All of the drawing object sizes can be changed to match the user's individual preferences. Line lengths and widths are definable in pictal increments and the font and style for each text tool can be set individually. Several preference files can be established and switching from one to the other is quite straightforward.

Overall, the program is simple to use and comes highly recommended. The reviewers have used MacDraw (in preference to ChemDraw) for many years but switched to Chemintosh II ten minutes after the package was first examined.

Susie Pruett and James K. Whitesell, *University of Texas*

Book Reviews

Chiral Liquid Chromatography. Edited by W. J. Lough (Sunderland Polytechnic, UK). Routledge, Chapman & Hall: New York. 1989. ix + 276 pp. $112.00. ISBN 0-412-01741-5.

This book is a review of the various aspects of the development and applications of chiral liquid chromatography. It is organized in five parts with a total of 16 chapters plus an appendix and an index. The titles of the five parts are the following: (1) Introduction, 3 chapters; (2) Chiral Derivatization, 1 chapter; (3) Direct Chiral Resolution, 8 chapters; (4) Strategy for Development of LC Enantiomeric Determination Methods, 3 chapters; and (5) Future Trends and Requirements, 1 chapter. Each of the chapters includes summary tables of useful information. Extensive references to the scientific literature are accumulated at the end of each chapter. The introductory chapters on Molecular Asymmetry; The Importance of Enantiomer Separations; and Chiral Liquid Chromatography: Past and Present give an important perspective to the book. Chapter 4 on Chiral Derivatization is particularly well done with an extensive table of derivatization reagents. Part 3 includes chapters on Chiral Ligand Exchange Chromatography; Synthetic Multiple-interaction Chiral Bonded Phases; Immobilized Proteins As HPLC Chiral Stationary Phases; Cyclodextrin Inclusion Complexation; Binding To Cellulose Derivatives; Binding To Synthetic Polymers; Ion-Pairing; and Other Direct Chiral Resolution Methods. Each of these chapters gives a good introduction and overview to the particular technique and examples of applications. Part 4 includes chapters on Consideration Of Other Techniques; Choice Of Chiral LC Systems; and Optimization. Chapter 13 discusses what other techniques, including spectroscopic and chromatographic, have to offer for enantiomeric determinations. Chapters 14 and 15 then deal with the development and optimization of the separation in actual problems.

This reference book has done an excellent job of organizing and summarizing the development of techniques and separation methodologies for the separation and analysis of enantiomeric mixtures. The organizational approach taken of presenting the information according to the chiral recognition mechanism was an excellent and appropriate choice on the part of the editor in recognition of the rapid developments in this field and also the volume of the contributions to the literature. The recently adopted regulations by the Food and Drug Administration regarding chiral purity and pharmacology of individual enantiomers focus increased attention on the methods discussed in this book.

This book is to be highly recommended to a wide range of research personnel that use liquid chromatography techniques particularly those in biochemistry and the pharmaceutical sciences. It is a very complete and a useful and timely reference book.

Bruce L. Currie, *University of Illinois at Chicago*

Enzyme Chemistry: Impact and Applications, Second Edition. Edited by Colin J. Suckling (University of Strathclyde, UK). Chapman and Hall: London. 1990. xii + 383 pp. $79.95. ISBN 0-412-34970-1.

C. J. Suckling has assembled eight interesting reviews in the general area of enzyme chemistry. These articles cover a broad spectrum of subjects within enzymology and enzyme chemistry and are specifically written from the point of view of the chemist. The book opens with a set of three general reviews which introduce and discuss "The mechanistic basis of enzyme catalysis", "Chemical models of selected coenzyme catalyses", and "Selectivity in synthesis-chemicals or enzymes". The focus then shifts, and specific topics are discussed in more detail. This includes chapters on "Enzymes as targets for drug design", "The impact of metal ion chemistry on our understanding of enzymes", "The enzymology of the biosynthesis of natural products", and "Enzymes in the food industry". Finally, this second edition of *Enzyme Chemistry* concludes with an article that strays away from the chemical focus of the book and touches on the current application of molecular biology to enzymology.

The objective of *Enzyme Chemistry* is to introduce the chemist to enzymology. As a result, the articles are written to address a chemical audience, and a good foundation in basic chemistry is required to appreciate this book. Furthermore, since a number of chapters focus on the enzymatic catalysis of organic reactions, *Enzyme Chemistry* should be of particular interest to the organic chemist.

Overall, the articles are well-written and well-edited. Each provides a thorough and scholarly account of the topics that are reviewed, and each emphasizes the basic chemistry involved in the study of enzymes and enzyme mechanisms. *Enzyme Chemistry* succeeds in illustrating that fundamental chemical problems are interwoven into biological systems and shows the necessary intermingling of chemistry with enzymology. Although the articles are written to introduce the chemist to enzymology, the articles are presented at a sophisticated level; consequently, *Enzyme Chemistry* is an excellent compendium of reviews that can be appreciated by both chemists and enzymologists.

Richard A. Ikeda, *Georgia Institute of Technology*

Rings, Clusters, and Polymers of Main Group and Transition Elements. Edited by H. W. Roesky (Universität Göttingen). Elsevier: Amsterdam. 1989. xii + 548 pp. $170.75/Dfl. 350.00. ISBN 0-444-88172-7.

The chemistry of rings, clusters, and polymers is becoming an important branch of inorganic and organometallic chemistry. Such compounds are of interest because of their unusual properties and their potential for applications in the areas of catalysis, electronics, and ceramics.

This book is divided into the following eleven chapters: (1) Boron, Aluminum, Gallium, and Indium with Oxygen and Sulfur (Bowser and Fehlner), which emphasizes mainly boron; (2) Boron Hydride Clusters (Greenwood), which includes the deltahedral boranes and which is organized according to the number of boron atoms; (3) Polysilanes (Hengge and Stüger); (4) Germanium–Carbon Rings (Mazerolles); (5) Rings with Phosphorus–Carbon Multiple Bonds (Fluck and Neumüller); (6) Azaphospholes (Schmidpeter and Karaghiosoff); (7) Multiple Bonds Between Transition Metals and Main Group Element Atoms (Herrmann); (8) Unsaturated Four-, Six-, and Eight-membered Metallaheterocycles and Metal-Containing Polymers (Roesky); (9) Organometallic π-Systems (Huttner and Lang); (10) Polynuclear Transition Metal Complexes with Sulfur Ligands (Krebs and Henkel); and (11) Clusters of Metals and Nonmetals (Whitmire). The authors of all of these chapters are authorities in their fields and the coverage is excellent with numerous literature references at the ends of the chapters. There is also a short (6 pages) subject index.

This book covers many areas of descriptive chemistry that are important in modern inorganic chemistry, particularly the chemistry of the non-transition elements. However, there are also some notable omissions. Boron–carbon and silicon–carbon rings are not covered in the book even though the less important germanium–carbon rings are covered. The inclusion of "polymers" in the title may mislead some readers to expect much more inorganic polymer chemistry than is actually present in the book. Despite these omissions this book is an essential addition to any library collection in inorganic chemistry.

R. Bruce King, *University of Georgia*

A Computational Approach to Chemistry. By David M. Hirst (University of Warwick, England). Blackwell Scientific Publishers: Cambridge, MA. 1990. viii + 444 pp. Paperback: $39.95. ISBN 0-632-02743-6. Hardback: $78.95. ISBN 0-632-02431-3.

In this book Hirst surveys a number of commonly used computational chemistry methods: molecular electronic structure, molecular mechanics and dynamics, chemical reaction models, and statistical mechanics of liquids. For each topic, the background of each method, basic theory, and examples of calculations are given. Many subtle features are covered, without complicating the picture with detailed references to specific software packages. Each chapter also contains an extensive list of current literature references for further reading. A logical companion to a course based on this book would be a laboratory sequence using actual programs

to perform the calculations discussed in the book.

Hirst provides the essential background to prepare chemists to deal with the often overwhelming array of terms associated with computational research. Almost any journal article in molecular orbital theory or reaction dynamics assumes of the reader a fairly sophisticated understanding of the field. This text serves to bridge the gap between the research literature and junior-level physical chemistry. Much of the specialized terminology associated with each method is clearly explained. This book equips a chemist with the knowledge to pursue the research literature in each covered area.

The text has a few shortcomings. It overlooks several areas of computational chemistry research. No reference is made to applications of theory to the study of solid-state or surface problems, e.g. phase stability of solids, surface microstructure, catalysis, or surface reactions. These areas offer very important challenges to chemists and a number of comutational techniques are in current use. In addition, density functional methods, such as $X\alpha$ electronic structure theory and band structure techniques, are not mentioned at all. This book clearly limits its coverage to the more traditional areas of theoretical molecular chemistry. The relatively short final chapter on proteins and polymers focuses only on structural simulation and overlooks the theory of macromolecular reactions.

As long as it is not viewed as a comprehensive review of chemical theory, this book would serve as an excellent text for a graduate or senior course covering the applications of theory to real scientific problems. In addition, for nonspecialists and experimentalists it provides valuable insight into the often veiled secrecy of theoretical chemistry.

Mark D. Jackson, *Florida Atlantic University*

Handbook of Polymer Science and Technology. Volume 1. Synthesis and Properties. Volume 2. Performance Properties of Plastics and Elastomers. Volume 3. Applications and Processing Operations. Volume 4. Composites and Specialty Applications. Edited by Nicholas P. Cheremisinoff (Exxon Chemical Company). Marcel Dekker: New York and Basel. 1989. Volume 1: viii + 783 pp. $185.00. ISBN 0-8247-8173-2. Volume 2: viii + 743 pp. $185.00. ISBN 0-8247-8174-0. Volume 3: viii + 664 pp. $185.00. ISBN 0-8247-8004-3. Volume 4: viii + 680 pp. $185.00. ISBN 0-8247-8021-3.

One strength of these volumes is the breadth of the backgrounds of the contributors. All articles are in English, but the nations represented by the authors are the following: Argentina, Brazil, France, Sweden, England, Italy, Belgium, Germany, Turkey, Latvia, USSR, Yugoslavia, Poland, India, Egypt, Iraq, China, Japan, Australia, Canada, and the USA. Industry and academe are well-represented. The editor is a representative of industry but his ties with academe are shown in a chapter he coauthors with his father, Paul N. Cheremisinoff.

Volume 1 covers many topics that would be included in a first year polymer chemistry course. In the section on "Synthesis and Reaction Kinetics", the topics range from theoretical considerations of polymerization kinetics, even as it applies to reactor technology, to the practical considerations of reactor technology. In this section are also included chapters on electroinitiated cationic polymerization and radiation-induced reactions of polystyrene derivatives, as well as on Ziegler-Natta catalyzed polymerizations, block copolymers, aromatic polyesters, nylons, vinyl ethers, and polyvinyl chloride. The section on "Polymer Characterization and Molecular Structure" has discussions of standard techniques (an overview on atomic absorption spectroscopy, chromatography, mass spectrometry, neutron activation analysis, NMR, thermal analysis, FTIR, and X-ray fluorescence: optical microscopy; other microscopy techniques) as well as more unique chapters on viscoelastic properties and thermally stimulated depolarization to study polymer relaxation. A chapter on structural characterization of SBR by a combination of ozonolysis and chromatographic techniques and one on gels complete the volume.

In Volume 2, the chapters on elastomers are varied. Two chapters cover oxidation of elastomers and two deal with protection of elastomers from oxidation. Two chapters present discussion on crystallization in polymers, covering both the theoretical and the practical aspects. The discussions include the use of rubber engineering components at low temperatures and a comparison of crystalline polymers with metals, ceramics, and amorphous polymers. Triblock copolymers, the use of elastomers for high temperature applications, flammability, and curing of elastomers are also discussed. The section on plastics includes four chapters on aspects of polyethylene (synthesis, properties, crystal growth, branching, degradation), two chapters on liquid crystal applications of plastics, a chapter on cross-linking of polyurethanes, a chapter on molecular aggregation of heat resistant polymers and the relationship of this aggregation to mechanical properties, and related chapters on other plastics.

Twelve of the fourteen chapters of Volume 3 range from detailed discussions of ethylene copolymers (synthesis, thermodynamics, rheology) to discussions of processing techniques (calendering, molding, extruding), including the technology of the equipment used. For example, a chapter on the designing of rubber extrusion dies concerns the art of die preparation as related to the use of CAD and finite element analysis to understand dies. Two final chapters deal with the photodegradation of polymers and the practical and theoretical aspects of wire coating.

The title of the fourth volume is somewhat misleading. A range of end uses and applications of polymers is presented. There is a discussion on the interaction of ultraviolet energy with small molecules, which is extended to macromolecules. There are three chapters on polymer blends and alloys, including one which outlines the basic understanding of this area. A chapter on vinyl plastics presents the basics of polymerization (especially chain growth), a discussion of processing conditions (plasticizers, blowing agents), and mechanical properties of these polymers (tensile and impact stengths). There are five chapters on composites, covering computational mechanics, laminated plates (3 chapters), and fiberglass reinforced plastics. The latter chapter is uniquely presented and includes two interesting tables on thermoplastics and thermosets and a good discussion on fabrication methods. The final four chapters cover transport phenomena in polymer films, charge mosaic membranes, plasma polymerization, and submicrometer lithography.

In all four volumes the citing of literature is very uneven. Some chapters contain no references. Some cite none before 1980. Some chapters cite the literature very extensively. Very few of the chapters cite references from 1988 and 1989. This latter aspect undoubtedly reflects the difficulty in coordinating an effort of this magnitude. There is remarkably little repetition in the volumes.

There is no doubt that books of this sort are needed. This book should be found in libraries serving chemists and/or engineers. Individual volumes would be useful in the teaching of related courses. Of course, the cost would make the use of this volume as a text prohibitive. It would be an important development if books such as these four volumes could be obtained at a price affordable to young scientists and engineers. While their presence in libraries is essential, their presence in a private library would be catalytic.

Adriane G. Ludwick, *Tuskegee University*

Progress in the Chemistry of Organic Natural Products. Volume 54. Edited by W. Herz, H. Grisebach, G. W. Kirby, and Ch. Tamm. Springer-Verlag: New York and Heidelberg. 1988. vii + 353 pp. $182.40. ISBN 0-387-82086-8.

This volume of the series still associated with the name of Zechmeister is entirely devoted to "Occurrence, Structure and Taxonomic Implications of Fern Constituents" by T. Murakami and N. Tanaka of the Science University of Tokyo. About 100 pages are devoted to a description, organized on the basis of chemical classification, of secondary metabolites isolated from ferns. Chemotaxonomy is treated briefly and succinctly. About 200 pages are taken up with tables relating compounds and plant sources. There are 514 references that include publications appearing as late as the middle of 1987. The presentation is clear and attractive, and the coverage is compendious and thorough. The inclusion of both subject and author indexes is commendable. Undoubtedly, anyone with any interest in the natural products of ferns will turn to this review.

Stewart McLean, *University of Toronto*

Organic Building Blocks of the Chemical Industry. By H. Harry Szmant (Industrial Consultant). John Wiley and Sons, Inc.: New York. 1989. xv + 716 pp. $75.00. ISBN 0471-85545-6.

This book is a comprehensive review of organic chemicals that are used as raw materials in industry. It gives information on the origins, synthetic pathways, and pricing of the primary organic building blocks and how they are used to make numerous secondary and other downline industrial chemicals.

The book is divided into ten chapters: Introduction to Industrial Organic chemistry; Sources, Production Pathways, and Pricing of Industrial Organic Chemicals: C_1 Building Blocks: C_2 Building Blocks; C_3 Building Blocks; C_4 Building Blocks Including Isoprene & Cyclopentadiene; C_5 and Higher Acyclic Building Blocks; Nonaromatic Carbocyclic Compounds; Aromatic Carbocyclic Compounds; and Heterocyclic Building Blocks. There is a complete index with compounds listed under the abbreviated, chemical, and trade name. There are references found on nearly every page.

The first part of the book deals with economic and historical aspects to give the reader a better understanding of the dynamics of the chemical industry. It discusses the number of organic chemicals, the categories of industrial chemicals, and their contribution to the economy.

The second part of the book systematically covers the sources, synthetic preparation, and commercial uses of the organic building blocks including their structures, useful properties, and unit cost. It explains how economic factors influence costs, production levels, and synthetic

pathways for various chemicals that industry depends on.

The author also addresses several subjects in greater detail including pesticides, phase transfer catalysis, homogeneous catalysis by transition-metal complexes, high-performance specialty thermoplastics, organic metals, polymerization methods, and more.

One criticism is the extensive use of acronyms and abbreviations without a table for convenient access. Although the author provides a list of important references and their abbreviations, the acronyms and abbreviations that refer to the chemicals, company names, or government agencies can only be found in the index.

Overall the book is well-written and I would recommend it. It would make an excellent reference book or could serve as a text for the chemist or chemical engineer interested in learning about industrial organic chemistry in a systematic and comprehensive manner.

Richard J. McCabe, *Parke-Davis/Warner-Lambert Co.*

Reviews in Computational Chemistry. Edited by K. B. Lipkowitz (Indiana University–Purdue University at Indianapolis) and D. B. Boyd (Lilly Research Laboratories). VCH Publishers: New York. 1990. xxiv + 419 pp. $95.00. ISBN 0-89573-754-X.

The relevance of computational chemistry as a discipline in its own right is beginning to be acknowledged even by experimentalists who otherwise used to quickly dismiss theoretical chemistry as basically a playground for physicists and mathematicians gone astray. Last but not least this is corroborated by the course of action of profit minded industry where computational chemistry groups have been established in virtually every major chemical or pharmaceutical company of renown.

Hence, this appears to be the right time to establish a review forum for recent developments in the field. This volume is a useful collection of 11 review articles. As is not unusual for this sort of book, the scope and level of treatment is not uniform. In general though, the emphasis is not on exhaustive reviews of the recent literature but on tutorial-like introductions to the particular fields of study. As promised on the cover, many of the articles are indeed accessible to any interested nonspecialist, even without theoretical background.

In the blurb it is also declared that this would be a "comprehensive new book covering all aspects of computational chemistry". This is certainly not the case. Despite some disclaimers in the introduction, computational quantum chemistry is by far the most prominently represented area, with essentially 5 out of 11 chapters. Molecular mechanics, molecular dynamics, and Monte Carlo methods are only covered in passing in a few places, and computer assisted synthesis planning, chemistry oriented computer graphics, the modeling of continuous chemical reactors, or new theoretical techniques such as simulated annealing and density functional methods are not represented at all. Application oriented examples mostly concern the design of biologically active compounds ("drug design", etc.) and do not touch upon materials problems.

Areas that are covered, besides ab initio and semiempirical quantum chemistry, include QSAR, chemometrics, chemical databases, and molecular surfaces. The tenth chapter moreover tries to illustrate past accomplishments of computer assisted methods in the industrial environment. Characteristically, these involved for the main part rather traditional QSAR approaches which incorporate lots of empirical information from the outset. Nevertheless, the purely commercial successes of such computer assisted methods are in fact quite impressive, considering the sometimes infant status of the discipline. Accordingly, one of the safe bets of predicting the future of chemistry is an ever increasing importance of computational methods. That certainly will not mean the systematic design of new marketable compounds from first principles without recourse to the ingenuity of the synthetic chemist. As pointed out eloquently by Boyd, this will rather involve ubiquitious *assistance* by computational practitioners in the analytic and synthetic laboratory in the sense of providing one more (and highly informative) tool.

The first chapter by Feller and Davidson gives an update on the skilled choice of basis sets for ab initio Hartree–Fock calculations. Chapter 2 by Stewart nicely reviews the popular semiempirical methods that were originally proposed and advocated by Dewar. Chapter 3 by Dykstra et al. systematically addresses the calculation of molecular "response properties", such as polarizibilities and magnetic susceptibilities, from the energy derivatives in ab initio calculations. The quite extensive fourth chapter by Plummer discusses the QSAR approach to the identification of new pesticides, and the fifth chapter by Jurs gives an equally comprehensive overview over the use of chemometrics in analytical chemistry. Chapter 6 by Martin et al. deals broadly with the problem of searching databases for three-dimensional molecular structures. The specific characterization of molecules through a surface and "shape" analysis is described in Chapter 7 by Mezey, one of the chief proponents of this approach. The eighth chapter by Lybrand summarizes molecular simulation methods and in particular the perturbation theory approach to the calculation of free energies that has recently become popular in the simulation community. The ninth chapter by Boyd gives a simple introduction to techniques of "informed structure building" on the basis of experimental data on the one hand and quantum chemical and distance geometry calculations on the other hand. The tenth chapter, also by Boyd and already alluded to above, gives examples for successes of computer-assisted methods in the industrial environment which, as indicated, have mainly been connected with QSAR of biologically active compounds. The final chapter 11 by Davidson returns to ab initio methods and some general thoughts about the evolution of the field, including a provocative view of the accomplishments of 35 years of quantum chemistry. A concluding appendix lists vendors and distribution centers for the major molecular modeling packages currently available.

In summary, the editors have to be praised for starting up a review series on computational chemistry in book form, a more than timely effort. Unfortunately, the $95.00 price tag appears hefty considering the fact that such a book might find a rather wide audience of buyers other than libraries.

Jurgen Schnitker, *University of Michigan*

Energy Transduction in Biological Membranes: A Textbook of Bioenergetics. By W. A. Cramer (Purdue University) and D. B. Knaff (Texas Tech University). Springer-Verlag: New York. 1990. xiv + 545 pp. $89.00. ISBN 0-387-96761-3.

This text is the most recent offering in Springer-Verlag's "Advanced Texts in Chemistry" series. The goal of the series, as stated in the preface by the series editor, is to identify areas of chemistry where recent work has outpaced material available in textbooks and then to find experts who can produce instructive introductions to the field. The area of bioenergetics has undergone a revolution in recent years due to the application of cloning techniques, and an up to date text on this topic is most welcome. Complete sequences of many energy-transducing proteins are now available, and these are being used to interpret results obtained from earlier biochemical and spectroscopic studies. In addition, recent successes in the structure determination of important energy-transducing proteins offer hope that the future will bring additional three-dimensional details about the molecules involved in energy collection and conversion.

While the need is great for a text that bridges the gulf separating molecular biologists and classical bioenergeticists and that exposes the next generation of researchers to the excitement and dynamics of this rapidly moving field, this book falls short of its goals on several counts. The text is divided and subdivided along fairly clear lines. The three major sections are the following: (1) Basic principles of bioenergetics—this section includes chapters on thermodynamics, biochemical redox and proton transfer, and membrane structure and chemiosmotic principles; (2) Components and mechanisms of the electron transport and proton translocation systems—included here are separate chapters on metalloproteins, quinones, photosynthesis, and proton pumping; (3) Use of the stored electrochemical potentials—these final two chapters cover ATP synthesis and the various types of active transport. Although each topic is presented with reasonable depth and clarity, it is unfortunate that the authors fail to convey a better overview of the subject. The book lacks a basic introduction to the history, recent progress, and future directions of the field, and a student reading it might easily be left wondering what the point is. Likewise, the introductions to each chapter do little to set the stage for what is to follow. Other factors also make the book somewhat disjointed. The background chapters are punctuated by "exercises" intended to provide the reader with relevant practical examples of the principles being described. These would work much better if they were more clearly set apart from the main text. Likewise, later chapters contain digressions describing techniques such as difference spectrophotometry and electron spin resonance that would have been better placed at the end of the chapter and referred to from the text. Finally, the use of figures that are reproduced from the original references, while perhaps more accurate than reworked illustrations by the authors, adds to the sense that the material lacks a common theme. A few "big picture" figures would have helped to give the reader a sense of perspective.

The text is intended for use in a one-semester course on bioenergetics for graduate students who have taken courses in advanced biochemistry and physical chemistry. While its level is probably about right for this group, it would be hard to imagine using it without an additional basic textbook in biochemistry to provide background material and to put the systems in a cellular framework. In addition, its price would make this reviewer reluctant to require his financially strapped graduate students to purchase it. Perhaps a better use of the book would be on the shelf of a researcher who has interests in the field, has a fairly good understanding of the systems described, but needs an up to date general reference and review. The material is detailed and accurate, and the references, while not exhaustive, will lead the reader quickly to the relevant

original literature.

David Roise, *University of California, San Diego*

Chemicals in the Aquatic Environment: Advanced Hazard Assessment. Edited by Lars Landner (Swedish Environmental Research Group). Springer-Verlag: New York, Berlin, Heidelberg. 1989. xxii + 415 pp. $139.50. ISBN 0-387-50863-5.

This book is a summary of studies of the Baltic Sea accomplished over a five-year period. A great number of scientists from Sweden and Finland participated in the project. The research efforts were quite interdisciplinary in nature, involving many of the branches of chemistry and biology. Some of the analytical chemistry methods mentioned include atomic absorption spectrometry, atomic emission spectrometry, high-performance liquid chromatography, gas chromatography, and gas chromatography/mass spectrometry. Investigations and discussions of biological systems comprise a significant portion of the book.

Joseph R. Siefker, *Indiana State University*

Organophosphorus Chemistry. Volume 20. By Senior Reporters B. J. Walker and J. B. Hobbs. Royal Society of Chemistry: Cambridge. 1989. v + 375 pp. $214.00. ISBN 0-85186-186-5.

This volume contains eight articles or reviews. The first, written by D. W. Allen, considers recent work in the area of phosphines, halogenophosphines, phosphonium salts, p_π-bonded phosphorus compounds, phosphirenes, phospholes, and phosphorins. The literature covers work done primarily in 1986–1988 and is rather complete. Most citations are for the syntheses and reactions of unusual members of the above families of phosphorus compounds. Attention is drawn to the preparation of chiral phosphorus-containing compounds, potential ligands for complexes, and novel phosphorus systems in all of the groups. Considerable discussion of $R_2C{=}P{-}X$ synthons is included as well as those containing $-P{=}P-$ units. A brief summary of heterocyclics with phosphorus in uncommon five- and six-membered rings is given.

The second article, by C. D. Hall, concerns developments in pentacoordinate and hexacoordinate phosphorus compounds with emphasis on moncyclic and bicyclic systems. Structure, bonding, and ligand reorganization in mono- and multicyclic phosphoranes (including the Wittig ylides) is delineated with ample references to recent work through 1988. The use of ^{31}P, ^{1}H, and ^{13}C NMR analyses, as well as variable-temperature NMR techniques, is outlined for the study of these dynamic systems in solution.

Chapter three, by B. J. Walker, reviews the recent chemistry of achiral and chiral phosphine oxides (acyclic and alicyclic) and related compounds. Reaction at phosphorus or on the side chains of alkyl-substituted phosphine oxides is described along with the use of complex phosphine oxides in the preparation of macromolecules. Triphenylphosphine oxide is known to form complexes (large crystals can be grown) with H-bonding substances. Transition-metal complexes are also reported.

Chapter four, by O. Dahl, concerns the chemistry of tervalent phosphorus acids. A variety of preparative methods are outlined including the use of Arbuzov reaction, attack of trivalent phosphorus-containing systems on unsaturated molecules, and attack on other elements such as nitrogen, halogen, etc. The synthesis of a large number of novel or unusual trivalent phosphorus compounds is also discussed including a new preparation of tri-*tert*-butyl phosphite (which has now been shown to be distillable) and the first example of a 1,3,2,4-dioxadiphosphorinane. A large number of chiral systems are also described. Mechanistic studies of the hydrolysis of phosphorus amides and esters, including some nucleotides, are illustrated. A nice description of reactions involving two-coordinated phosphorus-containing molecules is reviewed. The chapter title is a little misleading since the discussion on phosphorus acids is very minor.

Chapter five, by R. S. Edmundson, is entitled Quinquevalent Phosphorus Acids. The synthesis and reactions of derivatives of phosphoric acid, phosphonic acid, and phosphinic acid, including acid chlorides and amidates, is reviewed. The use of certain phosphoric acid derivatives in the preparation of alcohols, lactams, and aldehydes is delineated. The reviewer found this chapter particularly informative not only from the large number of references included but also from the somewhat detailed analysis of the reactions under discussion.

Chapter six, by J. B. Hobbs, on recent developments in the chemistry of nucleotides and nucleic acids has 475 references through 1988 and attests to the marked activity in this area. Although this field is still changing rapidly, this reviewer found the remarks in this chapter to be very revealing in terms of the chemistry involved, but the work will also be of interest to the biochemist as well as to the chemist and perhaps to the microbiologist. Considerable discussion on the potential utility of oligiodeoxyribonucleotide probes is included as one major area of active research interest. Many others are cited as well.

Chapter seven, by B. J. Walker, has focused upon Ylides and Related Compounds. Emphasis remains on the continued expansion of phosphorus ylides for the generation of alkenes. Evidence suggests that the *trans*-oxaphosphetane is thermodynamically favored while the *cis*-oxaphosphetane is the kinetically favored intermediate in the olefination reaction. Reactions of methylenephosphoranes and phosphonate anions are covered as is the application of ylides in natural product chemistry including the synthesis of alkaloids, carotenoids, leukotrienes, macrolides, pheromones, and prostaglandins.

Chapter eight, by C. W. Allen, is titled Phosphazenes. The chemistry of simple acyclic phosphazenes, interactions with transition metals, and polymers made from such molecules is reviewed. Cyclophosphazenes are addressed including the synthesis, reactions, and applications in fire retardancy. Some attention is directed toward the chemistry of cyclophospha(thia)zenes along with that for poly(phosphazenes). A valuable table on a number of structural parameters from X-ray diffraction analysis of a variety of phosphazenes is included at the end.

K. Darrell Berlin, *Oklahoma State University*

Biological Magnetic Resonance. Volume 9. Edited by L. J. Berliner (Ohio State University) and J. Reuben (Hercules Incorporated). Plenum Press: New York and London. 1990. xii + 251 pp. $65.00. ISBN 0-306-43341-9.

This ninth volume in the series contains 6 reviews that generally are well-illustrated with specific spectra and discussions. The chapter by P. L. Yeagle, Phosphorus NMR of Membranes, provides an extensive summary of model and biological membranes that touches on solid-state techniques, relaxation spectroscopy, and high-resolution results. The chapter by A. G. Marshall and J. Wu, Investigation of Ribosomal 5S Ribonucleic Acid Solution Structure and Dynamics by Means of High-Resolution Nuclear Magnetic Resonance Spectroscopy, reviews the structure determination as well as the structural dynamics of the RNA by a variety of NMR methods but emphasizes high-resolution proton experiments. The review by B. A. Borgias and T. L. James, Structure Determination via Complete Relaxation Matrix Analysis (CORMA) of Two-Dimensional Nuclear Overhauser Effect Spectra: DNA Fragments, addresses the application of complete relaxation matrix analysis applied to the derivation of structures from 2D NOE data for the particular cases of deoxyribonucleic acids. The chapter by A. D. Robertson and J. L. Markley, Methods of Proton Resonance Assignment for Proteins, provides a concise summary of techniques currently used for resonance assignment with a number of examples. The chapter by S. J. Opella, Solid-State NMR Spectroscopy of Proteins, is a short review on the applications of multinuclear high-resolution NMR of solids to the very complex problem of proteins. The chapter by J. E. Meier and A. G. Marshall, Methods for Suppression of the Water Signal in Proton FT/NMR Spectroscopy, is a well-illustrated presentation of the several methods currently used to eliminate the water resonance and detect solute resonances for simple and complex spectra.

These reviews are generally excellent although different authors make different assumptions about the reader. Nevertheless, many will find these reviews useful and timely.

Robert G. Bryant, *University of Rochester*