Book Reviews

Conformational Motion and Disorder in Low and High Molecular Mass Crystals. Advances in Polymer Science 87. By B. Wunderlich (University of Tennessee) et al. Springer-Verlag: Berlin, and New York. 1988. 137 pp. $71.50. ISBN 0-387-18976-9.

For some low-molecular mass and polymeric molecules, several phases intermediate between the crystal and isotropic melt states exist (with first-order thermodynamic transitions separating such phases). Plastic crystals (with positional order but orientational disorder) and liquid crystals (with positional disorder but some orientational order) have been widely discussed. Prof. Wunderlich distinguishes from these two cases *con*formationally *dis*ordered crystals (condis crystals) having positional and orientational order. An example that has been known for over 50 years is the hexagonal "rotor phase" for *n*-paraffins in a narrow temperature range below the transition to the isotropic melt. Many other examples exist.

Following the introduction and discussion of the thermodynamics of conformational isomerism, the authors discuss many cases (424 references) of low-molecular mass as well as flexible and rigid macromolecular condis crystals. With intensive interest in polymeric liquid crystals in the past decade, a chapter on the relationship between condis crystals and liquid crystals is valuable.

Prof. Wunderlich is internationally respected for his studies on the thermodynamics of polymeric materials. Many figures are reproduced in the monograph (which is number 87 in the Advances in Polymer Science Series). This book will be especially welcomed by those interested in the organization of macromolecules.

Stuart B. Clough, *University of Lowell*

Annual Review of Biophysics and Biophysical Chemistry. Volume 17. Edited by Donald M. Engelman (Yale University) et al. Annual Reviews: Palo Alto, CA. 1988. x + 592 pp. $49.00. ISBN 0-8243-1817-X.

This book continues the series of moderately priced collections of review articles on topics in biophysics and biophysical chemistry. It contains 23 articles of approximately equal length by experts in the respective areas. The range of topics is very broad, and in general the authors provide readable introductions and place the work in context. As with *Annual Review* volumes in other areas of science, the essays in this book are good starting points for students desiring state-of-the-art introductions to active research areas. The editors have provided a reasonable balance between modeling of biological systems and methods of measurement. Of course, primary problems such as the prediction of structure from sequence, regulation of gene expression, and the folding of DNA recur in various articles.

The table of contents of this volume would reveal more about its scope than is possible in this brief review. Perhaps I can indicate its flavor by mentioning a few randomly selected articles. The following abbreviated titles represent about one-third of the book: water and nucleic acid structure (Westhof); RNA structure prediction (Turner, Sugimoto, and Freier); sensory rhodopsins (Spudich and Bogomolni); pulsed field gel electrophoresis (Cantor, Smith, and Mathew); cellular mechanics and cytoplasm structure and function (Elson); genetic studies of protein structure and folding (Goldenberg); and DNA packing (Day, Marzec, Reisberg, and Casadevall). This volume and indeed the entire series are valuable resources for anyone attempting to keep up with major thrusts in this diffuse area.

Charles S. Johnson, Jr., *University of North Carolina*

Introduction to NMR Spectroscopy. By R. J. Abraham (University of Liverpool) et al. John Wiley and Sons: Chicester and New York. 1988. xiii + 271 pp. $44.95. ISBN 0-471-91893-8.

This is an updated version of *Proton and Carbon-13 NMR Spectroscopy*: (1978) by two of the authors (R. J. Abraham and P. Loftus). Although the present title does not imply it, this edition is essentially a treatise of proton and carbon-13 NMR. The first three chapters develop the basic concepts in NMR. Chapter 1 deals with the basic physical principles, chapter 2 with the chemical shift phenomenon, and chapter 3 with spin–spin coupling ($^3J_{HH}$, $^2J_{HH}$, $^1J_{CH}$, $^1J_{CC}$, $^2J_{CH}$, $^3J_{CH}$, $^2J_{CC}$, and $^3J_{CC}$). Chapter 4 presents the analysis of NMR spectra. The distinction between chemical and magnetic equivalence of nuclei is clearly illustrated but the relation between molecular symmetry elements and NMR spectra is missing, e.g., enantiotopic and diastereotopic nuclei are not mentioned. The NMR spectra resulting from interaction of two or three nuclei (AB, ABC, AB_2, and ABX spectra) are derived in detail by solving the Hamiltonian. Pulsed Fourier transform is introduced in chapter 5, followed by a discussion of double resonance techniques including INDOR, NOE, and gated decoupling in chapter 6. This chapter also contains—somewhat late—relaxation mechanisms and the measurement of T_1 and T_2. Multipulse NMR and 2D methods are illustrated in chapter 7. The SEFT experiment, *J*-resolved spectroscopy, HOMCOR (COSY), and HETCOR as well as the NOESY experiment are presented in sufficient detail to allow for a basic understanding of these techniques and their importance in structure work. The last chapter discusses a number of applications, among others assignment techniques, rate processes (DNMR), lanthanide shift reagents, CPMAS for solids, and NMR applications in biochemistry and biology (elucidation of biosynthetic pathways and of the structure and function of biologically important molecules as well as magnetic resonance imaging). The book ends with nine problems, eight of which are analyses and assignments of one- and two-dimensional spectra. The reviewer feels that this type of book could use a much larger number of problems including more NMR theoretical questions. The index appears to be adequate. There are no numbered references but at the end of each chapter "recommended readings" are listed. Some of these are not very recent; e.g., on page 33, the Breitmaier (first) edition of 1974 is listed, while this book is presently already in its third edition (1987), and on page 58/59 most references are from the 1960s and 1970s. The book has also been published as a paper edition, ISBN 0-471-91894-6.

I recommend this book to senior undergraduates or beginning graduate students who want to familiarize themselves with modern proton and carbon-13 NMR.

Ulrich Hollstein, *University of New Mexico*

Photoinduced Electron Transfer. Parts A–D. Edited by M. A. Fox (The University of Texas at Austin) and M. Chanon (Université d'Aix-Marseille). Elsevier: Amsterdam and New York. 1988. Part A, Conceptual Basis: xviii + 640 pp. $189.50. ISBN 0-444-87122-5. Part B, Experimental Techniques and Medium Effects: xviii + 748 pp. $215.75. ISBN 0-444-87123-3. Part C, Photoinduced Electron Transfer Reactions—Organic Substrates: xviii + 754 pp. $215.75. ISBN 0-444-87124-1. Part D, Photoinduced Electron Transfer Reactions—Inorganic Substrates and Applications: xviii + 790 pp. $223.75. ISBN 0-444-87125-X. Set: $710.50. ISBN 0-444-87121-7.

This four-volume set is divided into several sections. Part A covers primarily theoretical considerations. There are 11 chapters in this volume. The one entitled Theoretical Treatments of Solvent Effects by D. F. Calef is particularly up-to-date and informative. The introduction, by Chanon, Hawley, and Fox, provides an excellent and very readable account of thermodynamic and kinetic considerations with much practical information on reduction potentials, electron affinities, etc. being presented. Part B deals with experimental techniques and medium effects. Essays are included on membrane mimetic systems as well as on photoinduced electron transfers at interfaces and in polyelectrolytes. Part C examines photoinduced electron-transfer reactions on organic substrates, including those with carbon–carbon multiple bonds, strained hydrocarbons, aromatics, heteroaromatics, aromatic carbonyls, iminium cations, amines, thiols, thioethers, dyes, metal complexes, flavins, and deazaflavins as well as NAD(P)H, $NAD(P)^+$, and their analogues. Part D covers reactions of inorganic compounds, including such topics as photoinduced electron transfers involved in the activation of oxygen, in dioxygen–transition metal complexes, in hexacoordinate inorganic complexes, in ion-pairs and supramolecular systems, in intramolecular electron transfer between weakly coupled redox centers, and in organometallic complexes. This last volume also contains essays on photocatalysis on semiconductors, artificial photosynthesis, solar energy, polymerizations by photochemical electron transfer, information management and storage, and microlithography. An especially interesting chapter on drug-induced photosensitization processes is also included. Practitioners of the art of electron transfer chemistry by photoinduction may be found in almost every research organization. The ubiquity of these reactions in chemistry and biology has guaranteed that almost every imaginable technique has been applied to their study by scientists coming from many diverse backgrounds. The authors of each chapter have in general managed to convey their message in language simple enough to be understood by the scientifically literate nonspecialist, yet the work is sufficiently up-to-date (many 1987 references) to be useful to the specialist.

This work is a monumental effort which is very well done. The indices are extensive and useful. Each volume has a subject index, a chemical index, and an author index. The final volume, part D, has cumulative indices covering all three areas. I did not detect any serious errors. Most chapters are visually pleasing. However, there are some instances of text, figures, and chemical structures which are too small to be read easily. Most distracting, however, are the Greek letters inserted by hand in a few papers. Although legible, they do detract from the otherwise very professional appearance of the books. These volumes clearly belong in every serious chemistry library as a reference resource. In addition, selected volumes may be usefully purchased by the specialist, and part A may serve as an excellent introductory text for a chemist interested in entering the field.

Nita A. Lewis, *University of Miami*

Effets de sels en chimie organique et organométallique. By A. Loupy and B. Tchoubar (Centre National de la Recherche Scientifique). Dunod: Paris. 1988. xiii + 311 pp. ISBN 2-04-016986-5.

The authors describe many of the diverse aspects of the "salt effect" in organic and organometallic chemistry. The addition of an apparently inert salt to two reaction partners can strongly influence the chemo-, regio-, and stereoselective outcome of the reaction by either specific interactions of its cation or its anion with the substrates. After an introductory chapter describing the various possible interactions between salts and organic molecules, the authors discuss, via a mechanistic approach, the salt effect in substitution reactions. The second chapter includes some recent developments and gives a very complete picture (257 references). Salt effects are also observed in addition reactions, and these are described in chapter 3 (203 references). The same mechanistic arguments are used again in this chapter and give the reader an easy overview of the many reactions presented. Very useful for synthesis-oriented chemists are chapters 4 and 5 (187 and 278 references), which deal with the effects of salts on the regio- and stereoselectivity of organic reactions. A very interesting discussion showing how the addition of salts can influence the degree of retention in substitution reactions on carbon, silicon, germanium, and phosphorus is given. After a short chapter treating the effect of salts on thermodynamic parameters such as equilibrium constants (57 references), the authors describe in the final chapter the "salt effect" on several organometallic reactions (209 references). The first part presents the influence of the presence of salts on the structure and the reactivity of main-group organometallics (Li, Mg), while the second part is directed more toward transition metal complexes of copper, rhodium, and iron. The authors conclude the book with an appendix, briefly describing basic concepts used throughout the book such as acidity, hard and soft acids and bases, the Klopman equation, the 18-electron rule, etc. and with an addendum to the previous chapters, which gives relevant references of the recent literature (1986–1988). The book is written in a very pedagogical fashion, and the considerable amount of material presented as well as the interesting mechanistic approach used make it extremely useful for graduate students and researchers dealing with synthetic organic and organometallic chemistry. Unfortunately, the book is written in French, which will certainly limit its use.

Paul Knochel, *The University of Michigan*

Dictionary of Alkaloids. By I. W. Southon and J. Buckingham. Chapman and Hall: London and New York. 1989. Main volume, xlvi + 1161 pp. Indexes, 620 pp. $1295.00. ISBN 4-12-24910-3.

Ten thousand alkaloids (give or take a few) had been isolated by 1988, and structures have been determined for the great majority. The pharmacological actions of some of them on humans have been known since before the writing of history, and many are used extensively in medicine. Alkaloids are important in new fields of science as well; they play major parts in vascular and neurophysiology, oncology, cell biology, and chemical ecology. Furthermore, the roles of some in the alteration of consciousness states or as substances of abuse are matters of social concern.

Chemists have been well served for reviews in the alkaloid field by the Manske Series, now running to 34 volumes and presently edited by Dr. Arnold Brossi; but a need has long been felt for a new comprehensive dictionary to take the place of R. F. Raffauf's small but valuable compilation of 1969. The recent explosive growth in alkaloid research has made this need even more acute; I am pleased to say that Southon and Buckingham's *Dictionary* fills it admirably.

The dictionary has an entry for each alkaloid known up to the end of 1987, listing for each compound the name(s), stereostructure, formula, physical properties, derivatives, physiological activities, toxicological data, and key references (isolation, structure determination, stereochemistry, synthesis, biosynthesis, biological activity). Access to the entries is possible from five indexes—name, molecular formula, CAS registry number, type of alkaloid (a broad classification is employed here), and biological species of origin. Toxicological references are provided to the NIOSH Registry of Toxic Effects of Chemical Substances and other sources. The "Heilbron" format makes the dictionary easy to consult and interesting to browse through as well as to use for specific study. Looking through tne entries for alkaloids well known to me, I found listings up-to-date and accurate, with clearly drawn structures, and with references chosen to enable one to gain access quickly to the key papers. A very large amount of guideline information is assembled on each page, yet the format appears open and user friendly. This dictionary is clearly the place to start if one wishes to embark on an alkaloid literature search.

This book will be essential in the libraries of teaching and research institutions working in organic chemistry, physiology, biochemistry, pharmacology, pathology, and general medicine. It will be the "Dictionary of Organic Compounds" of the alkaloid field and will amply return its cost. The intended publication of supplements should ensure the series' continuing value.

Philip W. Le Quesne, *Northeastern University*

An Introduction to Solid State Diffusion. By R. J. Borg (Lawrence Livermore National Laboratory) and G. J. Dienes (Brookhaven National Laboratory). Academic: San Diego and New York. 1988. xvi + 360 pp. $49.50. ISBN 0-12-118425-0.

The shelf of books on diffusion in solids is not very well stocked despite the obvious importance of the subject to solid-state chemistry, materials science, and geochemistry as well as other disciplines. For an introduction to the subject one had to refer students to Shewmon's excellent *Diffusion in Solids*, which is now 25 years old. For these reasons the present book is a very welcome addition to the scene. Its stated goal is to serve as a textbook for senior undergraduates or beginning graduate students, and on the whole it should serve that function admirably.

There is a strong emphasis on atomic mechanisms of diffusion, so that one finds good accounts of such topics as correlation and isotope effects. Diffusion in different types of materials (metals, insulators, and semiconductors) is illustrated with generally well-chosen examples. Good chapters are also included on experimental methods of studying diffusion and on defect reactions.

Those privileged to teach solid-state chemistry will perhaps be disappointed not to find more on solid-state reactions and electrochemistry. However, it will be found that the present book will serve as a good complement to Schmalzried's *Solid State Reactions*, which covers these topics more fully.

I do have minor criticisms: the Kröger–Vink conventions for treating defects are now the de facto standard, and despite whatever shortcomings they may have, it is important to use conventions consistently. The authors do not always do this. Thus, in discussing defects in $Fe_{1-x}O$ (in the chapter on diffusion in ionic crystals) they do not use *effective* charges for defects (perhaps it is for this reason the electrical neutrality condition is incorrectly stated). However, the convention is changed without comment for the discussion of diffusion in $Ni_{1-x}O$ (in the chapter on diffusion in semiconductors). There are also some depressing errors, notably in the introductory chapter, that could well leave the independent student permanently confused on some important points.

Despite these minor shortcomings, the book fills a very real need, and I predict that it will have a long and happy life.

Michael O'Keeffe, *Arizona State University*

Intermolecular Complexes. Studies in Physical and Theoretical Chemistry 52. By P. Hobza (Institute of Hygiene and Epidemiology, Prague) and R. Zahradnik (J. Heyrovsky Institute of Physical Chemistry and Electrochemistry, Prague). Elsevier: New York and Amsterdam. 1988. xii + 295 pp. $129.00. ISBN 0-444-98943-9.

This is a well-written survey of contemporary studies of weak intermolecular complexes of the van der Waals variety, which for the authors includes hydrogen-bonded systems. It was written "in an attempt to simplify orientation for the reader in the whole field of intermolecular interactions" from both theoretical and experimental perspectives, and including both chemical and biological applications. It succeeds in providing a reasonably detailed framework that a new student to the field would find informative and useful as a reference.

The text suffers from two important defects, however—a lack of timeliness and a lack of balance. While it may be an updated introduction to the field, the literature survey ended in 1984, fully 4 years prior to publication. One expects certain delays in this business, even with the need for translation as was the case here. But a 4-year delay in a field as rapidly developing as this one seems excessive. This is perhaps not a serious defect in an "orientational" type of book, but the reader should not forget that it is not completely comprehensive. For instance, enough experience has been gained in the past 4 years to show that unless *diffuse* functions (which the authors do not carefully delineate from

Table I

chapter	subject	pages	% pages	% ref (1980s)	% ref (pre-1980s)
1	intro	14	5.8	1.0	1.7
2	theor methods	98	40.5	11.6	16.5
3	exptl methods	13	5.4	6.7	8.3
4	chem applns	47	19.4	7.9	15.1
5	biol applns	70	28.9	17.1	13.8
	totals	242	100	44.3	55.5

"polarization" functions) are included in nearly all basis sets, electron correlation energies can not be reliably calculated. Thus, their inclusion is a necessity and not merely an option, even for hydrogen-bonded systems.

A more serious problem becomes evident when examining the fractional coverages of each major subject noted in the contents, and the publication dates of its reference base. Table I summarizes the situation.

Two points are immediately obvious. First, a 13-page experimental methods section cannot be said to be exhaustive, and since well over half of the references are dated pre-1980, current computational and laboratory methods cannot be said to be overemphasized. In fact one could question the necessity of the book in the first place, since the same authors wrote a very similar volume published in 1981, which probably would still qualify as an orientational introduction even if the examples were out of date.

However, a major strength of the book is revealed in the treatment of biological applications, particularly those studies published since 1980. With the entire field of biological recognition undergoing a chemical renaissance, this applications chapter is perhaps the book's major service. It provides an interdisciplinary view of interprotein, internucleic acid, and enzyme–substrate, drug–receptor, and antigen–antibody interactions, to name just a few. The role of van der Waals interactions in carcinogenesis using a conformational soliton model is also very enlightening.

In conclusion, the authors have produced an interesting and readable review monograph for people who wish to introduce themselves to the field of van der Waals systems. However, the bulk of the reference base is dated so that practitioners in the field, or those looking for full descriptions of current methods, will be disappointed.

Howard D. Mettee, *Youngstown State University*

Advances in Boron and the Boranes. Edited by Joel F. Liebman (University of Maryland) et al. VCH: New York and Weinheim. 1988. xx + 547 pp. $84.00. ISBN 0-89573-272-6.

This volume is based in large measure on papers delivered at a special symposium organized by R. E. Williams to honor Prof. Anton B. Burg. The symposium was held at the University of Southern California in March 1985. A number of additional papers are included here which were solicited by the editors from people who were not at the conference. Thus, the scope of the book is quite broad; it begins with Burg's introductory paper on the way boron chemistry developed in the U.S. at his laboratory and at that of Prof. Herman Schlesinger at Chicago. The intermediate chapters give very good summaries of present-day experimental work in boron chemistry around the world including work on the smaller boranes, the larger cluster boranes, the carboranes, the heterocarboranes, the pyrazaboles, and the metallo derivatives of carboranes and boranes. A very interesting presentation of work on The Pharmacologically Active Boron Analogues of Amino Acids by Dr. Bernard Spielvogel suggests that boron compounds may yet have an impact on medicinal chemistry. The last two chapters in the book were theoretical reports (Liebman, Chickos, and Simons), one of which presented Pauling's Unsynchronized-Resonating-Covalent-Bond Theory (Pauling and Herman) as it applies to boron and boranes.

The experimental work described is both current and of high quality. A definitive paper by Wermer and Shore describes conversions of pentaborane(9) to higher boranes, and also describes some of the chemistry of decaborane. Synthetic methods for boranes, carboranes, and heteroboranes were the topic for several papers (Stibr, Plesek, and Hermaneck) (Corcoran and Sneddon) (Grimes) (Hosmane and Maguire); chemistries of lower boranes and of small carboranes were described (Kodama) (Onak) (Fehlner) (Bauer); special chapters are devoted to the thia- and azaboranes (Todd, Arafat, Baer, and Huffman); and to pyrazaboles (Niedenzu). Other special topics covered included mechanism studies using isotopically labeled boron hydrides (Gaines, Coons, and Heppert), cluster catalysis with metallocarboranes (Hawthorne), a definitive study correlating carbocation structures and borane structures by means of ^{11}B and ^{13}C chemical shift values (Williams, Prakash, Field, and Olah), boron monohalides (Morrison), asymmetric synthesis with boronic esters (Matteson), organometallic chemistry of strong acids (Siedle), and molecular structures of boranes and carboranes (Beaudet).

The book is a fitting tribute to one of the world's most individualistic and gifted experimentalists. Burg can be proud of his legacy to American chemistry.

R. W. Parry, *University of Utah*

Advances in Carbohydrate Chemistry and Biochemistry, Volume 46. Edited by R. S. Tipson (Kensington, Maryland) and D. Horton (Ohio State University). Academic: San Diego and New York. 1988. viii + 391 pp. $75.00. ISBN 0-12-007246-7.

This is the latest volume in an invaluable series which began rather tentatively during World War II under the title *Advances in Carbohydrate Chemistry*, edited by W. W. Pigman and M. L. Wolfrom. The first volume of the series was written entirely by American authors, but by the second volume, an "Associate Editor for the British Isles" (S. Peat) had been added. The contributors then included five distinguished authors from the British Isles and one from France, in addition to five from North America, and the series was well on its way to becoming the international series that it is today. In 1969 the title of the series became *Advances in Carbohydrate Chemistry and Biochemistry*.

Biographies and Obituaries have always been a regular feature of the series, and the current issue continues this tradition with obits of Konoshin Onodera and Venancio Deulofeu.

The current issue contains six reviews. K. B. Hicks surveys the high-performance liquid chromatography of carbohydrates. This is an opportune review of an important field by an experienced carbohydrate chemist who has been a leader in this type of analysis for some time. The review clearly exhibits the advantages of a sound background in fundamental science to an analytical science speciality.

A major strength of the series is the presentation of practically oriented reviews, and especially the inclusion of compilations of "useful" information such as tables of physical properties of compounds, spectroscopic shifts, etc., which are often not conveniently to be found elsewhere. The review of NMR spectroscopy of fluorinated monosaccharides by R. Csuk and B. I. Glänzer in this issue, with 71 tables of NMR data, is an excellent example of this type.

U. Zahavi reviews applications of photosensitive protecting groups in carbohydrate chemistry. This article draws extensively from other fields of organic photochemistry in order to illustrate applicable options available to synthetic carbohydrate chemists. R. J. Clarke, J. H. Coates, and S. F. Lincoln have reviewed the inclusion complexes of the cyclomalto oligosaccharides (cyclodextrins). The basic chemistry and biochemistry of these dextrins were the subject of an excellent review by D. French in "Advances" in 1957 (interestingly, before the affiliation of the series with "Biochemistry"). However, in recent years there has been a resurgence of interest in the possible clathrate uses of the dextrins in the food and pharmaceutical industries and in the development of methodologies for formation and study of clathrates. This article provides a good introduction to the principles of clathrate science, including an Addendum in which references are updated into 1988.

O. Theander and D. A. Nelson have reviewed the aqueous, high-temperature transformations of carbohydrates relative to utilization of biomass. This article reviews a broad and very complex field of chemistry. Certainly one must applaud the statement that it is a chemistry "rich in overlapping mechanisms and underlying confusion". The review helps to resolve at least some of the latter.

In summary, the latest volume of this series continues the tradition of "usefulness", timeliness, and excellence. It is difficult to imagine an effective carbohydrate research group without ready access to "Advances".

G. N. Richards, *University of Montana*

Trends in Synthetic Carbohydrate Chemistry. ACS Symposium Series 386. Edited by D. Horton (Ohio State University) et al. American Chemical Society: Washington, DC. 1989. xiii + 345 pp. $69.95. ISBN 0-8412-1563-4.

This volume has been developed from symposia sponsored by the Divisions of Organic Chemistry and of Carbohydrate Chemistry at the 191st National Meeting of the American Chemical Society in New York in April 1986 and the 194th National Meeting of the American Chemical Society in New Orleans in September 1987. The editors are to be congratulated for drawing together the output from two closely related symposia despite their 18 months separation; however, there are some obvious difficulties attendant on such an operation. There was an obvious tendency for authors not to update their symposium presentation for inclusion in the subsequent book, now published 3 years after the original event. To illustrate the problem at random, the first chapter, on New Synthetic Methods Emphasizing Deoxyfluoro Sugars and Protective-Group Strategy, by W. A. Szarek, has only two references dated as late as 1987 out of 96 references. Furthermore, one of these references is to a paper by Szarek and co-workers, while the other is to an ACS abstract. Similarly, the second chapter, on New Approaches to the Synthesis of Nitrogenous and Deoxy Sugars and Cyclitols; by H. H. Baer, contains only two references as late as 1987 out of a total 67 references, and both of the 1987 references are to papers by Baer and co-workers. Obviously, timeliness has been less of a problem with papers presented at the 194th National Meeting. In a field moving as rapidly as synthetic organic chemistry, the time lag is unfortunate, but should be regarded as a minimal disadvantage which may have little detrimental effect on the value of this volume to most readers.

The book is divided into two sections, viz., Synthetic Transformations in Carbohydrate Chemistry and Total Synthesis of Carbohydrates. The first section comprises a survey of several different synthetic methodologies that can be used for transformation of naturally occurring carbohydrates into design target molecules. A broad range of functional-group transformation and protective-group strategies are covered in the first three chapters, followed by three chapters dealing with specific synthetic aims relating to synthesis of bicyclic nucleosides, long-chain carbohydrates, and chiral pyrrolidines. This first section then concludes with three chapters concerned with high-yield, stereospecific glycoside synthesis, including the total synthesis of cyclodextrins.

The second section of the book is concerned primarily with strategies for synthesis of rare monomeric carbohydrates from nonchiral, acyclic precursors. The first four chapters emphasize the very broad usefulness of the Diels–Alder reaction in synthesis of chiral derivatives of tetrahydropyrans and -furans. Subsequent chapters deal with synthetic methods involving aldol reactions, boron and tin enolates, and steric control in formation of carbon–carbon bonds. Finally (and innovatively in a compilation of this type), the last two chapters deal with microbially aided synthesis of carbohydrates and the enzyme-catalyzed synthesis of carbohydrates.

The symposia, and hence this volume, can genuinely claim to be international in nature. The contributors comprise a large proportion of the leaders in their field, and of the 18 papers, five are from U.S. institutions, three from Canada, and the remainder from seven other countries.

G. N. Richards, *University of Montana*

Atlas of Zeolite Structure Types. Second Revised Edition. By W. W. Meier and D. H. Olson. Butterworths: London and Boston. 1988. 151 pp. $36.00. ISBN 408-02740-1.

Zeolites have been applied as ion-exchange agents for half a century, as molecular sieves in separation processes, and as heterogeneous catalysts in the petroleum and chemical industry. More recently, aluminum phosphates, gallium silicates, and other compounds have been synthesized with structures strongly related to those of zeolites. Parallel to the explosive expansion of the field grew the need for a clear, systematic overview of the structures that have been identified. The new *Atlas of Zeolite Structure Types* fulfills this need in an excellent manner. It replaces its 1978 predecessor, which was compiled by the same authors and had 38 entries; the present version describes 64 topologically distinct tetrahedral networks. In agreement with the conventional perception that solids of this category should be highly porous, only structures with framework densities of less than 21 tetrahedrally coordinated ions per 1000 $Å^3$ have been included.

The organization of the book is as clear as the structure of a perfect crystal. Following the rules of the IUPAC Commission on Zeolite Nomenclature, structure types are defined by a code of three Roman letters. FAU stands for faujasites, MOR for mordenites, GME for gmelinites, FER for ferrierites, etc.; this mnemonic code will be appreciated by readers who are less familiar with group theory and crystallographic notations than with the names of the more common zeolites. An alphabetic list of many trivial names at the end of the atlas is helpful where the code is not directly derived from trivial names; it shows, e.g., that ZSM-5 is described under the code MFI or that MAPSO-46 has the structure type AFI.

For each structure type the secondary building block, the framework density, the loop configuration, the coordination sequence, and where applicable, the fault planes are listed. This is followed by a description of the channel system, giving the crystallographic direction and the size of the narrowest ring. Ring sizes are defined by the number of T atoms in the ring, or by the radius in angstrom units. For elliptical channels, two radii are, of course, given. The distances are derived from rigid atom models; the reader should, therefore, keep in mind that at elevated temperatures larger molecules may be able to pass through these rings. A detailed description is given of a characteristic representative of each structure type, including its chemical formula, and the crystal parameters. Subsequently isotypic framework structures are given, reminding the noncrystallographer that chemically different species, such as the Al phosphate $AlPO_4$-24 and gallosilicate analcime, have the same structure. A stereographic projection is also presented of each lattice model. This will preferentially be examined through stereo glasses; in most cases, a two-dimensional view of characteristic rings is also presented.

I assume that these data will be sufficient for most readers to get information on the three-dimensional structure of each compound, its accessibility to molecules of different sizes, and thus its potential for separation, ion exchange, and catalyst support. For the benefit of those readers who wish to know more details of any zeolite structures, a list of relevant literature references is added to each structure type. The compilers of the atlas are outstanding experts in the field, and great care has been taken to provide a high density of relevant information easily digested also by the chemist with limited crystallographic background. The Atlas should be present in every laboratory where zeolites form a major object of research. If the extrapolating estimate of the authors is correct that at least three new topologically distinct tetrahedral networks will be found every year, we may expect a subsequent Atlas with 100 entries before the turn of the century.

Wolfgang M. H. Sachtler, *Northwestern University*

Isotopes: Essential Chemistry & Applications II. Edited by J. R. Jones (University of Surrey). Royal Society of Chemistry: London. 1988. x + 262 pp. $68.00. ISBN 0-85186-745-4.

Isotopically substituted molecules serve at least two important purposes in chemistry. Firstly, such molecules allow subtle and delicate changes in chemical reactivity with structure to be examined. Secondly, labeled molecules containing isotopes, radioactive or otherwise, underpin a variety of powerful analytical tools that frequently have the advantages of being neither destructive nor invasive. This book is devoted primarily to the latter use of isotopic atoms and is complementary to Volume I published in 1980.

Volume II consists of 10 lectures presented at the University of Surrey early in 1988. The lectures differ in style, substance, and depth—partly reflecting the varied background of the speakers drawn from academia, industry, and medical/pharmaceutical research. Thus, P. S. G. Goldfarb's contribution entitled Isotopes in Molecular Biology presents a summary of the importance of isotopes in probing the details of the sequence DNA → RNA → protein and includes 15 references. On the other hand, D. J. Lester elaborates the general principles associated with the Industrial Application of Isotopes and appends only two textbook references.

Generally speaking, the other lectures are more specialized and detailed. Thus, V. W. Pike's contribution entitled Organic Synthesis with Short-lived Positron-emitting Radio Isotopes relates primarily to PET (positron emission tomography)—a noninvasive technique used to investigate human pathophysiology and contains nearly 200 references. Similarly a Dutch group headed by F. M. Kasperson gives an account of Modern Spectrometric Methods for the Analysis of Labelled Compounds, and their discussion is mostly devoted to NMR spectra, but IR and UV methods are briefly considered. There are 50 references appended to this lecture. A companion contribution by D. B. Davies and co-workers examines isotopic shifts in NMR spectra and includes 27 references.

With the senior author and the number of references given in parentheses, the remaining five lectures provide information on (a) the use of isotopes in medicinal chemistry (D. Halliday, 115), (b) radiopharmaceuticals (K. Kristensen, 52), (c) radioiodination techniques (D. Silver, 11), (d) localization and quantitation of radioactivity in solid specimens using autoradiography (M. A. Williams, 53), and finally (e) the radiochromatography of labeled compounds (W. S. Lockley, 83).

The contents of Volume II should be informative to a wide variety of chemists. The lectures also provide a useful starting point for a broad range of scientists and engineers who contemplate using isotopes to solve a variety of technical problems.

John M. W. Scott, *Memorial University*