

## Book Reviews\*

**Lasers, Molecules, and Methods. Advances in Chemical Physics. Volume 73.** By Joseph O. Hirschfelder (University of Wisconsin) et al. John Wiley and Sons: New York and Chichester. 1989. v + 1022 pp. \$125.00. ISBN 0471-62457-8.

This book concentrates on the theoretical description of the interactions between molecules and laser-light fields: all of the chapters are based on presentations made at a symposium held at the Los Alamos Center for Nonlinear Studies in July 1987. The topics addressed include weak fields and quasi-energy states, the effects on molecules of very intense light fields and/or very short pulses, wave packet dynamics, chaos in dynamics and spectra, relaxation, squeezed states, etc. It is the kind of advanced and specialized volume that one expects to find in every respectable science library but only on the personal bookshelves of those specialists who are actually doing research in this area.

As is expected for a book that covers a wide range of topics (numerical methods for matrix inversion to spin relaxation), there is some overlap between the different chapters and some heterogeneity with respect to the level of presentation. However, all of the chapters are of high quality, and some will doubtlessly be extremely useful as more complete and comprehensive introductions to current research than can be found elsewhere in the literature. Of special note in this regard is the overview chapter by J. O. Hirschfelder that puts all of the following chapters into a coherent context and relates them to general research goals. While it is doubtful that anyone will read all of the chapters, everyone working in this area can enjoy and learn from this overview chapter.

The value of this book would have been enhanced by more rapid publication. Nonetheless, it is still a valuable addition to any science library.

Bryan E. Kohler, *University of California, Riverside*

**Proceedings of the First Princess Chulabhorn Science Congress 1987—International Congress of Natural Products.** Edited by H. R. H. Chulabhorn Mahidol (Chulabhorn Foundation). Chulabhorn Foundation: Bangkok. 1989. Volume I: 55 pp. \$20.00. Volume II: 577 pp. \$40.00. Volume III: 459 pp. \$40.00.

This three-volume set is a compilation of lectures given at the Princess Congress I, held in Bangkok during December 1987. The aim of the Congress was to give an up-to-date picture of all aspects of research in natural products chemistry with special emphasis on organic chemistry and pharmaceutical research. Volume I features a keynote lecture (H. R. H. Princess Chulabhorn) and two lectures by nobel laureates (H. C. Brown and K. Kukui). Volume II includes invited lectures (32) covering ethnopharmacology, pharmacognosy, pharmacology, and the utilization of natural products as well as (20 lectures) primarily including spectroscopic techniques and structure elucidation. Volume III contains 55 invited lectures which concentrate on the synthesis and biosynthesis of natural products.

A list of contributors, which reads like a who's who in organic chemistry, is included in each volume. Unfortunately, a subject index, which would have added to the value of this set, was omitted. Each contribution was submitted on camera-ready copy. Professor Dr. Her Royal Highness Princess Chulabhorn and her organizing committee are to be congratulated on assembling such a distinguished group of chemists and convincing them, as only a Princess could, to write such stimulating and timely manuscripts. This three-volume set is highly recommended not only for its scientific contents but also for its historical and sentimental significance.

John L. Neumeier, *Northeastern University*

**Luminescence Applications in Biological, Chemical, Environmental and Hydrological Sciences. ACS Symposium Series 383.** Edited by Marvin Goldberg (U.S. Geological Survey). American Chemical Society: Washington, DC. 1989. 251 pp. \$59.95. ISBN 0-8412-1560-X.

This monograph reports the proceedings of a symposium sponsored by the Division of Environmental Chemistry at the 193rd Meeting of the American Chemical Society held in Denver, CO, on April 5–10, 1987. Most of the contributions are laboratory research reports, and the participants are drawn from industrial, governmental, and academic laboratories. The research reports are approximately evenly divided between the application of luminescence technology to biological problems and to environmental monitoring. Several of the contributors report using primarily photophysical techniques, e.g., fluorescence polarization and

luminescence lifetime measurements, as adjuncts in speciation, but none of the contributions are primarily concerned with molecular photophysics.

Two contributions are reviews; one a historical review of luminescence and the other a critical review of luminescence standards for macro- and microspectrofluorimetry. The review of luminescence standards is very useful and, though brief, is well referenced. This review provides much needed perspective to the volume.

This book illustrates the broad applicability of fluorescence as an analytical tool but suffers from the fact that it does not really have a focus. Only about half the papers are truly concerned with the application of luminescence; the other papers are really about some other problem which requires a number that chances to be obtained through a luminescence measurement. These papers serve to illustrate the diversity of luminescence application but in general yield little perspective to the analytical applications of luminescence.

The appeal of most symposium volumes is rather limited and this one is especially so. The chapters which are case histories provide good insight into the problem-solving process, but only half of the chapters are about solving problems. The descriptions of fluorescence depolarization, cyclodextrin extraction, and lifetime methods as adjuncts in speciation were instructive and well conceived. This book does not belong on everyone's bookshelf, but the reviews and case histories are useful enough to warrant its inclusion in a reference library.

Wiley Lyle Parker, *North Dakota State University*

**Chromatographic Enantioseparation: Methods and Applications.** By S. G. Allenmark (University of Gothenburg). John Wiley & Sons: New York and Chichester. 1988. 224 pp. \$64.95. ISBN 0-470-21080-X.

This book is written by a well-recognized authority in a dramatically evolving field. Despite its modest length, a broad range of subjects has received comprehensive coverage. It is written in a highly readable, hands-on style presenting chiral chromatography through the eyes of an active practitioner. Although in several instances the author piques the curiosity, leaving the reader craving for more, at no time is clarity sacrificed for brevity. In fact, the numerous figures, schemes, and tables effectively facilitate the understanding of textual material.

Overall, the book is thoroughly referenced (Chapters 6–8 alone have in excess of 400 entries), with the majority of citations from 1980 to 1986 and several from 1987. Each chapter includes a bibliography of supplementary readings (usually books) as well as listings from the scientific literature. The Index is particularly thorough and allows for rapid access of information.

Chapters 1 (Introduction, 6 pages) and 2 (The Development of Modern Stereochemical Concepts, 8 pages) provide a broad-based perspective to the importance of enantioseparation, the pertinent nomenclature, and an overview of the structural features which confer chirality. Chapter 3 (Techniques Used for Studies of Optically Active Compounds, 14 pages) describes methods (polarimetry, NMR, calorimetry, isotopic dilution, and enzyme techniques) for optical purity determination along with appropriate equations. In Chapter 4 (Modern Chromatographic Separation Methods, 21 pages) we find a generalized account of chromatography theory, instrumentation, and the indirect (diastereomer) method of separation. A table summarizing the analytes (functional groups) and respective chiral reagents for their derivatization is provided. The literature citations in this chapter are not as current as they could be (most are prior to 1980), although the bibliography lists more recent texts in the area. This coverage is in line with the overall emphasis on direct separations which is continued in Chapter 5 (Theory of Chiral Chromatography for Direct Optical Resolution, 11 pages). The author describes several drawbacks to chiral derivatization, including reagent purity and susceptibility to racemization. While true, these constraints are often controllable and the diastereomer approach may offer advantages in cost, sensitivity, selectivity, and column efficiency. Both direct and indirect methods have merit and each is influenced by many variables, most particularly the preference of individual investigators. Chapter 6 (Chiral Gas Chromatography, 14 pages) presents a concise overview with a summary of the relative merits of chiral phases and the types of compounds resolved on them. The longest entry, Chapter 7 (Chiral Liquid Chromatography, 52 pages), includes several practical suggestions, summaries, strengths, and weaknesses of each phase. Careful attention to these comments will save the inexperienced chromatographer a considerable amount of anxiety during method development. Chapter 8 (Analytical Applications in Academic Research and Industry, 43 pages) deals with direct chiral separations of amino acids, natural

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products, and pharmaceuticals. A section on microbial/enzymatic reactions, a frequently underappreciated and underutilized resource, is included. Chapter 9 (Preparative Scale Enantioseparation—Need, Progress and Problems, 8 pages) provides a very good introduction into the relative merits of Pirkle, polysaccharide, and polyacrylamide sorbents; preparative resolutions on albumin and cyclodextrins are not discussed. Chapter 10 (Future Trends, 7 pages) covers developments in detectors, columns, and supercritical fluid chromatography while Chapter 11 (Experimental Procedures for the Synthesis of Chiral Sorbents, 7 pages) gives illustrative examples and includes procedures for binding the sorbents to silica. A concise list of chiral column (but not reagent) suppliers is found in the Appendix.

A specific strength of this book is the consideration given to often-encountered, but infrequently discussed, practical difficulties. These include the consequences of using derivatizing reagents of <100% optical purity, the configuration/elution order correlation, enantiomerization and coalescence of chromatographic peaks, and determination of optical purity when enantiomers are incompletely resolved. The author also points out, quite correctly, that the Dalglish "three-point interaction" model for chiral discrimination is all too frequently (and often inappropriately) invoked.

Substantive shortcomings are not evident; however, although the author's intent was to concentrate on the direct approach, a more thorough discussion of chiral derivatization would have been helpful. This is particularly true in the analysis of racemic pharmaceuticals for which numerous excellent methods are available. For comparative purposes it may also have been useful to describe preparative enantioseparation using membrane bioreactor technology which has recently been commercialized. Finally, it is worth mentioning that while L-proline is stable, the N-TFA acid chloride derivative is notoriously susceptible to racemization (page 54).

It is a pleasure to recommend this well-written book to students as well as practicing chromatographers but most particularly to analytical chemists and biomedical scientists who are contemplating applied studies in this very exciting field.

Franco M. Pasutto, *University of Alberta*

**A Primer of Diffusion Problems.** By Richard Ghez (IBM). John Wiley and Sons: New York. 1988. xiii + 243 pp. \$22.95. ISBN 0-471-84692-9.

This book presents an introduction to the mathematics of diffusion problems. The seven chapters are as follows: The Diffusion Equation, Steady-State Examples, Diffusion Under External Forces, Simple Time-Dependent Examples, An Introduction to Similarity, A User's Guide to the Laplace Transform, and Further Time-Dependent Examples. Each chapter is developed as a derivation of the particular equations of interest. Subsequent chapters rely substantially on material presented earlier. Exercises appear throughout the book; however, solutions are not included.

The coupling of chemical reaction with diffusion is an important topic, receiving increasing attention among chemists. This book provides a resource for the mathematical treatments of diffusion problems. The book may be more appropriate for a chemical engineering curriculum than a chemistry curriculum, although it will be useful for chemists with a special interest in diffusion.

Kenneth Showalter, *West Virginia University*

**Ab Initio Calculations of the Structures and Properties of Molecules. Studies in Physical and Theoretical Chemistry 58.** By Clifford E. Dykstra (University of Illinois). Elsevier: Amsterdam and New York. 1988. 275 pp. \$110.50. ISBN 0-444-43013-X.

This book discusses contemporary methods in ab initio molecular orbital theory for the calculation of geometries, electrical properties, and magnetic properties of small molecules. The volume begins with a comparison of theory and experiment for a number of small molecules of astrophysical interest as a demonstration of a useful partnership between theory and experiment. The second chapter discusses features of potential energy surfaces, vibrational motion, and geometry optimization. The next chapter deals with methods for calculating the electronic structure of molecules. The equations and concepts are discussed rather than derived, to provide the reader with an understanding of the physics behind present methodology without the burden of the mathematics. The effects of basis sets and electron correlation are covered in the following chapter. Chapter 5 discusses the calculation of molecular properties as derivatives of the energy. In particular, derivative Hartree-Fock theory is described in detail. This approach can be iterated to arbitrarily high-order derivatives and is particularly well suited to electrical properties (since the basis functions normally do not depend on the electrical field). The next chapter deals with force constants and vibrational frequencies, both harmonic and anharmonic, for small molecules. Chapter

7 is a lengthy exposition on the multipole expansion of charge distribution, polarizability, and hyperpolarizability. By comparison, the chapter on magnetic properties (susceptibility, shielding, spin-spin coupling using GIAO's) is relatively short. Both chapters discuss the large basis set effects seen for these properties and also consider the effects of electron correlation and molecular vibration. Examples in these chapters, as well as throughout the book, are drawn from the author's extensive contributions to the literature on these subjects. The final chapter is primarily a description of the local-space approach being developed by Kirtman and the author.

H. Bernhard Schlegel, *Wayne State University*

**Insecticides of Plant Origin. ACS Symposium Series 387.** Edited by J. T. Arnason et al. American Chemical Society: Washington, DC. 1989. x + 213 pp. \$44.95. ISBN 0-8412-1569-3.

This book was developed from a symposium sponsored by the Division of Agrochemicals of the American Chemical Society at the Third Chemical Congress of North America, Toronto, Ontario, Canada, June 5-11, 1988. The 14 papers which are included appear to have been reproduced from the authors' copy and many are extremely difficult to read. Some of the topics covered are insecticides from higher plants as well as some from North America, China, and Africa. Insecticides from the Meliaceae and the Solanaceae are also described. References and an index are included.

M. C. W. Smith, *Ann Arbor, MI*

**Martindale. The Extra Pharmacopoeia. 29th Edition.** Edited by James E. F. Reynolds. Pharmaceutical: London. 1989. xxx + 1896 pp. £95.00 (U.K. only). ISBN 0-85369-210-6.

The first section of this book contains 1535 pages of monographs arranged in 72 chapters in which nearly 4000 substances are organized according to their use or action. These range from analgesics to vasodilators. The monographs may contain the name of the drug, authorities for approved names, synonyms and code letters, chemical names, molecular formula, molecular weight, CAS registry number, references to the world's pharmacopoeias, physical and pharmaceutical properties, units, dependence, adverse effects, treatment of adverse effects, precautions (including drug interactions), antimicrobial action, resistance, absorption and fate, human requirements, uses, preparations, proprietary preparations available in the U.K., and proprietary names used in many countries. The second section contains information on new drugs, obsolescent drugs, and miscellaneous substances. The third section contains the formulas of proprietary medicines, a directory of manufacturers, an index to clinical uses, an index to Martindale identity numbers, and a general index to drug names, medicinal preparations, and miscellaneous substances. A number of tables and charts are also included. Not only physicians and pharmacists but also pharmaceutical chemists will find this an extremely useful book. It is difficult to imagine any information relating to drugs that has not been included. It is an outstanding reference book that is well organized and convenient to use with extensive cross references. It should be included in every pharmaceutical library.

M. C. W. Smith, *Ann Arbor, MI*

**Biohazards of Drinking Water Treatment.** Edited by Richard A. Larson. Lewis: Chelsea. 1989. ix + 293 pp. \$54.95. ISBN 0-87371-110-6.

This book is the result of a symposium of the Environmental Chemistry Division of the American Chemical Society held in New Orleans, in September 1987. Topics include volatile organic compounds and pathogens in treated drinking water, chlorination pathways and byproducts, ozonation byproducts, granular activated carbon, and recent developments. References and an index are included. This book will be of particular interest to chemists involved in water purification.

M. C. W. Smith, *Ann Arbor, MI*

**The Chemistry of  $\alpha$ -Haloketones,  $\alpha$ -Haloaldehydes and  $\alpha$ -Haloimines.** By Norbert DeKimpe and Roland Verhe (The State University of Ghent). John Wiley & Sons: New York and Chichester. 1988. x + 496 pp. \$196.00. ISBN 0-471-91708-7.

This is the first volume in a new venture, *Updates from the Chemistry of the Functional Groups*, an "offshoot" of the main series. Overall editorship is by Saul Patai and Zvi Rappoport. The venture is planned to contain "selected chapters on a single topic or on closely related topics". In addition, appendices to bring original chapters up to date, and suitably related new subjects, are to be included.

The present volume consists of two original chapters from Supplement D: Synthesis and Reactivity of  $\alpha$ -Halogenated Ketones and  $\alpha$ -Halo-generated Imines. Both have been brought up to the middle of 1986 with respect to the literature, by means of substantial appendices. The third chapter is a new subject: Synthesis and Reactivity of the  $\alpha$ -Halogenated Aldehydes. Although the title of the book explicitly includes only ali-

phatic compounds, the chemistry that is implied, and included, involves a larger amount of heterocyclic synthesis. A true author index and a subject index together make up 46 pages.

**Food: The Chemistry of Its Components. Second Edition.** By T. P. Coultae (Polytechnic of the South Bank). The Royal Society of Chemistry: London. 1988. xi + 202 pp. \$19.50. ISBN 0-85186-433-3.

This book is designed as a text for teachers and students. It covers sugars, polysaccharides, lipids, proteins, colors, flavors, vitamins, preservatives, undesirables, minerals, and water. An index is included.

M. C. W. Smith, *Ann Arbor, MI*

**Biochemistry of the Algae and Cyanobacteria.** Edited by L. J. Rogers and J. R. Gallon. Clarendon: Oxford. 1988. xiv + 374 pp. \$90.00. ISBN 0-19-854239-9.

This volume is a record of the Phytochemical Society Meeting held in Aberystwyth in April 1987. It includes sections on metabolism, biosynthesis, bioenergetics, regulation, interactions, and biotechnology. References and an index are included.

M. C. W. Smith, *Ann Arbor, MI*

**The Bioinorganic Chemistry of Nickel.** Edited by Jack R. Lancaster, Jr. (Utah State University). VCH: New York and Weinheim. 1988. xviii + 337 pp. \$85.00. ISBN 0-89573-338-2.

The bioinorganic chemistry of nickel has blossomed into an active, intriguing, and diverse field during the past 15 years. Even so, the existence of this area has escaped the consciousness of many chemists, biochemists, and biologists. A compilation of the properties of the elements that appeared earlier this year states flatly that nickel has no known biological role. The book that is reviewed here, the first volume dedicated entirely to the bioinorganic chemistry of nickel, will play a major part in changing that perception.

The book consists of 14 concise articles by the leading experts in the field. The subjects of the articles include overviews of aspects of the coordination chemistry of nickel, the application of EPR and X-ray absorption spectroscopy to nickel systems, the biological transport and utilization of nickel, and the enzymology and biochemistry of the four known classes of nickel-containing metalloenzymes—urease, hydrogenase, CO dehydrogenase, and methyl coenzyme M reductase. The articles are not typical comprehensive reviews of recent results. Instead, authors present a view of the field from their perspective and engage in more speculation than often seen. This works very well in most cases, particularly for the areas that are of lesser scope. The reader is given not only a good overview of the current state of knowledge in these areas but is also given an appreciation of the many fundamental questions that remain to be answered. Perhaps the least satisfying chapter was the introductory survey of the coordination chemistry of nickel. Admittedly, this chapter presents a difficult challenge. It is hard to imagine a satisfying review of such a large area in 26 pages. All of the chapters are well-written and are presented in manner that will make them accessible to scientists with backgrounds other than that of the authors.

The editor's stated objectives were to emphasize the interface between chemistry and biology as it relates to nickel and to provide a reference book for current and future workers in this area. He has succeeded on both counts. The book, which is current to about 1987, provides the single best picture available of a rapidly moving field. It certainly belongs on the shelf of workers in the several disciplines that are concerned with metals in biological systems.

Alan M. Stolzenberg, *West Virginia University*

**Analytical Applications of Spectroscopy.** Edited by C. S. Creaser (University of East Anglia) and A. M. C. Davies (Norwich Laboratory). The Royal Society of Chemistry: London. 1988. xiv + 488 pp. \$99.00. ISBN 0-85186-383-3.

*Analytical Applications of Spectroscopy* contains papers arising from two 1987 conferences in the United Kingdom entitled International Near Infrared Spectroscopy Conference and Spectroscopy Across the Spectrum. While the publisher's cover description emphasizes the idea of multidisciplinary insights on spectroscopy (e.g., the growth of hyphenated methods of analysis), the actual text is more accurately described as two distinct parts arising from two distinct conferences. The near infrared (NIR) portion is a well-balanced presentation of practical applications of NIR spectroscopy. The Spectroscopy Across the Spectrum section is more disjointed, with an overview paper plus a few application papers for each of five types of spectroscopy, ranging from NMR spectroscopy to mass spectrometry to atomic spectroscopy.

The NIR sections of the book make up 50% of the book, and include the first chapter, on NIR specifically, and the last chapter, on chemometrics (but with the bulk of the material being NIR). A good conceptual and historical introduction to NIR is given, emphasizing the

unique demands of quantitative NIR analysis. Any one of a variety of calibration approaches may be needed for a particular sample, due to the strong sample matrix dependence, strongly overlapped spectra, and nonlinear concentration dependence usually encountered. Multivariate calibration using a teaching set of representative samples is one common approach. A number of useful, but less common, calibration methods are discussed in the chemometrics chapter, including Fourier transform analysis, use of derivative spectra, and principal component analysis. Over 20 practical application articles are also included, drawn mainly from the food and agricultural product analysis areas. These articles deal with very specific problems, and as such are probably of direct interest only to workers dealing with very similar samples. Taken as a whole the NIR section does a good job of communicating the range of applications for which NIR can be used, as well as methods for managing the practical problems which arise.

The chapters from the more general spectroscopy conference are significantly less comprehensive and useful than the NIR sections, but have very nice overview papers on each area. While some interrelationships are explored, the areas covered are too dissimilar to form a cohesive whole. The topical areas are infrared spectroscopy (90 pages), mass spectrometry (48 pages), NMR (44 pages), and atomic/UV-visible spectroscopy (48 pages). Each section begins with an overview, the best of which are articles on coupled chromatography and FTIR by Peter Griffiths; coupled chromatography, FTIR, and mass spectrometry by Charles Wilkins; and HPLC-atomic spectroscopy for metal speciation by Les Ebdon and Steve Hill. While the individual research papers included are current and interesting, the number of such detailed papers for each area is too limited to be considered a complete summary of current research directions.

Jack K. Steehler, *Roanoke College*

**The Organometallic Chemistry of the Transition Metals.** By Robert H. Crabtree (Yale University). John Wiley & Sons: New York and Chichester. 1988. xv + 422 pp. \$39.95. ISBN 0-471-85306-2.

This text is a well-written overview of organometallic chemistry which captures much of the feeling of accomplishment that the field now enjoys. The stated audience of the text is senior undergraduate and graduate students as well as research workers who want to become better acquainted with the subject. Problems are provided at the end of each chapter along with short answers at the end of the text. After the first two introductory chapters, literature references accompany many of the examples discussed in the text. The approach throughout is not exhaustive detail, but rather a brief overview of each topic with a few carefully chosen examples to illustrate the concepts under discussion.

The first two chapters introduce many of the fundamental concepts used to describe classical metal-ligand interactions for Werner-type complexes. Chapter 2 is concerned primarily with electron-counting formalisms and the 18-electron rule. From here, the topics of all but one of the remaining chapters fall directly in the area of organometallic chemistry.

Chapter 3 describes the properties of metal alkyl and metal hydride complexes. Introduced here are the fundamental  $\beta$ -elimination and reductive elimination reactions. Also included is a short description of recently discovered molecular hydrogen complexes. Although Chapter 4 is entitled Ligand Substitution Reactions, the first part of this chapter describes the properties of the carbonyl and phosphine ligands. Here typical methods of introducing a carbonyl ligand and bonding modes for this ligand are described as well as several reactions of the carbonyl ligand. Both electronic and steric properties of phosphines are described. The last part of the chapter surveys several of the more important mechanisms underlying ligand substitution reactions. Chapter 5 rounds out the description of ligand types with  $\pi$ -bound ligands. Alkenes, alkynes, allyl, arenes, cyclopentadiene, and polyene ligands are all brought up in turn. In most cases each ligand type is introduced, bonding formalisms discussed, preparative methods surveyed, and important reactions summarized. Throughout the book, rather than discussing the properties of individual groups, distinction is made between the properties of a specific ligand bound to an early metal as opposed to a late metal.

Chapters 6 and 7 are devoted to more detailed discussions of the important reactions in organometallic chemistry: oxidative addition/reductive elimination and insertion-elimination reactions. Chapter 8 describes nucleophilic and electrophilic addition reactions to coordinated ligands. Nucleophilic addition to carbonyl and polyene ligands are described as well as electrophilic addition reactions involving initial attack at both the metal or a coordinated ligand. This is followed by a short chapter on homogeneous catalysis where the reactions discussed in the previous three chapters are now brought together to form a basis for understanding the catalytic cycles of alkene hydrogenation, isomerization, and hydroformylation.

Chapter 10 breaks the routine by taking a quick look at a few of the

techniques used to prepare and characterize organometallic complexes. NMR spectroscopy is given the lion's share of the chapter with short descriptions of  $^1\text{H}$ ,  $^{13}\text{C}$ , and  $^{31}\text{P}$  NMR as well as dynamic NMR,  $T_1$ , and NOE experiments. Short sections on IR and crystallography round out the chapter.

Chapter 11 covers the important carbene and carbyne ligands. Here the differences between nucleophilic Fischer carbenes and electrophilic Schrock-type carbenes are highlighted. Electron-counting formalisms, MO descriptions, the effects of different metals, substituents, and the reactivity of these ligands are discussed in some detail. The chapter also includes discussions of olefin polymerization and metathesis catalysts.

Chapter 12 covers current efforts to utilize small-molecule feed stocks via organometallic catalysts. The connection between the Fischer-Tropsch reaction and the water-gas shift reaction is discussed in terms of utilizing synthesis gas feedstocks. More recent efforts to develop transition metal catalysts which activate alkane feed stocks are also described. Chapter 13 focuses on cluster complexes and current models describing the metal-metal bonding in these molecules. The EAN rule is defined and compared with cluster stability and structure predictions based on Wade's rules. Hoffmann's isolobal analogy is very clearly and concisely described at this point and used to introduce one of several current synthetic methods used to prepare cluster complexes.

Chapter 14 describes a number of well-known and new applications of organometallic complexes to organic synthesis. Among the topics discussed are traditional nucleophilic alkyl complexes, organocuprates, mercurials, organometallic protecting groups, and directing groups as well as the new Sharpless asymmetric oxidation systems.

Chapters 15 and 16 focus on "relatively" new areas of organometallic chemistry, high oxidation state complexes, and bioorganometallic chemistry. These areas are developing very quickly (especially oxo complexes), and the text provides a brief overview of some of the more current work in each area.

This is an excellent text for an introductory course in organometallic chemistry.

Craig E. Barnes, *University of Tennessee*

**Proteins. A Theoretical Perspective of Dynamics, Structure and Thermodynamics. Advances in Chemical Physics Volume LXXI.** By C. L. Brooks III (Carnegie-Mellon University) et al. John Wiley and Sons: New York and Chichester. 1988. xiii + 259 pp. \$55.00. ISBN 0-471-62801-8.

As Martin Karplus notes in the Preface, the field of protein dynamics (the molecular description of the constantly changing protein conformation) is a young one, yet it is one which has grown rapidly, especially in the area of macromolecular simulations. The objectives of this book are to provide a current review for workers in the field and to introduce chemists and physicists to the field. As one interested in enzyme kinetics, I have reviewed this book with an eye toward the promise of new interpretations of experiments done with enzymes.

A brief introduction provides an excellent overview of the scheme of this book, some historical developments in the field, and a good bibliography of other reviews in the field, some of which at a more introductory level than the present text. The subsequent chapters include (a) a brief overview of protein structure and motions (including a very useful table listing types, magnitude, and rates of motions in globular proteins); (b) a discussion of the theory and form of potential functions for nonbonded interactions; (c) a discussion of dynamical simulation methods, including both the initial work on the numerical integration of Newton's equations of motion applied to proteins in vacuo (on relatively short time scales) and methods of harmonic, stochastic, and activated dynamics which have been applied to simulate slower, more complex processes in the presence of solvent; (d) the application of dynamic technique to estimating thermodynamic properties of proteins, both in vacuo and in solution; (e) a thorough summary of results from application of these dynamical simulation methods to atom and side-chain motions, and helix, domain, and subunit motions (rigid-body motions) and large scale order-disorder polypeptide rearrangements; (f) an excellent treatment of solvent-protein interactions and some consequences of these; (g) a brief description of thermodynamic aspects; (h) an analysis of the interplay between theoretical simulation studies and various experimental methods, including NMR, fluorescence depolarization, and electron spin relaxation techniques; and (i) a very fine summary which points the way to new areas in which theoretical approaches are likely to contribute new insights to protein and enzyme behavior. A bibliography of over 570 citations is included.

The book is written primarily for an audience already engaged in research in the area of protein dynamics or with a strong background in physical and theoretical approaches in molecular dynamics. Although most mathematical relationships discussed are only briefly defined, the reader is very adequately directed to comprehensive treatments in the

literature. I believe the authors have done an admirable job in stressing both the strengths and the limitations of the theoretical simulations approach. X-ray diffraction studies of proteins imparted a misconception of proteins as rigid structures; in recognizing the flexibility of proteins, which these theoretical simulations strikingly convey, one wants to be very aware that these beguiling moving images generated by a computer on a screen are also *models* of proteins and not the proteins themselves.

Three conceptions that have evolved from these studies of protein dynamics should be, in my opinion, more widely disseminated in graduate courses in biochemistry. The first is the variety, time scale, and extent of backbone and side-chain movement in proteins under physiological conditions (Table I, page 19). The second is the notion that "...small-amplitude fluctuations are essential to all other motions in proteins; they serve as the 'lubricant' that makes possible larger-scale displacements, such as domain motions..." The third is the extent to which water (and necessarily solutes) are affected by a protein; for example, the diffusion constant for water is estimated to be altered with respect to that in bulk water up to 15 Å from the surface of the protein (Figure 47, page 156). In fact, I believe anyone interested in enzyme kinetics will find the chapter on solvent influence on protein dynamics extremely useful in formulating ideas about mechanisms.

In sum, I believe this book is well organized and well written, and while aimed at a specialist audience, has much to offer others who have an interest in the results derived from the theoretical dynamics-simulation approach.

James H. Hageman, *New Mexico State University*

**Natural Products Isolation. Separation Methods for Antimicrobials, Antivirals and Enzyme Inhibitors. Journal of Chromatography Library, Volume 43.** Edited by Gerald H. Wagman and Raymond Cooper (Schering-Plough Research). Elsevier: Amsterdam and New York. 1989. xiii + 619 pp. \$139.00. ISBN 0-444-87147-0.

This volume is an excellent reference text for the natural products chemist interested in the isolation of antimicrobials, antivirals, and enzyme inhibitors from natural sources. Its 14 chapters cover a wide range of purification methods and compounds, with an emphasis on antibiotics. Each chapter contains a brief introduction, appropriate instrumentation, specific isolation methods, and extensive references. Many chapters contain a brief discussion of structure elucidation, and all but three have a list of equipment and suppliers.

The first chapter presents a discussion of countercurrent chromatography (CCC), giving excellent instrumentation illustrations and several representative separations. Five types of CCC, with applications of each to several different classes of compounds, are presented along with useful tables listing solvent systems and classes of compounds to which they can be applied.

Chapter 2 discusses detection of five classes of compounds of microbial origin directly from fermentation broths by high-performance liquid chromatography (HPLC). Many actual HPLC chromatograms with conditions are included. Noteworthy is the inclusion of emerging photodiode-array detector technology which permits the use of UV-vis spectroscopy during HPLC purification.

Each of the next six chapters (3-8) focuses on a specific class of antimicrobials. Chapter 3 covers the clinically useful glycopeptide antibiotics, discussing HPLC and affinity chromatographic separations. A 3-page overview of structure elucidation and a section on screening methods complete the chapter. Chapter 4 discusses the detection, isolation, purification, and structure elucidation of the nikkomyins and polyoxins, two groups of nucleoside peptide antibiotics with high antifungal and insecticidal activities. Chapter 5 covers the structure and isolation of the saframycin and isoquinoline antibiotics. Since these antibiotics are normally produced in very low fermentation yields, this chapter emphasizes scale-up processes and includes an interesting section on directed biosynthesis for the production of new saframycins. Chapters 6, 7, and 8 focus on the important  $\beta$ -lactam antibiotics. Chapter 6 covers the isolation and chemical characterization of several recently discovered cephalosporins. Chapter 7 discusses the monoclinic  $\beta$ -lactam nocardicins and monobactams, and includes a detailed isolation scheme for each antibiotic. Chapter 8 gives specific isolation processes for and a comparative study of the physicochemical properties of the carbapenem antibiotics first discovered in 1976.

The highly antiparasitic avermectins are the focus of Chapter 9. Included are sections on detection, isolation, separation, and structure elucidation of this important class of compounds.

Chapter 10 deals in a noncomprehensive manner with the biologically active products derived from marine organisms and cultivated blue-green algae. The emphasis on isolation and purification of 15 classes of compounds is timely since earlier reviews, while comprehensive, tended to lack this data.

A comprehensive review of the isolation and purification of human leukocyte and fibroblast interferons using HPLC and immunoaffinity chromatography is described in Chapter 11. An interesting section on emerging recombinant DNA technology for the production of interferons is included.

Chapters 12 and 13 cover enzyme inhibitors. Chapter 12 discusses seven classes of microorganism-produced enzyme inhibitors isolated since 1972. The structure, producing organism, associated enzyme are given for each of 105 inhibitors, but purification schemes are provided for only 24. Chapter 13 covers isolation procedures, chemical properties, and syntheses of 13 different alkaloidal glycosidase inhibitors isolated from plants.

The book concludes with a fascinating chapter on the isolation of natural products involved in three types of chemical communication: host recognition, cell cycle control, and tumorigenesis. A list of abbreviations and a subject index complete the text.

Contributing authors are researchers of significance in their particular areas. Their extensive use of up-to-date isolation and purification schemes makes this an extremely useful volume.

Joseph W. LeFevre, *State University of New York College at Oswego*

**Solids and Surfaces: A Chemist's View of Bonding in Extended Structures.** By Roald Hoffmann (Cornell University). VCH: New York and Weinheim. 1989. x + 142 pp. \$24.95. ISBN 0895-73709-4.

Ever wonder about the band structure of  $\text{PtH}_2^{2-}$ ? How about the Fermi level of  $\text{Re}_2\text{Cl}_8^{2-}$ ? Sometimes, the language of solid-state physics sounds as bizarre to the chemist as the complexity of molecules seems to the physicist. Hoffmann, in this recent monograph, attempts to bridge the conceptual barriers between each group, pointing out how various formalisms have their precise counterparts in physics and chemistry. The text, running about 130 pages, is a combination of earlier articles published by Hoffmann in *Angewandte Chemie* and *Reviews of Modern Physics*. This research topic has been of considerable interest to Hoffmann over the last decade, and the book gives him the opportunity to present a progress report of his theoretical efforts.

The text begins with a review of one-dimensional bands, Bloch functions, and band structures. Each description is annotated with the appropriate analogue from orbitals extracted from the extended Hückel theory. For example, the Fermi level is equated to the highest occupied molecular orbital (HOMO) as determined in the finest Hoffmann tradition. The density of states allows local frontier electron densities to be evaluated. The ideas are extended to two- and three-dimensions to include surfaces and solids. Examples such as CO on Ni,  $\text{CH}_3^+$  on Co and the structure of  $\text{ThCr}_7\text{Si}_5$  are used to illustrate specific aspects of electronic interactions. Once the theoretical conscripts are in place, Hoffmann goes on to speculate about the energetics of surface reactions, frontier orbitals in extended structures and finally to the origin of the Peierls distortion in solids with its analogue to Jahn-Teller distortions.

This text has Hoffmann's style all over it. He needn't even have put his name on the artistically designed cover. It is written in an extremely informal fashion in the first person. It is punctuated with some rather astounding pronouncements as in the Introduction "The heart of chemistry, let there be no doubt, is the molecule!" and at the conclusion "...the solid is a molecule, a big one, to be sure, but just a molecule.". The idea, of course, is that the intuition of the chemist should be useful to the solid-state physicist, and that the language of solid-state physics is important in finding an appropriate picture of chemisorption, bond-breaking, and making in the solid state and in determining the electronic structure of important inorganic crystals. This book is most useful to a reader who has already been exposed to quantum chemistry and solid-state physics courses at the graduate level, since a working knowledge of the separated disciplines is assumed. I thoroughly enjoyed it. The words coupled to many schematic pictures provide a statement which is worthwhile whether one gives it a quick scan or in-depth study.

Nicholas Winograd, *The Pennsylvania State University*

**Carbohydrate Chemistry.** Edited by John F. Kennedy (University of Birmingham). Oxford University: Oxford and New York. 1988. xi + 678 pp. \$150.00. ISBN 0-19-855177-0.

This book is 15 chapters, divided into 3 sections, and is targeted at the advanced undergraduate/graduate level student and at the established chemist seeking a current briefing on the carbohydrate field.

The sequence of topics is rather unusual: after two introductory chapters by Kennedy and C. A. White on structure and analysis of mono-, oligo-, and polysaccharides, there follows a useful overview by A. K. Mallams on the carbohydrate-containing antibiotics, keyed to major reviews and some original literature. A chapter by J. A. Secrist is a balanced treatment of the nucleosides with extensive and careful citation of original and secondary literature. A short overview of the glycolipids and gangliosides is next, presented by I. M. Morrison. The remainder

of the first part of the book consists of chapters contributed by Kennedy and White on plant, animal, and microbial polysaccharides, on glycosaminoglycans and proteoglycans, and the carbohydrate-directed enzymes, along with an article from R. J. Sturgeon on the glycoproteins and glycogen. The extent of literature citation is rather limited for these chapters, which cover a vast range of material.

The second part of the book is devoted largely to synthesis, starting out with well-developed chapters by N. Baggett and R. J. Ferrier on the synthesis of monosaccharides and on the reactions of their derivatives, with very brief reference lists that are essentially restricted to the secondary literature. There follows an excellent article by P. J. Garegg and A. A. Lindberg on the synthesis of oligosaccharides for biological and medical applications that is extensively referenced to a careful selection of original and secondary literature; this contribution will be most valuable for the reader seeking current understanding of this active and important area. A chapter by Catherine M. Sturgeon somewhat misleadingly entitled *Synthesis of Polysaccharide Derivatives* is, in fact, devoted to the immobilization of ligands on polysaccharide supports.

Part III of the book comprises two chapters, one by A. J. Griffiths and J. F. Kennedy on the biotechnology of polysaccharides (where there is considerable material on polysaccharide derivatives) and the final one by White and Kennedy, on the biotechnology of bioactive derivatives of polysaccharides, with particular emphasis on the industrial uses of immobilized carbohydrates and biocatalysts. There is a useful subject index.

The book is typeset and the structural formulas are clear and well produced. Use of the "name and date" system for reference citations rather than superscript numbers is judged an inconvenience for the reader, and may have inhibited writers from introducing an adequate depth of citation in some of the chapters. There are major areas of omission in the book (spectroscopy, in particular), and the overall balance is not even; the work does not constitute a comprehensive reference source on the subject, and it would be difficult to use as a course text. Nevertheless, there is much valuable material and some excellent individual chapters, and these commend the book for library acquisition and for the personal reference library of any researcher interested in current developments in this burgeoning field.

Derek Horton, *The Ohio State University*

**Prostaglandins, Leukotrienes, and the Immune Response.** By J. L. Ninnemann (University of California, San Diego). Cambridge University: Cambridge and New York. 1988. xii + 220 pp. \$44.50. ISBN 0-521-33483-7.

This volume is very different from most on the topic of eicosanoids. The opening paragraph of J. S. Goodwin's foreword explains precisely how valuable this book is: "Single-author books are becoming somewhat of a rarity in scientific literature. Far more common are the multiauthored loosely edited works focused on a single topic. Such publications have their uses, especially in giving the reader first-hand accounts when it comes to providing a synthesis, an overall picture of a complex field, wherein seemingly unrelated findings are placed in the "big picture". This is an important goal for any scientific book, especially one devoted to a field as rife with seemingly contradictory data as is the area of eicosanoids and immune function. Dr. Ninnemann succeeds admirably in meeting this goal. He has managed to integrate into a readable text an enormous amount of data, results obtained *in vitro* and *in vivo* in animals and in humans." I agree with every word. It was fascinating to read about how a plethora of seemingly disparate information could be correlated to explain so many physiological effects. Technical terms are clearly defined, and the book is remarkably easy to read. The first two chapters provide very clear accounts of the basic features of immunology and eicosanoid biochemistry, respectively, including the major laboratory techniques. These chapters are followed by others on monocytes and macrophages, lymphocyte response, inflammation and the neutrophil, malignancy and the arachidonic acid cascade, tissue and organ transplantation, rheumatoid arthritis and autoimmunity, traumatic injury and surgery, and allergy.

Brian S. Middleditch, *University of Houston*

**Studies in Natural Product Chemistry. Volume 3. Stereoselective Synthesis, Part B.** Edited by Atta-ur-Rahman (University of Karachi). Elsevier: Amsterdam and New York. 1989. x + 540 pp. \$165.75. ISBN 0-444-87298-1.

This volume is a collection of 15 chapters devoted to a wide range of natural products chemistry. In the first chapter, Professor Hudlicky presents a summary of polyquinane syntheses, focusing on utilizing diene-carbenoid additions, and also covering his work on pyrrolizidine alkaloids. Other synthetic methodology chapters included cover eight- and nine-membered rings, silyl-enol ether Michael additions and their use in forming lactones, recent developments in carbohydrate chemistry, recent applications of sigmatropic rearrangements to polyoxygenated



natural products, 4 + 2 cycloaddition approaches to alkaloids, and syntheses via arynes.

Chapters directed at more specific targets cover approaches to polyquinane terpenes, aureolic acid antitumor antibiotics, colchicine, antitumor compound CC-1065, yohimbine and related alkaloids, *Erythrina* alkaloids, and arteannuin (Qinghaosu).

This volume is the second in the series to be devoted to stereoselective syntheses and serves as a nice collection of concise summaries of selected areas of current research done by the leaders in their respective fields. Each chapter is unique in style and content, some chapters giving entirely a background synopsis, and one chapter including experimental details. This volume should be a stimulation to many synthetic organic chemists and should be widely circulated. It seems desirable to include it even as part of an advanced synthetic organic course but certainly should be a part of a chemistry library.

Thomas N. Nanninga, *Parke-Davis Pharmaceutical Research Division*

**Simple Methods for Identification of Plastics with the Plastic Identification Table** by H. Saechtling, **Second Edition**. By D. Braun (Deutsches Kunststoff-Institut). Oxford University: Oxford and New York. 1988. 110 pp. \$22.50. ISBN 0-19-520725-4.

This book is an excellent compilation of simple wet tests used for qualitative identification of plastics. It is primarily aimed at processors and users of plastics.

A brief introduction of polymer concepts is included followed by sample preparation, heteroatoms (N, S, P, O, and halogens) identification, general identification reactions, and specific tests for 18 plastics, ranging from phenolics, silicones, to polycarbonates. Compared to the first edition published in 1982, the second edition includes the following additions: more test methods, a table on polymer blends, and an extremely useful supplement: The Plastic Identification Table (8th ed.) by Dr. H. Saechtling.

The analytical procedures are well written and very easy to follow, which allows the reader to classify plastics unknowns without using sophisticated instruments. Although not written in lab textbook format, certainly it can be a very useful reference book for introductory polymer lab or qualitative analysis lab courses. Ten references, a glossary of polymer acronyms, and an index are included.

David Wei Wang, *IBM Corporation*

#### Volumes of Proceedings

**Pesticide Formulations. Innovations and Developments. ACS Symposium Series 371.** Edited by Barrington Cross (American Cyanamid) and Herbert B. Scher (ICI Americas). American Chemical Society: Washington, DC. 1988. xi + 288 pp. \$64.95. ISBN 0-8412-1483-2.

This is a collection of 21 typescript papers, mostly reports of original research. The central theme of the symposium, held in New Orleans in 1987, was to maximize the activity of pesticides by means of formulation. Concern with surfactants and emulsions is prevalent in the reports. One interesting line of inquiry concerns means of reducing the toxicity of pesticides to man while retaining their effectiveness. The index is substantial.

**Metal Clusters in Proteins. ACS Symposium Series 372.** Edited by Lawrence Que, Jr. (University of Minnesota). American Chemical Society: Washington, DC. 1988. ix + 413 pp. \$84.95. ISBN 0-8412-1487-5.

A symposium held at the American Chemical Society Meeting in New Orleans, and sponsored by the Division of Inorganic Chemistry, was the source of the 19 typescript papers in this volume. Complexes of copper, iron, and manganese figure prominently in them. Much attention is paid to the catalytic activity of the substances. Other papers are about structure or about synthetic analogues of natural enzymes, such as nitrogenase. The three main headings are as follows: Binuclear Sites Containing Copper, Metal-Oxo Centers, and Metal-Sulfur Clusters. The 9-page subject index is an especially helpful feature.

**Chemical Reactions on Polymers. ACS Symposium Series 364.** Edited by Judith L. Benham (3M Company) and James F. Kinstle (James River Corporation). American Chemical Society: Washington, DC. 1988. xii + 483 pp. \$99.95. ISBN 0-8412-1448-4.

There are 33 typescript papers, mostly reports of original research, in this volume, which is based on a symposium held at the American Chemical Society National Meeting in Anaheim in 1986. They are grouped under six headings: Reactive Polymers, New Synthesis Routes, Surface Modification of Polymers, Specialty Polymers With Polar/Ionic Groups, Chemical Modification For Analytical Characterization, and Chemical Modification For Functionalization and Curing. The indexing is thorough and professional, as is characteristic of the ACS Symposium Series.

**Seventh International Conference on Jojoba and Its Uses.** Edited by A. R. Baldwin. American Oil Chemists' Society: Champagne, IL. 1989. xxiii + 453 pp. \$95.00. ISBN 0-935315-22-5.

The Seventh International Conference on Jojoba and Its Uses, held in Phoenix in 1988, produced enough papers to require 3<sup>1</sup>/<sub>4</sub> pages of Table of Contents to list them. After welcoming remarks by three different people and an overview paper, Horizons For New Agricultural Products by G. Dunlop, the papers fell into five sections: Plant Physiology; Agronomy: Processing Economics and Marketing; Basic Chemistry and Industrial Uses; Cosmetics (sic) and Pharmaceutical Uses; and Food and Feed Uses of Jojoba Products. Then, after "Closing Remarks", there comes a paper, History of the Hyder Area, by C. Timmons, and a group of poster presentations. It is a pity that all this left no room for an index.

**Biopolymers. Original Research on Biomolecules. Volume 28. Number 1.** Edited by Murray Goodman (University of California). John Wiley & Sons: New York and Chichester. 1989. iii + 538 pp. \$50.00. ISBN 0-471-50943-4.

This is a special issue of a journal, and thus is softbound, consisting entirely of papers averaging 6-20 pages in length and deriving from the First Naples Workshop on Bioactive Peptides, held in 1988. They are set in type and well-illustrated (there are 6 color plates). There is no index.

**Trends in Medicinal Chemistry '88. Pharmacochimistry Library 12.** Edited by H. van der Goot (Vrije Universiteit) et al. Elsevier: Amsterdam and New York. 1989. xii + 860 pp. \$258.00. ISBN 0-444-87380-5.

This volume of typescript papers derives from the Tenth International Symposium on Medicinal Chemistry held in Hungary in 1988. Drug design and computer modeling are evident concerns, but receptor sites, inhibition, synthesis, screening, etc. are included. The extensive subject index is of the keyword type.

**Prediabetes. Advances in Experimental Medicine and Biology. Volume 246.** Edited by Rafael A. Camerini-Davalos and Harold S. Cole (New York Medical College). Plenum: New York and London. 1988. xii + 421 pp. \$79.50. ISBN 0-306-43105-X.

The Fifth International Symposium on the title subject, held in Argentina in 1988, produced the large number of typescript papers in this volume. About one-seventh is of concern to chemists: the section on immunological markers.

**Methods in Protein Sequence Analysis.** Edited by Brigitte Wittmann-Liebold (Max-Planck-Institut). Springer-Verlag: New York and Berlin. 1989. xxxv + 575 pp. \$112.00. ISBN 0-387-19433-9.

The Seventh International Conference on the subject was held in Berlin in 1988. The typescripts of the papers given there are arranged in 13 groups, with such concerns as degradative methods, alternatives, instrumentation, data bases, immunological recognition, and membrane proteins. A subject index of 18 pages is included.

**Anion Carriers of Mitochondrial Membranes.** Edited by A. Azzi (Universitat Bern) et al. Springer-Verlag: New York and Amsterdam. 1989. x + 381 pp. \$69.50. ISBN 0-387-50853-8.

This collection of papers, all apparently reports of original research, is nicely set in type, but not indexed in spite of the presence of 8 blank pages at the end of the volume. The conference that generated these papers was held in Zakopane, Poland, in 1988. The five sections are as follows: Isolation and Reconstitution of Carriers, Functional Evidence and Characterization of Various Carriers, Porins, Uncoupling Protein of Brown Adipose Tissue, and Carriers and their Cellular Environment.

**Nitrogen Fixation: Hundred Years After.** Edited by H. Bothe (University of Cologne) et al. Gustav Fischer: Stuttgart and New York. 1988. v + 878 pp. \$120.00. ISBN 0-89574-271-3.

The important subject of fixation of elemental nitrogen was the concern of an international conference held in Köln in 1988. This collection of typescript papers and poster presentations from it is divided into 10 sections, all of which are devoted to biological fixation, from history to the discovery of new nitrogen-fixing organisms. There is an extensive author index, but no subject index.

**Ecotoxicology and Climate. Scope 38. IPCS Joint Symposia 9.** Edited by Philippe Bourdeau (Commission of the European Communities) et al. John Wiley and Sons: Chichester and New York. 1989. xx + 392 pp. \$127.00. ISBN 0-471-91831-8.

An international "workshop", organized by the Scientific Committee on the Problems of the Environment, held in the FRG in 1985, was the basis of this book of contributed papers. They are set in type and arranged in five "chapters". One chapter is titled Introduction, Conclusions, and Recommendations, and one is titled Case Studies. The other three are concerned with natural transport, fate, and effects of chemicals that are important in atmospheric and aquatic ecology. There is a thorough index.