Book Reviews*

Inclusion Compounds. Volume 1. Edited by J. L. Atwood, J. E. D. Davies, and D. D. MacNicol. Academic Press: New York. 1984. xiii + 420 pp. $70.00.

This book, the first of a three-volume series, is devoted to inclusion compounds with inorganic and organometallic host lattices. Organic hosts will be treated in Volume 2, and Volume 3 will deal with properties and applications. In view of the number of papers currently being reported on the properties of molecules in ordered host environments, there is little doubt that the entire series will be a valuable addition to the literature.

The introductory chapter by H. M. Powell, an early pioneer to whom the book is dedicated, provides a historic perspective of inclusion chemistry and ties together the principal topics contained in the three volumes. Excellent coverage is provided for inclusion compounds with metal complex hosts. Included is a chapter by T. Iwamoto, on Hofmann-type compounds formed from salts containing M^{II}–CN–M^{II} linkages, and two chapters by J. Lipkowski and by J. Hanotier and P. de Radzitzky, on Werner-type inclusion compounds with *trans*-MX_2A_4 (A = pyridine-type ligand) and $Ni(NCS)_2(\alpha$-arylalkylamine$)_4$ complexes as hosts. The treatment of molecular host structures is continued in a well-illustrated chapter by G. A. Jeffrey on hydrate inclusion compounds and an excellent chapter on spirocyclophosphazene inclusion adducts by H. R. Allcock.

Inclusion compounds formed from hosts with extended two-dimensional structures are treated by R. Schöllhorn in a single chapter on intercalation compounds. Though this is the most extensive chapter in the book (421 references), the field of intercalation chemistry is so vast that only a general survey of the more important families of layered compounds could be included. Three-dimensional host structures, specifically the zeolites, are treated by R. M. Barrer. Metal–zeolite, salt–zeolite, and molecule–zeolite inclusion compounds are discussed, with emphasis being placed on the latter.

The final chapter by J. L. Atwood has the seemingly paradoxical title Liquid Clathrates. These are liquid phases formed between $(Al_2R_6X)^-$ salts and, principally, aromatic hydrocarbons which are believed to occupy disordered cavities between the strongly associated cations and anions. Interestingly, these liquid clathrates may have utility for coal liquefaction as they are capable of imbibing impressive amounts of coal components.

If the book has one fault, it is that not enough detailed coverage is provided on inclusion compounds with extended host structures. Nevertheless, it does provide a good overview of the inorganic aspects of inclusion chemistry, and it should be a useful reference text for most workers in the area.

Thomas J. Pinnavaia, *Michigan State University*

Semiclassical Theories of Molecular Scattering. By B. C. Eu (McGill University). Springer-Verlag: Berlin. 1984. xii + 229 pp. $31.00. ISBN 0-387-12410-1.

One of the most active research areas in the theoretical study of molecular collision processes since the late 1960's has been the development of a rigorous semiclassical theory of the nuclear dynamics, one in which the $\hbar \to 0$ limit is applied consistently to all degrees of freedom. B. C. Eu has contributed much to the development of this area, and in this book he provides a nuts-and-bolts discussion of both its mathematical development and its application to a number of important collision processes.

The presentation begins with an intense discussion of the mathematical foundations of the WKB and related semiclassical approximations, followed by an in depth analysis of semiclassical theory as applied to elastic scattering. The development for inelastic collisions is then considered, using first the time-independent coupled-state semiclassical approach for which Eu is best known and then the time-dependent semiclassical approach with which the names Miller and Marcus are often associated. This is perhaps the only place in the literature where both approaches are coherently developed and compared, and much insight is demonstrated by Eu here concerning the foundations of semiclassical theory.

The most detailed applications in the book are taken from curve-crossing phenomena. The Landau–Zener–Stuckelburg (LZS) theory of two-state curve crossing is developed, along with improvements to LZS based on uniform approximations. Multistate curve crossing and predissociation phenomena are then considered, followed by the generalization of curve crossing to many nuclear degrees of freedom with the Tully–Preston and Miller–George surface-crossing theories and the Eu's coupled-state approach. The book concludes with a detailed analysis of semiclassical theory for scattering from an ellipsoidal particle.

This is clearly an important book for those interested in molecular collision processes, particularly with regard to its discussion of curve-crossing phenomena. For the most part, the emphasis is on details of the theoretical development rather than on numerical applications, but in the former area the book provides much insight and depth. Although there are many areas of semiclassical theory which are not covered, particularly with regard to the treatment of rearrangement collisions, the topics which are included are done thoroughly and carefully.

George C. Schatz, *Northwestern University*

Free Radicals in Biology. Volume 6. Edited by William A. Pryor (Lousiana State University). Academic Press: Orlando, FL. 1984. XXIV + 437 pp. $75.00.

The previous volumes in this series have provided a wide and diverse variety of review articles concerning free radicals in biologically related systems. Indeed, they provide a history of the progress in this field and in many cases give excellent reviews of the state of research in specific areas to that date.

The editor points out that this current monograph differs from the past in that six of the eleven chapters "treat the free radical chemistry of the arachidonic acid cascade and the biochemistry of the prostaglandins, leukotrienes, and other products from arachidonic acid". This area has become one of the most important and topical in free radical biochemistry. For example, there is good evidence for the involvement of arachidonic acid chemistry in numerous regulatory and disease processes. This set of six chapters provides an excellent primer for the neophyte to the area. They of course cannot fully cover this rapidly growing area, but with references therein the reader can come to within 2 years of the most recent advances.

Other chapters deal with chemiluminescence, oxy radical involvement in parasitic disease, as well as aromatic amine and polynuclear hydrocarbon carcinogens. The last chapter provides detailed arguments and evidence for the free radical theory of aging. Interesting correlations between levels of various endogenous antioxidants and life-spans of various species are made. It seems that at least one necessary but not necessarily sufficient condition for long life is a high level of specific antioxidants. This monograph is recommended for all interested in free radical mechanisms in biological systems.

Michael D. Sevilla, *Oakland University*

Rodd's Chemistry of Carbon Compounds. 2nd Edition. Supplement to Volume IV. Heterocyclic Compounds, Part A, Three-, Four-, and Five-Membered Mono-heterocyclic Compounds. Edited by M. F. Ansell. Elsevier Science Publishers: Amsterdam and New York. 1983. xx + 540 pp. $146.25. ISBN 0-444-42397-4.

This volume is written entirely by R. Livingstone, who has evidently labored mightily to cover a broad subject in six chapters. One chapter deals with three-membered heterocycles of all types of atomic makeup. Another deals with furan and its benzo derivatives. The remaining chapters are devoted to the thiophenes, pyrroles, and five-membered-ring compounds containing one P, S, As, Sb, Si, or Ge atom. The treatment is that which has been standard for "Rodd": a broad survey intermediate between specialist monographs and introductory texts. It provides an efficient entry into an area, provides orientation, and by means of the many references points the reader to more detailed sources.

The text is reproduced from the author's typescripts, without running heads. There are no tables of properties, and yields are rarely given, but such gaps are not detracting in a work at this level. Structures and equations are abundant and for the most part clear, although their hand-lettered character is unnecessarily crude for a work of permanent reference (it is so easy to type atomic symbols, that there seems to be no reason not to). The references, which are inserted into the running text, suffer from what is presumed to be an editorial directive to adhere to the eccentric style of the series, in which standard abbreviations are not consistently used, and adjectives in Journal names are not capitalized (e.g. "J. Amer. chem. Soc."). The poor authors should be allowed to write the references in the customary style for chemical publications, rather than wasting their energies in a fruitless attempt to be consistent in doing the unnatural. Journals with non-English titles are an insidious trap, for example, and whereas "heterocycl." is mostly found uncapitalized, its

*Unsigned book reviews are by the Book Review Editors.

Russian equivalent, "Geterotsikl.", is always capitalized in this volume. A further problem with the references is the irritating use of "*ibid.*" and "*loc. cit.*" These force the reader to rummage through previous pages, in some cases only to find that the reference intended is not there at all (e.g., on p 390, "Durham, Hughes, and Rees, *loc. cit.*").

Nomenclature is generally a comfortable compromise between traditional and strictly systematic, but there are a few lapses, such as "cycloheptene-thioaldehyde" (for -thiocarbaldehyde), and on p 391 "lithium tetrahydridoaluminate" and "sodium bis-(2-methoxyethoxy)-aluminum hydride" are found in the same sentence.

No clue is given as to how recent the literature coverage extends, but a casual search turned up nothing later than 1980.

Advances in Heterocyclic Chemistry. Volume 35. Edited by A. R. Katritzky. Academic Press: Orlando, FL. 1984. ix + 456 pp. $89.00. ISBN 0-12-020635-8.

This volume contains six chapters by eight contributors, who cover the literature through 1982. Dibenzofurans are reviewed by M. V. Sargent and P. O. Stransky, who concentrate on the material published since Parham's review in 1951. J. A. Joule reviews carbazole chemistry since the Sumpter and Miller review of 1954. The chemistry of thietes, thietanes, and derivatives that has been published since Saunder's review of 1966 is covered by W. Ried and B. Heinz. Bipyridines, which do not appear to have received a comprehensive review before this, have now been given one by L. A. Summers. Twin chapters by M. P. Sammes and A. R. Katritzky treat 2*H*- and 4*H*-imidazoles, thereby completing the series on nonaromatic azoles.

The typesetting, arrangement of references, and drafting of structural formulas adhere to the high standards of this series and provide a model for good publishing. The content is, as to be expected, excellent. An index is not provided, unfortunately; although the tables of contents of the chapters are fairly detailed, they alone are not sufficient for optimum access.

The Chemistry of Optically Active Sulfur Compounds. By Abraham Nudelman (Bar-Ilan University). Gordon and Breach, Science Publishers: New York. 1984. ix + 253 pp. $58.00 ISBN 0-677-16390-8.

According to the author, the purpose of this paperback, which is a collection of five review articles, "is to make available, to the investigator interested in this field, a comprehensive and organized summary of the published work" on optically active compounds which contain an asymmetric sulfur atoms(s). Racemic compounds have generally been excluded from consideration. The first four reviews, which make up three-quarters of the book, were published previously and reappear as unaltered typographical copies of the originals with minor misprints and misspellings intact. Parts I and II first appeared in the *International Journal of Sulfur Chemistry*, **1971**, *6*, 1; **1977**, *7*, 241, and parts III and IV in *Phosphorus and Sulfur*, **1976**, *2*, 51; **1980**, *9*, 1, respectively, and cover the literature from 1929 through 1977. Part V resembles parts II, III, and IV in format and reviews the literature from 1978 through 1979. Inclusion of more recent references would have been welcome since a great deal of relevant work has appeared in the last few years. Unfortunately, there is no index, but each part does begin with a table of contents. For example, part V is divided into sections named as follows: Sulfoxides; Sulfinates, Amidothiosulfites and Amidosulfinyl Halides; Sulfinamides; Sulfonium, Oxosulfonium, Iminosulfonium and Alkoxysulfonium Salts; Sulfilimines and Sulfoximines; Sulfuranes; Thiabenzenes; Sulfenamides; Disulfides; and Organometallic Chiral Sulfur Compounds. Numerous structural formulas are included.

Thhs book can be recommended to those chemists who wish a review of the literature through 1979 with over 800 references all in one paperback.

Kenneth K. Andersen, *University of New Hampshire*

Central Analgetics. Chemistry and Pharmacology of Drugs Series. Volume 1. Edited by Daniel Lednicer. John Wiley and Sons: New York. 1982. xii + 219 pp. $47.50. ISBN 0471-08314-3.

"Central Analgetics" is a collection of four articles (as chapters) bridging the physiology, pharmacology, and medicinal chemistry of the processes involved in the propagation, perception, and therapeutic treatment of pain mediated by the central nervous system. This book seems geared for the practicing medicinal chemist who is in the process of becoming more involved in the rational design of analgetics through interaction with biological counterparts in this area. Thus, the chapters on Pain Pathways: Potential Sites for Analgetic Action (Chapter 1) and Pharmacological Alteration of Pain... (Chapter 2) serve reasonably well to bring the non-biologist up to date on current theories and knowledge relating to the propagation and perception of pain. Throughout these sections, the respective authors point to possible targets for consideration by the medicinal chemist where new discoveries may be forthcoming. The third chapter is devoted to a discussion of centrally acting regulatory peptides as potential analgetics and makes an attempt to familiarize the reader with current knowledge on the complex functions of neuroregulatory peptides. The author points to several promising directions for agonist and antagonist peptide analogues that may lead to analgetics.

The fourth chapter provides a historical perspective on the medicinal chemistry of morphine and its derivatives with a sprinkling of synthetic chemistry and SAR. A more critical presentation of the bioorganic chemistry of this large class of compounds is missing and would certainly enrich the readers' appreciation for the past, present, and (presumably) future role of morphine derivatives, which has had a major impact on the development of organic chemistry and pharmaceutical science.

The book, overall, contains useful information in each topical area and will certainly be required reading for scientists in several disciplines involved in the development of analgetics. What was lacking was a more unified view of this area that each individual chapter could not achieve. Obviously, developments in this area must, at present, fall short of the badly needed insight into the structure of various "receptor sites" and the structures and conformations of both natural and unnatural agonists and antagonists. Although various "models" are discussed throughout the book, a more detailed examination of several referenced recent approaches to drug design that draws on new knowledge of specific receptors would have, perhaps, been more interesting. "Central Analgetics" succeeds as a textbook for the "student" of analgetic development but may disappoint the learned researcher at the forefront of this area.

Robert M. Williams, *Colorado State University*

Principles of Water Quality. By T. D. Waite (University of Miami). Academic Press: Orlando, FL. 1984. xii + 289 pp. $45.00. ISBN 0-12-730860-1.

This is the first in an international series of books on the subject "Water Quality Management", edited by Hillel I. Shuval. Dr. Waite's book does a good job of describing those aspects of undergraduate chemistry and biology which bear on water quality, its measurement, its deterioration, and its treatment. The book begins with two short introductory chapters in which a few of the well-publicized water quality problems of the last 15 years are called to mind and described. Such topics as mercury contamination, DDT contamination, enhanced eutrophication, and difficulties in the treatment of wastewater set the stage for the rest of the book. Natural water systems are then described from a chemical point of view. The dynamics of dissolved oxygen and carbon are briefly summarized.

The chapter on toxic metals serves many purposes. Mercury, lead, zinc, and cadmium are emphasized and their solubilities with hydroxide, chloride, and carbonate anions examined. This leads to chelation and redox equilibria which are handled clearly with a special emphasis on graphical presentation of results. Unfortunately, there is nothing said about the influence of pH upon the solubility of metal salts of basic anions; also, chelation is equated with the formation of organic metal compounds. A final shortcoming is the lack of any mention of the kinetics of metal complexation. Equilibrium considerations are handled well, however. The very useful concept of pH–pE diagrams is introduced and used well to explain equilibrium transformations in aqueous solution. Subsequent chapters dealing with refractory organic compounds, biological nutrients, microorganisms, thermal effects, and atmospheric deposition into surface waters are all well done. The book concludes with chapters dealing with water quality modeling and water quality standards. These final chapters utilize the information put forth in the body of the book to emphasize the complexity of natural systems and to summarize the difficulties inherent in the management of water for optimal utilization.

This book will be useful either to someone trained in chemistry who wishes to become aware of the applicability of that training to the field of water quality or to the person who wishes to enter the field of water quality without extensive chemistry background.

James D. Carr, *University of Nebraska*

Chromatography of Alkaloids. Part B: Gas/Liquid Chromatography and High Performance Liquid Chromatography. Journal of Chromatography Library. Volume 23B. By R. Verpoorte and A. Boerheim Svendsen. Elsevier Science Publishers: Amsterdam and New York. 1984. 457 pp. $94.25. ISBN 0-444-42265-X.

This text is the second part of a two-part volume dealing with the analysis of alkaloids. The authors have divided the text into approximately equal sections dealing separately with GLC and HPLC. In each part, general instrumentation is discussed first, followed by a description of separations for individual classes of alkaloids.

Part 1, dealing with GLC, starts with a description of packed columns, including their preparation. A chapter on capillary columns and derivatization follows. The importance of proper deactivation of column

tubing and packing material is stressed. Unfortunately, there is virtually no information on evaluation and testing of GC systems, a vital subject for substances which are difficult to chromatograph. This aspect should have been included, if necessary, at the expense of other information such as the preparation of column packings. In practice, most workers purchase these materials rather than prepare them in the laboratory. The significant advances which have been made in capillary column technology and instrumentation, in particular in the preparation of thermostable, chemically bonded phases on fused silica tubing and the emergence of new inlet systems, have not been discussed by the authors. A short discussion of available options and perhaps a bit of information on optimization, i.e., choice of stationary phase, film thickness, column length and diameter, etc., would have been of help to anyone, in particular to the novice. The entire section dealing with methods and instrumentation constitutes a mere 10% of Part 1. The same holds true for the coverage of columns and instrumentation in the HPLC section of the book.

The main part of the book consists of a very careful compilation of analytical procedures published in the literature. Both GLC and HPLC methods are organized according to chemical classes. The coverage of these families of alkaloids can only be described as very thorough and meticulous. There are numerous tables and chromatograms throughout the text. Attention has also been given to sampling and pre-column clean-up procedures. The strength of the text lies with the accessibility in which the information is provided. At the end of each section discussing a specific class of alkaloids, a summary is provided in the form of a table. The summary covers experimental conditions, sample preparation/derivatization, and the appropriate references. In general, material is covered up to approximately 1982, although some of the chapters in the part dealing with gas chromatography do not go beyond 1978.

This text bridges a large gap since many articles are published in a very wide variety of journals, varying from chromatographic texts to literature with medicinal orientation. In spite of some shortcomings, this book is an excellent reference source. It is well documented and essentially free of errors. The text is highly recommended especially for the practicing chromatographer.

Wolfgang Bertsch, *University of Alabama*

The Third Dimension in Organic Chemistry. By Alan Bassindale (The Open University). John Wiley and Sons Ltd.: Chichester. 1984. xiv + 242 pp. $17.95. ISBN 0471-90189-X.

Were this book a building it would have to be condemned as an "attractive nuisance".

Aimed at a naive audience—students who have had one or two semesters of organic chemistry—it is attractively printed, well-illustrated, and modestly priced. It is put out by a reputable publisher. It deals with an active and exciting area of organic chemistry and has a good Table of Contents. But it reads like a set of lecture notes fleshed out by a student for publication. All the right topics are there, in reasonable sequence, but the text is shot through with the misapprehensions that arise when hasty notes are expanded without a seasoned understanding and without checking and rechecking original sources.

A lower level textbook should not contain the *whole* truth (as that is known at the time), but what it does contain should be correct, not misleading; it should be pedagogically apposite. So what, then, is one to make of a textbook on stereochemsitry in which the summary of a section on symmetry includes the sentence: "Those chiral molecules containing at least one symmetry element such as C_n axis are called *nondisymmetric*" (spelling and emphasis as in the original, p 35)? Where *plain* ORD curves that cross the zero axis (and show, therefore, one of the several kinds of "anomalous" behavior that are possible) are said to be "simple" and to exhibit positive or negative Cotton effects (p 112)? Where it is stated that "Pasteur separated that enantiomeric *R,R*- and *S,S-tartaric acid* crystals using tweezers and a microscope" (p 117) (emphasis added; he used the sodium ammonium salt)? Where the Curtin–Hammett principle is illustrated *only* with a reaction coordinate diagram for a case where the major conformer gives rise to the chief product (p 164)? Where Cram's rule for reactions of organometallics at carbonyl groups is illustrated by use of Karabatsos' model and Prelog's rule is similarly formulated (and Felkin's model is not mentioned) (p 207)? Where, in interesting but almost certainly misleading metaphor, melting temperature and reaction with Br_2 (*inter alia*) are described as "properties that contain an element of symmetry" (p 104) and plane polarized light as a "chiral agent" (p 118)? Where the application of the Cahn–Ingold–Prelog notation to compounds with several chiral centers is illustrated by assigning *R* and *S* configurations (instead of *r* and *s*) to the central atoms of the *meso*-2,3,4-tribromopentanes, with the comment that mirror planes pass through those atoms—but no sign of recognition that this would throw any student with an attention span of at least one page into total confusion? There probably is a need for a good textbook on organic stereochemistry at this level and with the emphasis this book gives to reaction stereochemistry (but with *some* references to the original literature!). With more care in research, writing, editing, and proofreading, this book might have been it.

A pity, that!

James H. Brewster, *Purdue University*

Natural Product Chemistry—A Mechanistic and Biosynthetic Approach to Secondary Metabolism. By K. B. G. Torsell (University of Aarhus). John Wiley and Sons: New York. 1983. XII + 401 pp. $24.95 paperback. ISBN 471-10379-9.

This is a good text overall and will be of most value to the advanced student with adequate preparation in organic and biochemistry. The coverage is comprehensive and includes important features of primary metabolism as well as most of secondary metabolism with a major emphasis on mechanistic considerations.

The introductory chapter provides a brief historical account of the field and a somewhat superficial overview of the ecological importance and pharmacological significance of natural products. The remainder of the chapter includes useful sections on key metabolic reactions and methodology. The second chapter deals with carbohydrates and includes good coverage of photosynthesis and the origin of mono-, di-, and polysaccharides. Chapter three provides excellent treatment of the biosynthesis of shikimic acid and of phenylalanine, tyrosine, and tryptophan. Biological hydroxylations are described here, and the chapter includes sections on benzoates, cinnamates, and lignins. The polyketide pathways are described in chapter four, and this chapter includes an introduction to NMR-based approaches to biosynthetic investigation and a good section of flavonoids. In chapter five, the origin of mevalonate and its transformation to prenyl phosphates is well described, but coverage of the various terpenoid families is uneven and, is some cases, a bit dated. Essential and non-essential amino acids are treated in chapter six, and this chapter includes sections on the function of pyridoxal phosphate and on the biosynthesis of penicillins and cephalosporins, both of which are fairly well done. The coverage of alkaloids is conventional and comprehensive, with strong emphasis on mechanisms by which the various types are produced. The final chapter deals with the biosynthesis of *N*-heteroaromatics, including porphyrins, and includes a good description of vitamin B_{12} dependent reactions.

A major shortcoming of the book is the poor coverage of the literature since the late 1970s. There is a heavy emphasis on the in vivo biogenetic studies of this period, and much of the more recent research with in vitro systems is not included. There are a few errors (pathway of morphine biosynthesis) and proposals that have been outdated by more recent research (redox isomerization of prenyl pyrophosphates). In some sections the presentation lacks focus due, in large part, to the brief and often very speculative coverage of important, but still unresolved, questions. In spite of these criticisms, I did like the book because of the comprehensive treatment of the area and the prominent mechanistic emphasis. In addition to the useful questions and answers provided at the end of each chapter, the referencing is excellent and both an author index and a good general index are provided.

Rodney Croteau, *Washington State University*

Applications of Transition State Theory to Unimolecular Reactions. By J. H. Beynon (University College of Swansea) and J. R. Gilbert (University of Essex). John Wiley and Sons: New York, NY. 1984. vii + 85 pp. $24.95. ISBN 0471-90316-7.

This book provides an up-to-date description of unimolecular transition-state theory. It is not intended for one who wishes to delve into the various intricacies of the theory. Instead, its intent, which is accomplished, is to give a general introduction to the subject suitable for scientists with interests ranging from physics to organic chemistry. Though many of the examples deal with the decay of metastables in mass spectrometry, the book is still quite useful for one interested in the unimolecular decomposition of neutrals.

Terminology related to unimolecular kinetics is carefully defined as well as important dynamical concepts. Emphasis is placed on microcanonical (RRKM) unimolecular rate theory, which describes decomposition vs. excitation energy. The statistical approach of the theory is described, and situations for which the theory may fail are explained in detail. The discussion of variational unimolecular rate theory, which is not included in many texts, is beneficial.

This book would be a useful addition to many kineticists' libraries. Many instructors may wish to include it as a required text for courses dealing with chemical kinetics.

William L. Hase, *Wayne State University*