by a chapter of NMR of fluorocarbons that is rather narrowly focused. The final chapter is by Brey, who gives an overview of new developments in NMR and pulls together the material in the other chapters.

For either the reader interested in an introduction to modern pulse methods in NMR or as an introductory text this is the best book currently available, since both basic theory and applications are presented quite well. While there are a few problems with different modes of presentation from chapter to chapter, overall the material is well integrated and this book should be especially appealing to those who wish to find out what modern pulse methods can do for their research area.

P. H. Bolton, *Wesleyan University*

Petrochemicals: The Rise of an Industry. By Peter H. Spitz (Chem Systems). John Wiley and Sons: New York. 1988. XXVII + 588 pp. \$29.95. ISBN 0-471-85985-0.

Take an important industrial saga, give it to a skilled, experienced technologist with a gift for words and access to many anecdotal inputs from other practitioners, and the result should be a first-rate book. Unfortunately, this is not the case with Peter Spitz's book, which falls short because of lack of organization and various diversions. The overall effect yields a good book instead of an excellent one.

The text's problems begin with the first chapter, which, after the author's topic sentence "Although the petrochemical industry is an American phenomenon ...", proceeds to go into great detail to describe the German chemical (coal-based) industry of the 1930's and 1940's. While many, including myself, share his admiration for the accomplishments of the German chemical industry, his choice of this as his lead chapter is totally out of sync. These diversions occur again and again in the text. For example, after getting back on the beam with several chapters that do discuss the petrochemical industry, he then flies off to a discussion of cartels and, in particular, European examples (alkali, nitrogen) not connected with petrochemicals. These diversions continue with separate chapters that are, in effect, capsule histories of plastics and synthetic fibers. The overall result is a book that lacks smooth transitions and therefore becomes difficult to follow.

The book does make sense if the following chapters are read in the indicated order: Chapter 2 (Early Petrochemical Production in the United States), Chapter 3 (Cat Crackers: Wartime Fuels and Petrochemical Raw Materials), Chapter 1 (German Chemical Industry), Chapter 4 (Aromatic Feedstocks from Petroleum), Chapter 8 (Rush into Petrochemicals), Chapter 9 (International Development and Growth), Chapter 12 (The 1970's), Chapter 13 (The Once and Future Industry).

This reading gives an interesting and informative history of one of the world's great industries. All other chapters should be scanned.

While not appropriate as a text, the book nevertheless would be a good addition to a governmental, industrial, or university library.

Richard G. Griskey, *Stevens Institute of Technology*

Low Energy Electron Diffraction: Experiment, Theory and Surface Structure Determination. By M. A. Van Hove, W. H. Weinberg, and C.-M. Chan. Springer-Verlag: New York. 1986. xvii + 603 pp. \$69.00. ISBN 0-387-16262-3.

Low energy electron diffraction (LEED) surface crystallography is as important for determination of the atomic structure of solid surfaces as X-ray diffraction is for bulk structure analysis. By careful and painful research both in theory and experiment the field reached the point where the structures of adsorbates of great complexity are determined on solid surfaces of great diversity of structure and composition. This book gives an excellent progress report on LEED, the development of this technique, and the surface structures that it solved. It is an indication of the rapidity of change in the field that over 200 new surface structures have been

determined and new experimental (digital LEED) methods developed since the publication of this volume along with major new advances in LEED theory (disordered LEED) that are, of course, not included. New developments in theory and in experiment made possible the determination of the structure of disordered overlayers and of large organic molecules on surfaces that occurred after the publication of this book. It would be a mistake, however, to consider this book out of date because of the rapid changes that are occurring in the field of surface crystallography by LEED.

This volume is an important document that shows well the many contributions of low energy electron diffraction to surface science. The historical development that is described in chapter one is a reminder of the historical tradition out of which the field grew. The description of the LEED experiment is an important source of information to initiate graduate students or researchers on how the experiment may be carried out. The description and analysis of the diffraction patterns in Chapter 3 is complete and very educational. Discussions of the kinematic and dynamical LEED theories and the various approximations are clearly important for those who are attempting to learn surface crystallography. Detailed and complete exposure of the theory reflects the depth of understanding of the authors of the complexity and the important aspects of the theory in obtaining the surface crystallographic data. The experimental descriptions of selected systems provide insight to the history of the development of the field of surface structural chemistry in Chapters 7, 8, and 10. Chapter 9 discusses surface reactions that are monitored by LEED which is an important sub-field of surface crystallography. Finally, the future of LEED is discussed in Chapter 11, followed by a very good reference list and table of surface structures.

This book is a welcome addition to the library of those interested in surface science and its applications to study surface structure. It provides good background and an educational tool for students who would like to improve their knowledge in the field of surface structural science.

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

Electrochemical Sensors in Immunological Analysis. Edited by T. T. Ngo (University of California, Irvine). Plenum Press: New York. 1987. xi + 360 pp. \$62.50. ISBN 0-306-42580-7.

The use of non-isotopic immunoassay techniques (in place of conventional radioimmunoassays) to quantitate biologically active species at trace levels is a rapidly growing area. While a wide range of non-isotopic labels (e.g., fluorophores, enzymes, etc.) and detection schemes have been proposed, this book focuses on the most recent efforts to couple modern non-isotopic immunological methods with electrochemical detectors. Twenty-five chapters, written by leading researchers in the field, cover a wide range of approaches. These include direct immunosensor devices (no label required), use of electrochemical sensors (amperometric and potentiometric) to detect activities of labeling enzymes in homogeneous and heterogeneous enzyme-linked immunoassay arrangements, novel ionophore-mediated membrane electrode based potentiometric immunoassay methods, flow-through immunoassay-electrochemical schemes, and the use of electrochemical labels and ion-loaded liposomes or red blood cell ghosts in immunoassay techniques.

For the most part, the chapters within the book are well-written. However, many of the contributions are simply minor variants of manuscripts that already have appeared in the literature. Thus, this monograph serves more as a collection of original research papers than an authoritative survey of the fundamentals, problems, and challenges facing the field. In addition, readers who are interested in solving real-world analysis problems are not likely to find this book appealing, since many of the approaches described are still at the very early research stage and, at this point, do not offer significant advantages over existing non-electrochemical immunological methods (e.g., ELISA, TDX, etc.). Nonetheless, for those researchers involved in attempting to exploit the fundamental advantages of electrochemical detection for biochemical immuno-analysis, this book will serve as a valuable reference guide regarding what had been accomplished to date.

Mark E. Meyerhoff, *The University of Michigan*

Organic Photochemistry. Volume 9. Edited by Albert Padwa (Emory University). Marcel Dekker, Inc.: New York and Basel. 1987. xi + 353 pp. \$99.95. ISBN 0-8247-7775-1.

Volume 9 continues in the tradition of this series to present timely overviews of photochemical research. The three chapters are the following: "The Photochemistry of Substances Containing the C=N Moiety with Emphasis on Electron Transfer Processes", by Patrick S. Mariano; "Photocyclizations and Intramolecular Cycloadditions of Conjugated Olefins", by Wim. H. Laarhoven; and "Photolytic Deprotection and Activation of Functional Groups", by V. N. Rajasekharan Pillai.

The first chapter deals with electron-transfer processes involving the

excited C=N bond, namely in imines and iminium salts. This overview is concerned only with UV absorbing systems and does not address the electron-transfer properties of visible-absorbing conjugated bis-iminium salts, i.e., cyanine dyes. The initial part presents a good descriptive overview of photochemical electron transfer. The mechanistic aspects of C=N* reactivity are discussed with regard to both cycloaddition as well as electron-transfer pathways. Emphasis is placed on intra- and intermolecular electron-transfer reactions of excited iminium salts resulting in C-C bond forming reactions, of particular use in alkaloid synthesis. Finally, the author illustrates the biochemical aspects of C=N reactivity primarily through a discussion of flavin photochemistry.

The second chapter presents an excellent overview to substituent and conformational effects in electrocyclic ring closures and additions to polyenes. With the use of numerous examples, the effect of temperature and irradiating wavelength on secondary photoproduct formation is also described. The organization of the sections on the basis of the π -systems allows this chapter to be used as a convenient reference to these types of reactions. The chapter also presents a good synopsis of various methods for forming cyclobutadienes.

The third chapter gives a complete account of the various methods associated with photochemical deprotection and activation of carboxyl, amino, hydroxyl, thiol, and carbonyl groups. Most of these photoactive groups consist of nitrated aromatics. These have absorption maxima at long enough wavelengths to avoid side reactions from excitation of chromophores with the compound containing the protecting group. Their main advantage is shown to be in peptide and nucleotide synthesis using Merrifield techniques.

This volume provides a comprehensive review of each of the topics presented. These reviews would be of interest to any photochemist and a valuable addition to one's synthetic library as well.

Peter Gottschalk, *Mead Imaging*

Potential Energy Hypersurfaces. By P. G. Mezey (University of Saskatchewan, Saskatoon, Canada). Elsevier Science Publishers: Amsterdam and New York. 1987. xiv + 538 pp. \$156.00. ISBN 0-444-42887-9.

The aim of this book, to familiarize the chemist or molecular scientist with the "fundamental properties of potential energy hypersurfaces that are general for ... larger molecules", is laudable. A central premise of the text is that the mathematics of topology provide more realistic and hence better tools to describe molecules and chemical reactions than the more routine mathematics of quantum chemists. As a result, many of the topics addressed are new to most chemists, but the material is presented in a straightforward manner and with sufficient reference to physical and chemical systems that the 'essential essence' of the ideas can be grasped on first reading.

Chapter 1 reviews the background quantum mechanics. The author makes very useful observations concerning the physical and chemical justifications and limitations of the usual approximations (Born-Oppenheimer, adiabatic, etc). Different global and local coordinate systems are described with adequate reference to the literature for readers seeking more detail. The discussion of intersections of hypersurfaces sets the tone for the following chapters.

Chapters 2 and 3 describe the geometrical properties of energy hypersurfaces and their calculation and representation. The discussion of critical points is especially lucid and makes good use of graphical illustrations. These chapters can be read on at least two levels. A cursory reading gives the 'flavor' of the relationship between hypersurface properties and chemical reactions while there is adequate 'meat' for much lengthier contemplation. Again many relevant references to the literature have been included. Examples and proofs provide additional insight and justification of the ideas presented.

The first sections of Chapter 3 provide a good general review of the Hartree-Fock formalism and the associated problem of electron correlation. The details provided on optimization techniques for potential energy surfaces provide either a good introduction and/or refresher to the topics. Thus most chemists will have at least a nodding familiarity with the topics in the first half of this book.

Chapter 4 calls into question the conventional chemists' picture of a molecule as a small group of atoms localized in space. The "fuzziness" required by the Heisenberg uncertainty principle appears to require that our geometrical models be replaced by topological ones. In fact the author argues that "raw experimental information on structural features of molecules is more directly compatible with a topological structural model than with a geometrical model." Here the introduction of open sets and fuzzy sets will find many chemists in unfamiliar territory, but if the reader will bear with the author (with referral to the Appendix as required), a new way of thinking about molecules and chemical reactions will emerge.

The author claims that applied topology has the potential to simplify complicated problems in chemistry and physics in a manner analogous to the simplifications achieved by applications of group theory. The aim of reaction topology is to identify and characterize fundamental groups of reaction mechanisms with the eventual goal of developing computer based quantum chemical synthesis design. Continuing the group theory analogy, Chapter 6 defines the set of generators for the fundamental group of reaction mechanisms and shows this group to be commutative. Furthermore the interrelations among the energy dependent fundamental group are developed with analogy to lattice theory.

The fact that the energy hypersurface for complex molecules and for chemical reactions of these molecules contains multiple critical points (global and local minima and maxima being of most chemical interest) argues that simultaneous examination of these points is needed to understand chemical processes. The increasing availability of computers with multiple processors could permit such studies. The author sees topology as being able to identify fundamental properties of energy hypersurfaces, which are independent of the specific molecules involved, just as group theory identifies symmetry properties and uses these properties to provide insight and information about different chemical systems that nevertheless have the same symmetry.

Whether this ambition is fulfilled or not, the author has clearly presented an intriguing approach to thinking about chemical problems. The wedding of topology and quantum chemistry deserves further consideration and offers ideas of which chemists should be aware. This book provides a good introduction and self-contained overview of the topic.

Patricia L. Moore Plummer, *University of Missouri—Columbia*

Inorganic Reactions and Methods. Volume 11. Edited by J. J. Zuckerman. VCH Publishers: New York. 1988. xii + 594 pages. \$150.00. ISBN 0-89573-250-5.

This book is one of a series of 18 volumes on general inorganic preparative methods. The series is organized on the basis of the formation of bonds between different groups of elements. This volume summarizes reactions for the formation of bonds between C, Si, Ge, Sn, and Pb and Li, Na, K, Rb, Cs, Fr, Cu, Ag, Au, Zn, Cd, and Hg. As many of the carbon-based reagents are commonly employed in organic synthetic reactions, formation of these bonds constitutes a large fraction of the book. However, attention is also paid to bonds to the other elements of the group, rendering this volume a valuable resource for acquaintance with general approaches to the synthesis of a particular type of bond.

The first of the three chapters addresses the generation of bonds between Group IVB and Group IA elements. The large number of lithium-carbon reagents led to their being given treatment in a separate subsection, further separating routes employing lithium metal and other organolithium reagents. The formation of other Group IA-carbon bonds is treated next, followed by separate treatments of Group IA-silicon, -germanium, -tin, and -lead bond formation.

The second chapter treats the formation of bonds between elements in Group IVB and Group IB. Formation from metal salts and from metal-phosphine complexes are briefly included here.

The third chapter summarizes Group IVB-Group IIB bond formation. As with lithium, the reactions producing bonds to carbon are singled out as they constitute a large portion of known compounds. The chapter also treats preparations of bonds to silicon, germanium, tin, and lead separately and thoroughly.

Overall, this volume makes an excellent reference text for initially approaching the synthesis of any compound containing a Group IVB to Group IA, Group IB, or Group IIB bond. The organization of the text makes it an easy task to quickly locate a summary of the known paths for formation of any of these types of bonds, along with indications of the appropriateness of each method for a given class of compounds. Also, each subsection is prefaced by a boldface statement alerting the unfamiliar reader to the appropriate toxicity/explosion hazards associated with many of these compounds. One minor drawback of the text is that the authors used the Group I-VIIIA and Group I-VIIIB nomenclature rather than the new IUPAC designations Group 1-18. A periodic table is included inside the back cover of each volume of this series to help alleviate the confusion over A vs B nomenclature.

William D. Jones, *University of Rochester*

Modern Carbohydrate Chemistry (Part 27 of the Food Science and Technology Series). By Roger W. Binkley (Cleveland State University, Ohio). Marcel Dekker, Inc.: New York and Basel. 1988. xi + 343 pp. \$90.00 (U.S. and Canada); \$108.00 (all other countries); \$49.75 (orders of 5 or more copies for classroom use only). ISBN 0-8247-7789-1.

For some years there has been a need for a concise text on the topic defined by this title. The need was most felt by those who teach this topic to undergraduate or graduate majors in fields such as chemistry, food science, and biology. For such purposes, the alternative has been to

reference sections of multivolume texts. An excellent text by R. J. Ferrier and P. M. Collins ("Monosaccharide Chemistry", published by Penguin Books, 1972) had filled this gap but has long been out of print. The volume under review fills much of this need. It is well written and produced. The language used is concise and normally goes economically to the minimal basis for understanding of the point under discussion. The figures are equally well chosen. The explanations and discussion should be understandable to the average student, either undergraduate or graduate, who already has a good grounding in College Chemistry.

The first quarter of the book deals, quite properly, with nomenclature, structural representations, and shape (conformation), predominantly of monosaccharides. The remainder deals with reactions, predominantly of monosaccharides, although there is also a brief and good chapter on oligosaccharide synthesis. There is a good index. The general orientation is toward synthetic organic chemical aspects, which is reasonable since this is the major area of activity in carbohydrate chemistry today. As perhaps an inevitable consequence, however, the book places very little emphasis on biological relevance of carbohydrates (after the first three pages), or on their industrial significances. Polysaccharides are barely mentioned, but this is in accord with a normal interpretation of the title. I would particularly have welcomed a further chapter dealing with physical methods such as NMR and mass spectrometry, using a similar depth of treatment to the remainder of the book.

This text should serve well for a significant period for its target audience, viz. "carbohydrate and organic chemists; biochemists; food scientists and technologists; molecular biologists; biotechnologists; and undergraduate and graduate students studying carbohydrate chemistry" (at least for those who can afford it). I should again caution that it would be best used by those who already have a good grounding in Chemistry, especially physical and organic. We still lack an equivalent single volume text on Modern Polysaccharide Chemistry.

G. N. Richards, *University of Montana*

A Bibliography of Matrix Isolation Spectroscopy: 1954-1985. Edited by David W. Ball, Zakya H. Kafafi, Leif Fredin, Robert H. Hauge, and John L. Margrave. Rice University Press: Houston. 1988. xvi + 643 pp. \$90.00. ISBN 0-89263-266-6.

The use of a frozen medium in a glassy state to stabilize highly reactive species for spectroscopic observation perhaps began with the research of G. N. Lewis more than half a century ago, but the subject has seen its greatest growth since 1960. Atoms, free radicals, and transient intermediates can be studied by this technique, and their reactions can be followed.

In this book, the bulk of the content consists of references, arranged chronologically, with titles in full, subdivided into reviews, books, and research papers. Access to specific subjects is provided by three indexes: authors; formulas; and key words.

Organometallic Syntheses. Volume 4. Edited by R. B. King (University of Georgia) and J. J. Eisch (State University of New York, Binghamton). Elsevier Science Publishers: Amsterdam and New York. 1988. XX + 620 pp. \$236.75. ISBN 0-444-142956-5.

This volume contains over 160 detailed and tested procedures for the preparation of specific organometallic compounds. The book is divided in two, almost equal, parts: one concerning the synthesis of transition-metal organometallic compounds and the other concerning the synthesis of some 85 nontransition-metal organometallic compounds. Each described procedure is organized with a similar spirit to the procedures reported in *Organic Syntheses* and *Inorganic Syntheses*. All the procedures are related in detail and eventual hazards are very clearly indicated. A very broad choice of procedures is found in this volume; it goes from model reagents for the Fischer-Tropsch reaction to very useful reagents in organic synthesis such as (η^5 -cyclopentadienyldicarbonyl (phenylthiocarbonyl) iron hexafluorophosphate. A number of interesting and useful intermediates for other syntheses are fully described such as (η^5 -cyclopentadienyl)niobium tetrachloride and -tantalum tetrachloride or iodotetracarbonyl-cobalt. Several of the procedures described are reported in a very detailed fashion compared to the procedures found in the literature and this is certainly the greatest advantage of this book. The preparations of nontransition-metal organometallic compounds also clearly reflect the recent trends of this field of organometallic chemistry. The high-yield preparation of dimetallic compounds of lithium (like 3,4-dilithio-2,5-dimethyl-2,4-hexadiene, *cis*-1,2-dilithiocyclooctene, dilithium biphenylide), of magnesium (like bis(bromomagnesium)methane, 1,3-bis(bromomagnesium)-2,2-dimethylpropane, 1-magnesacyclobutane), and of aluminum (like 1,2-bis(dibromoaluminum)ethane) are representative for the intense research activity and the rapid progress in this field. Some procedures are more oriented toward organic chemistry and several procedures involving sulfur chemistry are described (synthesis of phenylsulfonyl(trimethylsilyl)methane, (*E*)- and (*Z*)-1-(phenyl-

sulfonyl)-2-(trimethylsilyl)ethene, 1-(phenylsulfonyl)-2-(trimethylsilyl)ethane). The synthetic utility of all these reagents is clearly indicated in all of these preparations. Of special interest is the description of the synthesis of the chiral silanes *R*(+)- and *S*(-)-(α -naphthylphenyl)methylsilane, which allowed many important stereochemical studies. Finally the preparations of several heterocycles containing silicon, germanium, tin, bismuth, selenium, or tellurium complete this general picture of preparative main-group organometallic chemistry.

In summary, this book, which should definitely be in each chemistry library, will be of great utility for the synthetic (organic and inorganic) chemist. He will find there numerous unpublished or more detailed experimental procedures of very useful organometallic compounds.

Paul Knochel, *The University of Michigan*

Ullmann's Encyclopedia of Industrial Chemistry. Fifth Edition. Edited by W. Gerhartz, Y. S. Yamamoto, F. T. Campbell, R. Pfefferkorn, J. R. Rounsaville, and G. Schulz. VCH Publishers: Weinheim and New York. 1985,-6,-7,-8. ca. 600 pp per volume. \$180.00 per volume (lower by subscription). ISBN 0-89573-151 to 160-6.

The original encyclopedia compiled by Professor Fritz Ullmann appeared in 1914 as a collection of "recipes" for industrial chemical processes. In the ensuing editions, it has expanded greatly, both in volume and scope, as it has attempted to keep up with the many developments and concerns in the chemical industry. In this Fifth Edition, the encyclopedia has been completely revised, and German has been abandoned in favor of English in order to serve the international market. Indeed, internationality is manifest throughout, beginning with the editors.

The work is planned as two series: 28 volumes in which subjects are arranged alphabetically, and eight volumes on "basic principles" (e.g., fluid dynamics, transport phenomena). The first series has been appearing at the rate of about three volumes a year and has now reached Volume 10, in which subjects up to "Fibers" are covered. Each volume contains about 16 to 24 entries; these are thus substantial chapters. Volume A1, for example, begins with Abrasives, Acaricides, and Acetaldehyde and ends with five entries on aluminum and its alloys and compounds. Volume A10 contains such subjects as Ethylbenzene, Explosives, and Fertilizers. The entries are contributed by obvious experts and are very thorough, with many tables and figures, as well as substantial reference citations. Subjects that are not themselves the title of an entry are cross-referenced at the point where they would have come alphabetically. For example, immediately following the end of the entry on 2-Ethylhexanol appear such indications as "Europium \rightarrow Rare-Earth Elements" and "Eutrophication \rightarrow Detergents".

The revision has been taken advantage of to introduce many new topics (e.g., biotechnology) and concerns (e.g., toxicity and environmental concerns). Nomenclature and units have been modernized, and a glossary of units, symbols, and abbreviations is at the front of each volume. The individual volumes are not indexed, but annual cumulative indexes are provided.

The quality of production is high, and the volumes should stand up well to the heavy use that they are likely to be subjected to in libraries.

Organic Reactions. Volumes 35 and 36. Editor-in-Chief A. S. Kende. John Wiley & Sons: New York. 1988. Volume 35: xxi + 650 pp. \$69.95. ISBN 0-471-83253-7. Volume 36: xvii + 602 pp. \$65.00. ISBN 0-471-85748-3.

It has been 3 years since the publication of Volume 34 of this series, of which each volume is eagerly awaited by organic chemists. It is good to see its previous frequent appearance resumed.

Volume 35 begins with memorial tributes to A. Harold Blatt (1903-1986) and Frank C. McGrew (1914-1986). The chapter titles of the previous volumes are then shown. The main content consists of three chapters: The Beckmann Reactions: Rearrangements, Elimination-Additions, Fragmentations, and Rearrangement-Cyclizations (Robert E. Gawley); The Persulfate Oxidation of Phenols and Arylamines (the Elbs and Boyland-Sims Oxidations) (E. J. Behrman); and Fluorination with Diethylamino-sulfur Trifluoride and Related Aminofluorosulfuranes (Miloš Hudlický). The first subject was reviewed in *Organic Reactions* once before, in 1960; the present chapter brings the subject up to date, with more emphasis on applications to synthesis and an unusually large number of experimental procedures.

Oxidation with persulfate can be a useful method for introducing a hydroxy group into an aniline derivative or a second hydroxy group into a phenol. Neither has been thoroughly reviewed for a long time, although limited aspects have been treated in books, and Behrman's review is timely.

Continuing interest in preparing organic fluorine compounds has led to the development over the past 20 years of the new reagents that are treated in the third chapter. They are not fluorinating agents in the strict sense, since they do not substitute fluorine for hydrogen; amino fluoro

sulfuranes (λ^4 -sulfanes) replace $-\text{OH}$ by $-\text{F}$ and $=\text{O}$ by $=\text{F}_2$, and the third type of reagent discussed in this chapter, $(\text{R}_2\text{N})_3\text{S}^+(\text{CH}_3)_3\text{SiF}_2^-$, replaces other halogens by fluorine. All chapters have the customary format that includes a detailed discussion of scope and experimental procedures as well as extensive tables of published examples.

Volume 36 also has three chapters: The [3 + 2] Nitron-Olefin Cycloaddition Reaction (P. N. Confalone and E. M. Huie); Phosphorus Addition at sp^3 Carbon (R. Engel); and Reduction by Metal Alkoxy-aluminum Hydrides. Part II. Carboxylic Acids and Derivatives, Nitrogen Compounds, and Sulfur Compounds (J. Malek). The last of these takes up more than half of the volume.

Cycloaddition of nitrones leads to isoxazolidines, which are interesting not only for themselves but for their utility in the synthesis of alkaloids, amino acids, etc. This chapter gives a good treatment of the preparation of nitrones and a thorough discussion of the mechanism with much attention to regioselectivity and stereoselectivity. The tables of examples are divided into intermolecular and intramolecular examples.

The second chapter is actually concerned with the addition of derivatives of phosphorous acid to carbonyl compounds (including Michael-type addition to unsaturated compounds), leading to phosphonic acid derivatives. These are of importance in synthesis (e.g., in Wittig reactions) as well as in biochemistry.

The third chapter continues the review that was begun in Volume 34. The variety of functional groups treated is enormous: imidoyl chlorides; alkylidene phosphinic amides; nitrimino compounds, heterocyclic bases; sulfoxides, etc. etc. Appropriately, a rich offering of experimental procedures is presented. No less than 31 tables were needed to contain all the data.

The index is a cumulative one of chapters and topics in Volumes 1 to 36.

The Chemistry of the Cyclopropyl Group. Edited by Z. Rappoport. John Wiley & Sons: New York. 1987. ix + 1739 pp. \$545.00. ISBN 0-471-91738-9.

Although traditionally the cyclopropane ring has been regarded as a hydrocarbon skeleton rather than a functional group, there is much reason to consider it otherwise. From a pragmatic standpoint, it shows chemical behavior not found in other types of hydrocarbons, and from a theoretical standpoint, its bonds are distinct from "normal" single bonds. It is therefore both reasonable and useful to treat the subject in the series, *The Chemistry of Functional Groups*.

These two volumes are made up of 24 contributed chapters. The first five are devoted to theoretical and spectroscopic aspects, and Chapter 6 treats acidity and basicity. Preparation of cyclopropanes and their use in synthesis of other types of compounds take up three chapters. Reactions are covered in several chapters, generally in conjunction with other properties, structural features, or methods of treatment. Electrochemistry, radiation chemistry, solvolysis, free-radicals, strain effects, and rearrangements are the subjects of various chapters. Even the biochemistry of the cyclopropyl group merits a chapter.

A somewhat esoteric subject, preparation and uses of isotopically labeled derivatives, is important enough to require 56 pages. Bicyclobutane has a chapter by itself, as do propellanes and cyclopropenes (and, in yet a separate chapter, cyclopropenyl compounds). Two substituent functions, amines and oxo compounds, have a chapter each. Only the planned chapter on photochemistry did not materialize. The subject index of 31 pages is thorough, and the author index of 132 pages is monumental. This comprehensive treatment of cyclopropane chemistry meets a real need and meets it well.

Fused Pyrimidines: Pteridines. By D. Brown (The Australian National University). John Wiley & Sons: New York. 1988. xxvii + 730 pp. \$225.00. ISBN 0-471-83041-0.

This book is Part Three of Fused Pyrimidines, which in turn is part of the series "The Chemistry of Heterocyclic Compounds". It consists of twelve chapters, of which one is an introduction, two are on syntheses from pyrimidines, and one consists of an enormous table of ionization constants and spectra. There is also an 80-page Appendix Table which "aims to be a complete alphabetical list of simple pteridines described up to the end of 1986". The remaining chapters take up pteridines according to the type of functional group present.

The author presents this work as a critical review, containing a large amount of detail so as to illustrate syntheses, properties, and reactions thoroughly but without including all relevant data. The result is an unusually readable and informative account of a complex subject, with a satisfyingly rich quantity of practical information. The observations in the primary literature are reported accurately, with such experimental detail as is needed to assess them properly, and the purposes and reasoning are also reported, along with additional insight and generalization where appropriate. The text is profusely augmented with tables and

carefully drawn structures, and the whole is thoroughly and professionally indexed. The references are collected at the end; there are 1761 citations. This work will undoubtedly stand as the definitive treatment of pteridines for a long time.

Dictionary of Antibiotics and Related Substances. Edited by B. W. Bycroft. Chapman and Hall: London and New York. 1988. xviii + 944 pp. \$675.00. ISBN 0-41225450-6.

The Dictionary of Organic Compounds (DOC), originated by Sir Ian Heilbron, has been an invaluable resource for many decades, and it would be hard to find an organic chemist who is not familiar with it. The publishers have expanded the concept, using the same format: short entries (mostly 5 to 10 to a page) containing name(s), structure, molecular formula, physical and biological properties, source, and key references. In the dictionary at hand, there are about 4000 entries, about a quarter of which derive from the DOC. The entries range from Aabomycin A to Zygosporin G. A name index is appended to make it possible to find a substance under alternative names. There is also a molecular formula index, a CAS Registry Number index, and an index of types of compounds. The forepages include a useful description of the main types of antibiotics. This is clearly a reference work that will be heavily consulted.

Comprehensive Organometallic Analysis. By T. R. Crompton (Northwest Water Authority, Warrington, England). Plenum Press: New York and London. 1987. xxv + 883 pp. \$129.50. ISBN 0-306-42593-9.

The author's intention is to provide a comprehensive review on this subject and he expresses the hope that the book will be source-book on all aspects of analysis of organometallic compounds. Compton's first series of books on this topic was written 16 years ago; since that time, he contends, numerous papers on applications of known methods have appeared, a high proportion on topics related to the environment. This has led to inclusion of a chapter on this topic; a new chapter is also included on the use of chelates of metals.

How well has Compton met his goal? The good news is that there are 3792 references, exceptional by any standard. For the most part, the book is organized to provide fairly easy access to the information, the nine chapters devoted to specific topics, with several further subdivided into techniques. For example, visible and ultraviolet spectroscopy are the subdivisions in Chapter 3 on spectroscopic techniques. Sections and/or subsections are then subdivided on the basis of elements, with the exception of Chapter 7 which is organized on the basis of procedure and subdivided based on ligand group. The index is quite small and not at all useful, duplicating for the most part the Table of Contents. It does not, for example, list the various places in the book where a given element is considered.

The bad news? Besides the poor index, there are five points to be expressed.

First, remarkably few new developments have occurred in this area in 16 years. A quick survey indicated that about 20% of the references are on work published after 1973. With a rather high proportion of recent references in the chapter on the environment (perhaps 65% of 700 references), the fraction of references from the last 16 years in the rest of the book is even lower than 20%. This book appears to be largely a reproduction of the previous version; one wonders whether the information is of as much interest to chemists in the field as was hoped.

Second, the author has been selective in the choice of elements covered in this book. Thirty-four elements are covered, including the distinctly non-metallic element phosphorus, which probably receives the lengthiest coverage of any element, and the metalloids. Over 30 metals, many with substantial organometallic chemistry, are not mentioned, including very obvious candidates such as gold and vanadium, and all of the lanthanides and actinides (for which most of the organometallic chemistry has occurred in the last 16 years). This is hardly a "comprehensive" book in its coverage.

Third, there must be doubts about the completeness of treatment of many common elements. As a single example, take the element manganese, for which thousands of organometallic compounds are known. References on this element are either to methylcyclopentadienylmanganese tricarbonyl or to several non-organometallic coordination compounds.

Fourth, some rather superfluous information is included. Why, for example, are references given to studies on the infrared spectra of ferrocenes? Similarly, miscellaneous references to NMR, ESR, mass spectrometry, and X-ray diffraction studies on these species are included; this information is largely irrelevant to the principal topic. If inclusion of this work is important, then one must point out that there is a massive amount of such information on all sorts of organometallic compounds which has not been included.

Fifth, there are some errors; the most striking is the omission of references 418-467.

Overall, it is difficult to be positive about this book. On one hand it provides easy reference to analysis of selected organometallic compounds and in emphasized material the book is quite good. It has been updated, but most of this material is in the last version. Finally, do not count on finding a complete coverage of a topic; and do not count on finding all the topics that the title implies are present.

Paul M. Treichel, Jr., *University of Wisconsin—Madison*

Chemiluminescence in Organic Chemistry. By K.-D. Gundermann (Technische Universität Clausthal) and F. McCapra (University of Sussex). Springer-Verlag: Berlin and New York. 1987. X + 217 pp. \$93.50. ISBN 0-387-17155-X.

This volume is an update and expansion of "Chemilumineszenz organischer Verbindungen" by K.-D. Gundermann (published in 1968). The current edition principally covers chemiluminescence in the liquid phase, although a few examples involving the solid state are cited. The chapter headings indicate the broad range of topics covered: General Concepts; Autoxidation Reactions; Chemiluminescent Peroxide Decompositions; Peroxide Decompositions, II: Dioxetanes; Peroxy Oxalate Chemiluminescence; Luminol and Related Compounds; Acridine Derivatives; Other Nitrogen-Containing Compounds-Imine Peroxides; Miscellaneous Compounds; Electron Transfer Chemiluminescence; Bioluminescence; Analytical Applications; Instrumentation; Chemiluminescent Demonstrations; Chemiluminescence in the Future.

The specific areas of chemiluminescence covered in this text appear to reflect the research interests of the authors. In the case of Professor Gundermann, in particular, that approach benefits the reader since he has included a large body of unpublished research on the chemiluminescence of luminol and related cyclic hydrozides. However, that approach also leads to the neglect of worthy topics such as the biochemical generation of excited states that result in work (photochemistry) rather than light emission (principally the work of Professor Cilento) and also what might be termed "photochemistry without light". The latter topic is only casually introduced on page 57 (without attribution). The slight coverage of Lophine chemiluminescence is also puzzling in view of the importance of that reaction in early establishing the role of dioxetanes in oxygen-dependent chemiluminescent reactions. The usefulness of this volume is also somewhat impaired by a modest number of errors in reference numbers and in drawings.

In balance, however, this volume represents a convenient source of an enormous amount of information on a wide variety of chemiluminescent reactions. The authors are to be congratulated for their efforts in drawing attention to interrelationships between the various known chemiluminescent reactions. Since no comparable coverage exists elsewhere, this volume is recommended to practitioners of the noble art of chemi- and bioluminescence and also to others interested in learning about the chemical generation of excited states.

Emil H. White, *The Johns Hopkins University*

Cellulose: Structure, Modification and Hydrolysis. Edited by R. A. Young (University of Wisconsin) and R. M. Rowell (USDA Forest Products Laboratory). John Wiley & Son: New York. 1986. xix + 379 pp. \$64.50. ISBN 0-471-82761-4.

The editors have brought together selected papers from the Anselme Payen Award Symposium honoring R. D. Preston, to whom the volume is dedicated, and a symposium on Cellulose and Cellulose Derivatives organized by the editors, both symposia held at the fall meeting of the ACS in 1982. Nevertheless, most manuscripts appear to have been submitted in late 1984 and 1985. The book is in four parts, entitled respectively: Structure and Biosynthesis, Cellulose Modification, Cellulose Liquid Crystals, and Cellulose Hydrolysis and Degradation.

The part on structure and biosynthesis begins with an interesting overview of Natural Celluloses by R. D. Preston, wherein he sets forth his perspective on native celluloses and touches some of the questions outstanding. Two other chapters on the primary cell wall and the biosynthesis of cell wall glucans round out the discussion of biosynthesis. The papers on diffractometrically determined structures review applications of traditional methods but do not deal with recent developments based on spectrometric observations. The final chapter in the first section, by R. A. Young, provides a discussion of structure from the perspective of those interested in its commercial utilization; it represents an interesting contrast with the overview provided in Chapter 1.

Part two, on cellulose modification, presents some novel approaches to preparation and characterization of well-known modifications. It includes chapters on cellulose carbamate, photografting, anionic grafting, and the characterization of cellulose ethers and concludes with an economic analysis of an "innovative process for cellulose acetate production." Part three consists of three chapters on liquid crystalline phenomena in

concentrated solutions of cellulose derivatives and includes chapters on characterization, structures and rheology.

Part four includes chapters on both acid and enzymatic hydrolysis of celluloses and lignocellulosic materials and concludes with a study of pyrolytic decomposition. The studies of hydrolysis include a comparison of the efficacy of different acids, a kinetic model for the saccharification of woody matter, and an analysis of a process based on the use of HF as the hydrolytic agent. The chapters on enzymatic hydrolysis include a discussion of factors influencing saccharification in a pilot scale study and a rather elegant electron microscopic study of the action of cellulases on cellulose microcrystals from *Valonia macrophysa*.

In summary, the book is a useful record of work presented at the symposia, as well as some extensions of it. As with all proceedings volumes, the adequacy of coverage is inverse to the scope defined by the title, which in the present instance is relatively broad.

Rajai H. Atalla, *The Institute of Paper Chemistry*

Studies in Surface Science and Catalysis. Volume 27. Catalytic Hydrogenation. Edited by L. Cervry (Prague Institute of Chemical Technology). Elsevier Science Publishers: Amsterdam and New York. 1986. XXV + 677 pp. \$118.00. ISBN 0-444-42682-5.

This volume (No. 27 in the series) presents the most up-to-date collection summarizing the state-of-the-art research in the field of catalytic hydrogenation. The 18 chapters in the text have been written by 36 experts who have summarized their specific areas of interest, containing published as well as unpublished results. Each author has written on his area of expertise in great detail and listed many references to which the reader can refer.

The most recent problems and research in catalytic hydrogenation are discussed by the various contributors. The text is divided into four parts: Part I, Kinetics and mechanisms of hydrogenation and hydrogenolytic reactions, Chapters 1-7; Part II, Heterogeneous hydrogenation catalysts. New aspects, Chapters 8-12; Part III, Advances in homogeneous hydrogenation, Chapters 13 and 14; and Part IV, Catalytic hydrogenation reactors and technologies, Chapters 15-18.

Chapter 1, Some Problems of Chemical Kinetics and Hydrogenolytic Reactions, discusses available data on the kinetics and related problems to catalytic hydrogenation of organic compounds.

Chapter 2, Synergy in Catalytic Reactions Involving Hydrogen: Possible Role of Surface-Mobile Species, presents the evidence for the role played by surface-mobile hydrogen in heterogeneous catalysis reactions where synergy occurs.

Chapter 3, Adsorption and Hydrogenation of Carbonyl and Related Compounds on Transition Metal Catalysts, mainly discusses transition metal catalyzed hydrogenation of compounds isolated as carbonyl functions.

Chapter 4, Hydrogenation of Nitriles, summarizes the hydrogenation of nitriles in the liquid state.

Chapter 5, Hydrogenolysis of C-C Bonds on Platinum-Based Bimetallic Catalysts, deals with reactions of saturated hydrocarbons on these catalysts.

Chapter 6, Hydrogenative Denitrogenation of Model Compounds as Related to the Refining of Liquid Fuels, discusses this topic in detail.

Chapter 7, Effect of Catalyst Composition on Reaction Networks in Hydrodesulphurization, summarizes the literature data on the influence of catalyst composition on the product distribution in the hydrodesulphurization of model sulphur compounds.

Chapter 8, Carrier Effect on Hydrogenation Properties of Metals, discusses some data on hydrogenation of linear hydrocarbons, aromatic compounds, etc., and the interpretation of the role of the support in catalytic-activity.

Chapter 9, Role of Bimetallic Catalysts in Catalytic Hydrogenation and Hydrogenolysis, discusses the effect of size, dispersion, nature of adsorbed hydrogen, metal-support interaction, and other factors on the behavior of bimetallic catalysts in hydrocarbon transformations.

Chapter 10, Supported Mono- and Bimetallic Catalysts in Hydrocarbon Conversions, elucidates the relationship between the structure and catalytic properties of these catalysts in hydrocarbon conversions.

Chapter 11, Supported Bimetallic Catalysts Prepared by Controlled Surface Reactions, discusses these reactions and that these catalysts possess unique properties in hydrocarbon conversion and in the hydrogenation of organic compounds.

Chapter 12, New Supported Metallic Nickel Systems, reviews the data and the characterization and use of these catalysts.

Chapter 13, Supported Metal Complexes as Hydrogenation Catalysts, analyzes the results of the anchoring of metal complexes in the preparation of hydrogenation catalysts.

Chapter 14, Supported Asymmetric Hydrogenation Catalysts, discusses the use of these catalysts attached to organic polymers and inorganic supports in hydrogenation reactions.

Chapter 15, *Liquid Phase Hydrogenation: The Role of Mass and Heat Transfer in Slurry Reactors*, treats the subject in terms of Langmuir-Hinshelwood type kinetic behavior.

In Chapter 16, *Application of Fixed-Bed Reactors to Liquid-Phase Hydrogenation* is discussed.

In Chapter 17, *Control of Hydrogenation Autoclaves* is discussed with emphasis on the design of control systems for small plants.

Chapter 18, *Selective Hydrogenation Applied to the Refining of Petrochemical Raw Products Produced by Steam Cracking*, deals with the technological aspects of the process.

The text is well-written and provides information that will be most valuable to researchers in the field and to any interested person concerned with homogeneous and heterogeneous catalysis, such as petrochemists and chemical engineers. The editor has selected a variety of topics submitted by the contributors which provides the reader with a thorough and current review of the field of catalytic hydrogenation.

Reuben L. Baumgarten, *Lehman College*

Computer-Enhanced Analytical Spectroscopy. Edited by Henk L. C. Meuzelaar (The University of Utah) and Thomas L. Isenhour (Utah State University). Plenum Press: New York and London. 1987. ix + 272 pp. \$52.50. ISBN 0-306-42644-7.

I like this book. This is the sort of book of which we need more, one with a clear purpose and one that comes very near achieving it. The book arises from the "First Hidden Peak" symposium and attempts to provide an overview of recent advances in computerized optimization, data exploration and spectral interpretation in a variety of spectroscopic areas. In general these attempts are successful in that the authors do cover a wide range of topics at a level that should be comfortable for any practicing spectroscopist. Indeed, the book can give a spectroscopist a good sense of how many of the ideas matured (particularly in IR interpretation) via two chapters (1 and 9). The area of computerized methods in mass spectrometry is rather neglected in this book but that is by the editors' design and the decision has made the book manageable in size.

This is, I think, a very good book as an introduction to the problems of designing (and by the same token buying) a computerized system for the interpretation of spectra. I would recommend it, for example, to anyone buying for the first time a FT/IR spectrometer as an introduction to the topics of data analysis that will be encountered in such a purchase. Students who are just beginning to work in laboratories where such systems are used or are being developed should also profit from the book, but it is certainly not a "text" on the subject of data analysis or automated analysis. One note of caution—a series of editing lapses in Chapter 11 make the chapter a bit hard to read even though it is the one chapter that I felt was not as complete in coverage as it should have been for the goals of this book.

Eric Enwall, *University of Oklahoma*

Food Irradiation. By W. M. Urbain (Michigan State University). Academic Press: Orlando, FL. 1986. xv + 351 pp. \$59.50. ISBN 0-12-709270-2.

The book is an excellent source of information on food irradiation. It would be adequate as a textbook for an undergraduate, and possibly a graduate course, and also as a reference for persons working in industry in food irradiation.

The book has many strong points. Chapter 1 ("Ionizing Radiation") covers the most important concepts of radiation physics in considerable depth. The same is true of Chapter 3 ("Radiation Chemistry of Food Components and of Foods"). This chapter presents a broad and thorough review of the effects of ionizing radiations on food components (carbohydrates, lipids, proteins, and vitamins) and on general food groups (meats and poultry, marine products, etc.). Chapter 4 ("Biological Effects of Ionizing Radiation") is as thorough as Chapter 3 and covers the effects of radiation on all types of biological food components (e.g., viruses, bacteria, yeasts, molds, parasites, and insects) as well as on plant foods. This chapter is especially valuable because it contains a table of the D_{10} (decimal reduction dose) for many organisms in different media. The discussion of factors that affect the radiation sensitivity of microorganisms (e.g., water content, pH, oxygen, temperature, etc.), also included in this chapter, is well presented.

Chapters 6 through 10 ("Meats and Poultry", "Marine and Freshwater Animal Foods", "Fruits, Vegetables and Nuts", "Cereal Grains, Legumes, Baked Goods and Dry Food Substances", and "Miscellaneous Foods") are the applications chapters of the book. These contain up-to-date information that can be used directly in industrial practice. As is the case with the previous chapters, the material presented in these chapters is very well organized. The reader can study the applications of ionizing radiations to each food group, in the different existing modes: radappertization (radiation sterilization); radurization (radiation pasteurization); radicidation (destruction of pathogenic non-spore forming

bacteria by irradiation); inhibition of sprouting and delay of ripening and senescence in fresh fruits and vegetables; decontamination (reduction of the bacterial load of foods with the purpose of rendering them more hygienic); and insect disinfection.

Chapters 14 ("Government Regulation of Irradiated Foods") and 15 ("Commercial Aspects") are also good chapters. Chapter 14 contains a summary of all existing legislation concerning irradiated foods in the U.S. (Food and Drug Administration) and abroad (World Health Organization and Codex Alimentarius Commission). Chapter 15 presents useful and practical information on the economics of food irradiation, as well as on the different types of food irradiation equipment currently being utilized (machine sources and radionuclide sources).

Some of the weaker chapters in the book are 2 ("Radiation Chemistry Basics"), 5 ("General Effects of Ionizing Radiation on Foods"), 11 ("Combination Processes"), 12 ("Packaging"), and 13 ("Wholesomeness of Irradiated Foods"). In the opinion of the reviewer, these chapters are rather shallow and lacking in important information.

There are a number of points that the reviewer would have liked to see mentioned in a book on "Food Irradiation" but which were either not covered in this volume or else were covered only to a limited extent. These include more discussion of the direct and indirect effects of radiation on matter; radioprotectors and radiosensitizers; a deeper and more thorough discussion of the concept of "radiation dose", including physical meaning of "dose" (i.e., amount of energy absorbed by one gram of matter), different terms which are being used or have been used for measuring dose (i.e., roentgen, rem, rep, rad, and gray), differentiation between specific inactivation dose D_0 (based on natural logarithms), and decimal reduction dose D_{10} (based on common logarithms); equation for induced radioactivity in foods; a more thorough discussion of the combined effects of heat and irradiation; there are many references in the scientific literature pertaining to this topic, but the results of only a few are mentioned in Chapter 11; effects of ionizing radiation on enzymes (it is known that enzymes are more resistant to radiation than microbes, and this has posed a problem in the case of radiation sterilization of foods); and a discussion of the relative costs (capital investment and operating costs) for the different types of food irradiation equipment described in Chapter 15. Finally, a complete chapter on "Radiological Safety", including physiological effects of radiation and radiation monitoring of personnel, would have been highly desirable, but was lacking; instead, a brief section entitled "Protection of Personnel" was included in Chapter 15.

Summarizing, the book is well written and very well organized and has a thorough coverage of material in most chapters. It contains valuable theoretical and practical information that can be applied as much in industrial practice as in academic and industrial research. It would be of much value to persons working in the field of food irradiation, be they in industry or in academia.

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Volumes of Proceedings

Bacterial Protein Toxins: Third European Workshop Überlingen. Edited by F. J. Fehrenbach, J. E. Alouf, P. Falmagne, W. Goebel, J. Jeljaszewicz, D. Jürgens, and R. Rappuoli. Gustav Fischer: Stuttgart and New York. 1988. xii + 459 pp. \$100.00. ISBN 0-89574-260-8.

This book gathers together the large number of papers, in typescript form, that were presented at the Third European Workshop on the title subject, held in the Federal Republic of Germany in 1987. They are grouped under seven headings: Molecular Architecture of Toxins in Relation to Function; Toxin Cell Surface Interaction; Toxin Secretion and Internalization; Genetic Aspects of Toxinogenesis; Toxin-Lipid Interaction; Toxins as Virulence Factors; and Applied Toxinology. The subject index occupies 10 pages, but it is actually rather short, for it is double-spaced and typed one column to a page.

Dynamical Phenomena at Surfaces, Interfaces and Superlattices. Edited by F. Nizzoli, K. H. Rieder, and R. F. Willis. Springer-Verlag: Berlin and New York. 1985. xiii + 329 pp. \$29.50. ISBN 3-540-15505-8.

The 22 typescript papers in this volume are reviews that constituted an International Summer School held in Italy in 1984. They are grouped under six headings: Structure; Lattice Dynamics; Phase Transitions; Electronic States; Optical Properties; and Magnetic Properties. Not indexed.

Advances in Biomedical Polymers. Edited by Charles G. Gebelein. Plenum Press: New York and London. 1987. ix + 405 pp. \$75.00. ISBN 0-306-42467-3.

The ACS Division of Polymeric Materials sponsored the symposium, held in 1985, that produced the 33 typescript papers in this volume. They are essentially reports of original research on applications of both natural and synthetic polymers to a wide range of medical problems. A subject index of 5 pages is included.

Chemical Aspects of Food Enzymes. Special Publication No. 63. Edited by A. T. Andrews. Royal Society of Chemistry: London. 1987. viii + 318 pp. \$37.50. ISBN 0-85186-686-7.

This book contains 17 typescript papers of a review nature, given at a symposium held at the University of Reading in 1986. The subjects range from structure and genetic engineering to various applications and methods. A 4-page subject index is included.

Preconcentration and Drying of Food Materials. Process Technology Proceedings 5. Edited by S. Bruin. Elsevier Science Publishers: Amsterdam and New York. 1988. xii + 353 pp. \$102.75. ISBN 0-444-42968-9.

A symposium in memoriam of the late Professor H. A. C. Thÿssen was held in Eindhoven in 1987. The papers and poster presentations will be primarily of interest to chemical engineers. Not indexed.

Transposition. Edited by A. J. Kingsman, K. F. Chater, and S. M. Kingsman. Cambridge University Press: Cambridge and New York. 1988. xv + 375 pp. ISBN 0-521-35464-1.

The 43rd symposium of the Society for General Microbiology was held at the University of Warwick in April, 1988, and gave rise to this remarkably prompt volume of 16 papers and an introduction. They are grouped under the headings Prokaryotic Systems and Eukaryotic Systems; the index is substantial.

Biophysical Studies of Retinal Proteins. Edited by Thomas G. Ebrey, Hans Frauenfelder, Barry Honig, and Koji Nakanishi. University of Illinois Press: Champaign, IL. 1988. xxi + 304 pp. \$24.95. ISBN 0-252-01528-2.

A conference was held at the University of Illinois at an undisclosed date to honor the memory of the late Laura Eisenstein. It includes both a biography and a bibliography and 39 papers, the first of which is a review of the studies of retinal proteins by FTIR carried out by Laura Eisenstein in 1981-1985. Not indexed.

Permanent and Transient Networks. Volume 75. Edited by M. Pietralla and H.-G. Kilian. Springer-Verlag: New York (Steinkopff Verlag: Darmstadt). 1987. vi + 248 pp. \$72.00. ISBN 0-387-91310.

This volume of the series "Progress in Colloid & Polymer Science" contains papers from a conference held in Swabia in 1986. They are set in type and are grouped under the headings Permanent Networks, Transient Networks, and Networks and Theory. A subject index of 1 page is included.

Electrochemistry, Sensors and Analysis. Analytical Chemistry Symposia Series. Volume 25. Edited by Malcolm R. Smyth and Johannes G. Vos. Elsevier Science Publishers: Amsterdam and New York. 1986. xviii + 420 pp. \$118.00. ISBN 0-444-42719-8.

This volume contains the typescripts of papers presented at a conference "Electroanalysis na h'Eireann", held in Dublin in 1986. The papers, none of which is in Erse, are grouped under four headings: Analytical Voltammetry; Analytical Potentiometry; Bioelectrochemistry; and Modified Electrodes and Sensors. Not indexed.

Algal Biofouling. Studies in Environmental Science. 28. Edited by L. V. Evans and K. D. Hoagland. Elsevier Science Publishers: Amsterdam and New York. 1986. ix + 318 pp. \$84.50. ISBN 0-444-42705-8.

Contains 18 typescript papers from a symposium held at the University of Florida in 1985 and a 6-page index.

Chemistry and Fate of Organophosphorus Compounds. Current Topics in Environmental and Toxicological Chemistry. Volume 12. Edited by E. Merian, R. W. Frei, J. F. Lawrence, and U. A. Th. Brinkman. Gordon and Breach Science Publishers: New York and London. 1987. xviii + 209 pp. \$43.00. ISBN 2-88124-215-4.

The papers in this volume are reprinted from the *International Journal of Environmental Analytical Chemistry* and the *Journal of Toxicological and Environmental Chemistry*. They originated in the Workshop on Chemistry and Fate of Organophosphorus Compounds, held in Amsterdam in 1986. A very short subject index completes the volume.

Industrial Polysaccharides. Genetic Engineering, Structure/Property Relations Applications. Edited by Manssur Yalpani. Elsevier Science Publishers: Amsterdam and New York. 1988. 856 pp. \$289.50. ISBN 0-444-42944-1.

A symposium on Applications and Modifications of Industrial Polysaccharides was held as part of the 193rd National Meeting of the ACS in Denver in 1987. The typescript papers are arranged in five parts: Genetic Engineering and Enzymatic Modifications; Chemical Modifications; Structure/Property Relations; Characterization; and Novel Applications. A 6-page subject index is included.

Vibrations at Surfaces. 1987. Edited by A. M. Bradshaw and H. Conrad. Elsevier Science Publishers: Amsterdam and New York. 1988. 856 pp. \$289.50. ISBN 0-444-42944-1.

This is a reprint from the *Journal of Electron Spectroscopy and Related Phenomena*, Volumes 44 and 45, and constitutes the proceedings

of the Fifth International Conference, held in Germany in 1987. Not indexed.

Flavour Science and Technology. Edited by M. Martens, G. A. Dalen, and H. Russwurm, Jr. John Wiley & Sons: Chichester and New York. 1987. xvi + 566 pp. \$85.00. ISBN 0-471-91743-5.

The large number of papers in intriguingly varied typescripts in this volume are arranged in four "chapters": Chemistry in Flavour Research; Biotechnology in Flavour Research; Sensory Science in Flavour Research; and Data Analysis in Flavour Research. One learns about the aroma of cherry juice, the formation of pyrazines in foods, the perception of flavor, and even the arcane language for describing wine—truly a mouth-watering collection of topics. There is a subject index, but it is shorter than the table of contents.

Physical Properties of Foods. 2. Edited by Ronald Jowitt, Felix Escher, Michael Kent, Brian McKenna, and Michel Roques. Elsevier Applied Science Publishers: London and New York. 1987. xviii + 564 pp. \$137.00. ISBN 1-85166-124-7.

The 47 papers in this volume make up the proceedings of the "COST 90 bis" seminar held in Zurich at an unspecified (or cunningly hidden) date. The papers are set in type, and there is a substantial index.

Perinatal Nutrition. Edited by B. S. Lindblad. Academic Press: San Diego and New York. 1988. xxvi + 394 pp. \$65.00. ISBN 0-12-450285-7.

This volume contains the papers presented at the Sixth Annual Bristol-Myers Symposium on Nutrition Research, held in Sweden in 1986. The emphasis is on the clinical biochemistry of the subject, which is interpreted to include newborn and pre-term infants as well as fetuses. Set in type and indexed.

Polymer Surface Dynamics. Edited by J. D. Andrade. Plenum Press: New York and London. 1988. vii + 182 pp. \$49.50. ISBN 0-306-42788-5.

As part of the Rocky Mountain Regional Meeting of the ACS in 1986, a symposium on the title subject was held. The 12 papers in typescript found in this volume are essential reports of original research and include experimental procedures. There is a brief index.

Bioelectrochemistry. II. Membrane Phenomena. Edited by G. Milazzo and M. Blank. Plenum Press: New York and London. 1987. xii + 543 pp. \$97.50. ISBN 0-306-42765-6.

The "Thirteenth Course of the International School of Biophysics" was the source of the 19 "lectures" and the opening address that make up this typeset volume. It contains as well a 4-page glossary of symbols and acronyms, a 7-page list of participants, a subject index of equal length, and, after each chapter, a transcript of questions and answers from the ensuing discussion.

Unusual DNA Structures. Edited by R. D. Wells and S. C. Harvey. 1988. Springer-Verlag: New York and Berlin. xvi + 311 pp. \$39.00. ISBN 0-387-96631-5.

The First Gulf Shores Symposium, held in Alabama in 1987, produced the 18 typescript papers in this volume. The stated purpose was to enhance "our understanding of the biology and chemistry of these important structural features". The modest index suffers from the fact that it is not constructed in the conventional manner with inverted phrases. For example, "site-specific binding of RNA polymerase" is indexed only under "site", with no listing under "RNA" or "polymerase".

On Conceptual Modelling. Perspectives from Artificial Intelligence, Databases, and Programming Languages. Springer-Verlag: New York and Berlin. 1984. xi + 510 pp. \$34.00. ISBN 0-387-90842-0.

The symposium of which this book is the proceedings took place in 1982 in New Hampshire. The term "conceptual modelling" is used to encompass the three areas of artificial intelligence, databases, and programming languages. Nineteen papers, set in type and indexed, are included.

F.E.C.S. International Conference on Circular Dichroism. Edited by the Bulgarian Academy Sciences. VCH Publishers, Inc.: New York. 1987. vii + 442 pp. \$60.00. ISBN 0-89573-9.

This soft-bound volume of typescript papers includes the texts of 16 plenary lectures, 19 short papers, and a group of "late papers", all from a conference held in Sofia in 1985. Not indexed.

Organic Synthesis: Modern Trends. Edited by Oleg Chizhov. Blackwell Scientific Publications, Inc.: Oxford and Palo Alto. 1987. vii + 327 pp. \$58.50. ISBN 0-632-02014-8.

The IUPAC Symposium on the title subject was held in Moscow in 1986. The 28 typescript papers in this volume are preponderantly by chemists from the East Bloc nations, but the authors range across the world, from the USA to Japan. The preface states that there were actually 10 plenary lectures and 20 invited lectures, plus 700(!) poster presentations. Not indexed.